KENYATAAN TENDER

Tender adalah dipelawa daripada kontraktor-kontraktor yang berdaftar dengan Lembaga Pembangunan Industri Pembinaan Malaysia dalam gred, kategori, pengkhususan dan jenis pendaftaran yang berkaitan dan yang masih dibenarkan membuat tawaran buat masa ini bagi kerja berikut:-

Bil.	Tajuk Dan No. Tawaran	Taraf/Syarat Pendaftaran	Tarikh dan Tempat Taklimat	Tarikh & Tempat Mendapatkan Dokumen	Tarikh & Tempat Tutup Tender
1.	**CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326), BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.** **NO TENDER : LRT/IP/ST/2025/06**	♦ **Berdaftar dengan LPIPM (CIDB)** **- Gred : G2** **- Pengkhususan : B04** **Dan** ♦ **Vendor Berdaftar Ladang Rakyat Trengganu Sdn Bhd** daftar di https://ivendor.lrtsb.com.my	Tarikh : **22 Januari 2025 (Rabu)** Pendaftaran: **10.30 pagi – 11.00 pagi** Tempat: **Pejabat Ladang Lubuk Lesung, Gerai No.4, Tingkat Atas, Bangunan Kedai 2 Tingkat, Seri Bandi, 24000 Kemaman, Terengganu** Masa: **11.00 pagi** (Taklimat Tender dan Lawatan Tapak adalah **DIWAJIBKAN**)	**22 Januari 2025 (Rabu)** sehingga **10hb Februari 2025 (Isnin)** Muat turun di laman web http://www.lrtsb.com.my	**10hb Februari 2025 (Isnin)** Sebelum atau pada jam **2.00 petang** Tempat: **Peti Tender** **Ladang Rakyat Trengganu Sdn Bhd,** **KM1, Jalan Cherul, Bandar Cheneh Baharu,** **Kemaman, Terengganu**

1. Waktu urusan pertanyaan mengenai tender adalah seperti berikut :

HARI	WAKTU
Ahad hingga Khamis	9:00 pagi – 12:00 tengahari dan 2:30 petang – 4:00 petang

2. Kaunter pendaftaran dibuka pada jam 10.30 pagi sehingga sesi taklimat bermula. Pendaftaran lewat tidak dibenarkan untuk menyertai tender. Kontraktor yang hadir ke Taklimat dan Lawatan Tapak handaklah membawa bersekali Sijil-sijil ASAL dan SALINAN (tidak akan dikembalikan). PERWAKILAN KUASA ADALAH TIDAK DIBENARKAN SAMA SEKALI. Pengarah syarikat yang sah dan dinamakan dalam sijil sahaja dibenarkan menghadiri taklimat dan lawatan tapak. Pihak pembekal diminta mengemukakan salinan Sijil Berdaftar Vendor Ladang Rakyat Trengganu Sdn. Bhd. bersama tawaran harga untuk rekod simpanan (tidak akan dikembalikan).

3. Dokumen Meja Tender disediakan untuk semakan di Kaunter Bahagian Pentadbiran Dan Sumber Manusia, Ladang Rakyat Trengganu Sdn Bhd, KM1, Jalan Cherul, Bandar Cheneh Baharu, 24000 Kemaman, Terengganu pada waktu pejabat sehingga dan termasuk tarikh tender dijadualkan ditutup.

4. Dokumen tender hendaklah dimasukkan ke dalam sampul surat berlakri, dengan tajuk tender dituliskan di kirinya dan dimasukkan ke dalam peti tender di alamat berikut :- **PENGURUS PENTADBIRAN DAN SUMBER MANUSIA, LADANG RAKYAT TRENGGANU SDN BHD, KM1, JALAN CHERUL, BANDAR CHENEH BAHARU, 24000 KEMAMAN, TERENGGANU.**

5. Semua kos yang berkaitan dengan tawaran tender di atas adalah tanggungjawab pembekal. Tawaran yang LEWAT diterima tidak akan dipertimbangkan sama sekali.

6. **LADANG RAKYAT TRENGGANU SDN BHD** tidak terikat menerima tawaran terendah atau sebarang tawaran atau memberi apa-apa sebab sesuatu tawaran itu ditolak dan juga tidak bertanggungjawab ke atas perbelanjaan dengan tawaran ini.

7. Sebarang pertanyaan boleh menghubungi Bahagian Pentadbiran Dan Sumber Manusia, Ladang Rakyat Trengganu Sdn Bhd di talian 09-8730 399/0395/0034 atau melalui emel: admindiv@lrtsb.com.my

DOKUMEN TAWARAN SEMULA

CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326), BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

UNTUK

LADANG RAKYAT TRENGGANU SDN BHD

ARCHITECT
KUMPULAN PERUNDING (1988) SDN BHD
44, TINGKAT 1, JALAN SULTAN ISMAIL
20200 KUALA TERENGGANU
TERENGGANU DARUL IMAN
TEL : 09-622 3582, 622 3755
FAX: 09-628 4841
EMAIL : kpkt@kp88.my , kpkt88sb@yahoo.com

CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326) BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

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TENDER NOTICE

TENDER NOTICE

CLOSING TIME

1. Tenders shall be lodged at the office of **LADANG RAKYAT TRENGGANU SDN. BHD. , KM. 1, JALAN CERUL, BANDAR CENEH BAHARU, 24000 KEMAMAN, TERENGGANU DARUL IMAN** not later than **12.00 noon** on _____

FORM OF TENDER

2. Complete the tender form provided and accompanying schedule, if any, fill in all blanks, and supply all information called for in the tender documents. Submit in a sealed envelope marked "Tender for

CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326) BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

INFORMAL TENDER

3. A tender may be declared informal if the tenderer fails to comply with any of the relevant conditions stated in the Tender Documents. Informal tender may not be considered.

IMPLICATION OF TENDER

4. The submission of a tender shall be deemed to imply that the tenderer:- Undertakes to execute the form of contract in the Tender Documents, embodying all the conditions and special if any, stated therein. Agrees that the Client is not bound to accept the lowest of any tender.

TENDER FEES

5. A set of Tender Document could be obtained at **LADANG RAKYAT TRENGGANU SDN. BHD.** office at a cost of **Ringgit Malaysia** : **(RM)** in cashier's or deposit. The deposit will be refunded to all unsuccessful tenderers upon the return of the Tender Document (Including Drawings) in good order and condition by the closing date of tender.

   Successful tenderer shall required to pay a sum of Ringgit Malaysia : **One Thousand Five Hundred Only (RM1,500.00)** for documentation disbursement before the signing of the contract.

TENDER NOTICE

RETURN OF DOCUMENT

6. Return the Documents in good order and condition by the closing date for tender

COPIES OF DOCUMENT

7. The Architect may upon request, supply extra copies of Tender Documents at the cost of reproduction and handling. Such extra copies are to be returned with the Tender Documents.

FORM OF CONTRACT

8. The form of contract shall be **PAM Form Of Agreement And Schedule Of Conditions Of Building Contract (Without Quantities) 2006** based on drawing and specification. A copy of the form of contract with blank filled in where possible and incorporating any amendments which are to apply, is available for inspection at the office of the Architect.

NATURE OF CONTRACT

9. The nature of contract shall be **Lump Sum Based On Tendered Price Together With Variation If Any As The Architect Shall From Time To Time Authorise On Behalf Of The Client.**

TENDER ADDENDA

10. Tenderers may ask the Architect to clarify anything in the tender documents which they find unclear. Any instruction which the Architect may give as a result be issued in writing to all tenderers in form of a tender addendum, which shall then become part of the tender documents. Tenderers shall refer to each addendum and shall state, that the tender allows for the instruction given in the addenda.

COMPLETION TIME

11. The tenderers shall stated the time within which he undertakes to complete the works. The contract time for completion will be derived from the time stated by the successful tenderer or otherwise stated.

CONSTRUCTION PROGRAMME

12. All tenderers shall submit a **detail construction programme in Microsoft Project** together with their tender documents.

FORM OF TENDER

FORM OF TENDER

Tender for : **CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326) BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.**

Client: **LADANG RAKYAT TRENGGANU SDN. BHD.**
KM. 1, JALAN CERUL,
BANDAR CENEH BAHARU,
24000 KEMAMAN,
TERENGGANU DARUL IMAN

Sir,

1. Under and subject to the Conditions of Tendering annexed hereto, the undersigned does hereby tender and offer to execute and perform the works and provisions and supply all labour and materials and everything of every kind respectively named, shown, described and alluded to in, or to be inferred from, the PAM Form of Amended Agreement and Schedule of Conditions of Building Contract, Schedule of Rates, Specifications and Drawings to be executed and supplied on the part of the Contractor, for the Works above described, in conformity with the Schedule of Rates, Specifications and Drawings and under subject to the said Conditions of Contract for the lump sum named herein below.

2. The undersigned agrees to be bound by and submit to the said Conditions of the Contract, Schedule of Rates, Specifications and agrees that after rectifications of any errors therein in the undersigned's prices and calculations, as by the Conditions of Contract provided, shall form a basis for the valuation of interim certificates and any variations or extra work which may from time to time be ordered by the Architect.

3. And further, the undersigned agrees to complete the Works within _____ **weeks** from the date of possession of site or within such extended time as by the Conditions of Contract provided.

4. The total amount of this tender in accordance with the Form of Tender, Schedule of Rates, Specifications and Drawings is the lump sum of Malaysian Ringgit:-

   (_____

   _____

   i.e(RM_____)

FORM OF TENDER

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5. Whereas it is understood that you reserve to yourself the right to accept or to refuse this tender, whether it is lower or higher than any other tender, or of the same amount, the undersigned agrees that this tender is to remain valid for (90) days from the final date for submission of tenders.

6. And further, the undersigned agrees, in the event of your acceptance of this tender to execute the formal Contract Agreement and to deposit the Performance Bond and within ten (10) days from posting or delivery if by hand, or notification of acceptance to obtain the insurance required as stated in the Specification.

7. The undersigned confirms after personal scrutiny that the documents and drawings used by the undersigned in compiling, this tender are true copies of the documents and drawings included in the Tender Table Documents.

Signature of Tenderer : .....

Name of Tenderer : .....

Address : .....

Date : .....

Signature of Witness : _____

Name of Witness : .....

Address : .....

Date : .....

CONDITIONS OF TENDERING

CONDITIONS OF TENDERING

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1. The whole of the work set forth in the Drawings and specification will be let on contract,
subject to the Conditions of Contract.

2. a) Each tenderer must submit, enclosed and sealed in an envelope addressed as stipulated in the Tender Notice, a tender in the Form of Tender provided, together with the Summary of Tender thereof duly filled and completed, the earnest money and the Construction Programme.

   b) Each tenderer must enter, in the space provided in the Form of Tender, the time he will require to complete the works.

   c) Each tenderer must enter in the spaces provided the Schedule of Prices. Such copy shall be fully priced in ink and signed by the tenderer and submitted together with others tender prices.

3. a) Tender and documents in connection therewith as specified above must be delivered to the place and at or before the time stipulated in the Tender Notice.

   b) In the case of tender not being delivered by hand, the tenderer must arrange for his tender and other documents to be posted in the time to reach the stipulated place not later than the stipulated time.

   c) Any tender delivered after the stipulated time, from whatever cause arising, will not be considered.

   d) In no case will any expenses incurred by a tenderer in the preparation of his tender be allowed.

   e) Successful tenderer shall contribute wholly his tended deposit as tender documentation fee, plus (refer to Architect's letter).

4. In the event of any tenderer being supplied, at his request, with copies of any of the Tender Table Documents, it shall be the sole responsibility of the tenderer to scrutinise such copies and satisfy himself that they are exact copies of those included in the Tender Table Documents. In the event of any discrepancy being found between any such copy supplied to the tenderer and those included in the Tender Table Document it shall be the sole responsibility of the tenderer to apply to the officer receiving to the tenders to have such discrepancy rectified before the final date for submission of Tender Notice.

5. Tenders shall remain valid for one hundred and sixth (6) month from the final date for submission of tenders stipulated in the Tender Notice. No tenderer may withdraw his tender within that period, for which, the penalty will forfeiture of his earnest money.

6. The owner shall not be bound to accept the lowest of any tender.

7. The successful tenderer shall notified of the acceptance by letter within one hundred and sixth (6) month during which by paragraph 5 hereof the tender is to remain valid and the said tenderer shall within the time stated in the Specification execute the formal contract Agreement.

   The period for executing the formal Contract Agreement shall be as specified. However it may be extended if the Architect is satisfied that the adequate reason exist for doing so.

8. Every notice, to be given to a tenderer may be posted to the tenderer's address given in tender and such posting shall be deemed good service of such notice.

9. Non - compliance with the Conditions 2, 3 and 5 in any respect shall render the tender to rejection.

10. Unsuccessful tenderers MUST return specification and all drawings to the Architect before tender deposit can be refunded.

NOTE TO TENDERER

CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326) BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

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NOTE TO TENDERER

A. SUMMARY OF WORKS

Summary of Works does not form part of the Contract; it is for the purpose of tender evaluation the works only. Any other works not specifically stated in the Summary of Works but which are necessary for the proper and due execution and completion of the works all in accordance to the appropriate standard of works shall be priced in one of the items stated in the summary. No claim will be entertained due to ignorance or overlook.

B. ADDITION AND OMISSION OF WORKS

The client has the right to deduct or add in whole or in part any items shown in the drawing or stated in the specification, provided the total addition or deduction is not more than 30% of the contract sum.

C. DISCREPANCIES IN DRAWINGS

Any discrepancies found in the drawings, the Contractor shall clarify with the Architect before carrying out the actual works and not later than (2) weeks after taken possession of the site, otherwise any additional cost form the discrepancy will not be considered.

D. VISIT TO SITE

The Contractor shall be deemed to have examined the Tender Document and visited the site and to have ascertained the nature, character and extent of the works, local conditions, accessibility of site, the supply of and conditions offering labour and materials and any other matters affecting this Contract. No claim will be entertained on the ground of ignorance of the conditions under which the works will be carried out.

E. SCHEDULE OF WORK

The Contractor is required to submit their schedule of works to the Architect for approval prior to the commencement of work.

SUMMARY OF TENDER

CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326) BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

GENERAL SUMMARY

BILL	DESCRIPTION	FROM PAGE NO.	TOTAL AMOUNT (RM)
1.00	PRELIMINARIES	B1/2/2	
2.00	SITE PREPARATIONS	B2/1	
3.00	BUILDING WORKS	B3/3/3	
4.00	EXTERNAL WORKS	B4/1	
5.00	INFRASTRUCTURE WORKS	B5/1	
	TOTAL CARRIED TO FORM OF TENDER		

I / We hereby declare that above statement is correct :

Sum of Ringgit Malaysia : ……

……

Completion Period : …… ( ) **weeks**

…… ……

Signature of Contractor & Chop Signature of Witness

Name : …… Name : ……

Address : …… Address : ……

…….. ……..

…….. ……..

Date : …… Date : ……

CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326) BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN

ITEM	DESCRIPTION	UNIT	RATE (RM)	AMOUNT(RM)
	BILL NO. 1 - PRELIMINARIES			
	SURVEYING			
A	The contractor to appoint licensed surveyor to verify the existing site level boundary and submit bulding setting out for Architect's approval.	LS		
	INSURANCES			
B	Insurances as required by the General Condition of Contract, Workmen's compensation, fire, all risks and Public Liability Insurances.	LS		
	TEMPORARY SERVICES			
C	Water and electrical supplies for use in the construction works shall be supplied by contractor. The Contractor shall apply for the services and paying all associated cost and fees	LS		
	SAFETY, HEALTH AND WELFARE ACT 1994.			
D	The contractor shall keeping the Site dry and ensure no water retaintion	LS		
E	Dust prevention such as making adequate provision for spraying water, erecting screens or other method against any nuisance or damages to all existing property in the vicinity	LS		
F	Contractor shall provide all safety precaution for his worker on site and authorised visitor to site including supply of safety helmet and all necessaries item required by authorities	LS		
G	All construction machinaries to be operated by skilled operators with appropriate license.	LS		
H	First aid facilities	LS		
	MOSQUITO PREVENTION			
J	The contractor shall take relevent precaution as may be deem necessary for prevention of breeding of mosquitoes	LS		
	KEEPING THE SITE TIDY			
K	The contractor shall make every effort to keep site in a reasonably clean and tidy condition for the duration of the works described			
	LAW, REGULATION AND REQUIREMENTS			
L	The contractor shall comply to Part VIII of the Lembaga Pembangunan Industri Pembinaan Malaysia Act 1994 and the Construction Industry (Levy Collection) Regulation 1996 and shall submit and notification on Form CIDB L1/96 to the Lembaga not later than 14 days after the inssuance of the Letter of Acceptance/ Letter of Award/or any document that constitues acceptance of contract of works, or not less than 14 days before the commencement of the works, whichever date is earlier.	LS		
	PHOTOGRAPHS			
M	Provide 3 sets of mounted progress photoghraphs of work done at site to be included in monthly progress report. (minimum eight (8) shots).	LS		
	balance carried forward			

ITEM	DESCRIPTION	UNIT	RATE (RM)	AMOUNT(RM)
	balance brought forward			
	BILL NO. 1 - PRELIMINARIES (*Cont'd*)			
	TEST			
A	All cost of meterial and transportation for sampling as directed by architect to be born by the contractor inclusive testing equipments and samples such as cube test, sieve analysis, slump test, etc. as per specification.	LS		
	AS-BUILT DRAWINGS			
B	Upon completion of foundation and stump. Prepare four (4) sets of as-built building setting out include infrastructur works as required by S.O. and Local Authority.	LS		
	CLEARING THE SITE ON COMPLETION			
C	Dismantle and remove from site all temporary structure, surplus material and etc upon completion of work	LS		
	MOBILISATION AND DEMOBILISATION			
D	Provide for mobilisation and demobilisation of all constructional plants, equipments and incidentals necessary for the completion of the works.	LS		
	STAMPING			
E	Stamp duty to Lembaga Hasil Dalam Negeri for three (3) sets of Contract Document.	LS		
	WORK PROGRAMME			
F	Contractor shall submit critical path method programme (CPM) for planning, monitoring and control of resource and progress of work two weeks upon receipt of letter of acceptance	LS		
	TEMPORARY WORK			
G	Provide, erect and maintain; as per drawing and obtain permit form authority; allow for maintenance and remove on completion :			
	a) Project Signboard and Hoarding	LS		
	b) Temporary warning sign, lamp and guard rail	LS		
	c) Temporary wash trough	LS		
	d) Temporary silt trap and earthdrain	LS		
	e) Contractor shall allow for maintainance and ensure the safety of public and who may be on the or within the vicinity of the Site	LS		
	SCAFOLDING AND WORKING PLATFORM			
H	Erection of scafolding include staging, to be include for cost for submission by professional and approval by JKKP	LS		
	WATER PRESSURE TEST			
J	Carry out all necessary test as per SATU requirement and obtain letter of approval from SATU upon completion.	LS		
	TOTAL BIL NO.1 - PRELIMINARIES			

CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326) BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

ITEM	DESCRIPTION	UNIT	RATE (RM)	AMOUNT (RM)
	BILL NO. 2 - SITE PREPARATIONS			
	All site preparation works shall include the supply of materials, labour, equipments, plant and all necessary for the construction, completion and maintenance of the works hereinafter in accordance to the specification contract drawings and general conditions of contract.			
2.01	**SITE PREPARATION** Note : *(The contractor is urged to site visit for inspect and examine the site and its surrounding and ensure they understood with the nature of existing site and scope of work to be carried out.)*			
a.	Clear the site as shown on drawing including take away all debris from site to dumping ground approved by Local Authority.	LS		
2.02	**EARTHWORKS**			
	Cut and Fill			
a.	Excavate oversite to formation level not exceeding 1.00m deep and get out, part return, fill in and ram, deposit, spread in making levels where directed within the site and remainder load and cart away (340m3)	LS		
b.	Backfilling using suitable material to make up formation level, well compacted, spread and levelled to specifications (11m3)	LS		
c.	Disposed excess material off site to contractors dumping area in an approved manner	LS		
	TOTAL BIL NO. 2 - SITE PREPARATIONS			

CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326) BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

ITEM	DESCRIPTION	UNIT	RATE (RM)	AMOUNT (RM)
	BILL NO. 3 - BUILDING WORKS			
	All building works shall include the supply of materials, labour, equipments, plant and all necessary for the construction, completion and maintenance of the works hereinafter in accordance to the specification contract drawings and general conditions of contract.			
3.01	**SUB-STRUCTURE** All as shown on the drawings and comprising of :			
a.	Excavation and backfill, include spread and levelled and remove surplus out of site.	LS		
b.	Vibrated reinforced concrete as per engineer drawing including lean concrete, formwork and steel reinforcement in pad footing; ground beam; slab and column stump	LS		
c.	Carry out termite treatment on hardcore. The contractor is required to submit 3 years guarantee certificate, specification and method of treatment to S.O for appproval.	LS		
3.02	**SUPER-STRUCTURE**			
a.	Vibrated reinforced concrete as describe in structural drawing including formwork and steel reinforcement in for column and roof beam	LS		
3.03	**WALL & PARTITION**			
a.	Supply and lay 110mm thick brickwall inclusive of rc stiffiner at maximum of 3 m c/c and 'exmet' reinforcement at every 4th course and mild steel bonding ties as specified	LS		
3.04	**ROOF CONSTRUCTION**			
a.	Supply, deliver, hoisted and fixed mild steel trusses; including concrete roof tiles with ridge capping as roof covering; as per drawing and specified	LS		
3.05	**DOORS** Supply and fix all including framing works; ironmongery and etc. as as per drawing & schedule.			
a.	Overall size 1500mm x 2100mm solid timber decorative door. (D1)	LS		
b.	Ditto 900mm x 2100mm solid timber decorative door. (D2)	LS		
c.	Ditto 750mm x 2100mm PVC door. (TD)	LS		
3.06	**WINDOWS** Supply and fix all including framing works; safety bar; glasses and etc. as as per drawing & schedule.			
a.	Overall size 1200mm x 1800mm comprising of side hung casement window with top hung above. (W1)	LS		
b.	Ditto 1800mm x 1800mm ditto. (W2)	LS		
c.	Ditto 1200mm x 600mm fixed top hung casement as high window (HW)	LS		
	balance carried forward			

ITEM	DESCRIPTION	UNIT	RATE (RM)	AMOUNT (RM)
	balance brought forward			
	BILL NO. 3 - BUILDING WORKS (*Cont 'd*)			
3.07	**FLOOR FINISHES**			
a.	Supply and lay 600mm x 600mm ceramic tiles including screeding	LS		
3.08	**INTERNAL & EXTERNAL WALL FINISHES** Supply and lay wall finishes the following :			
a.	Cement plaster as per specification to wall, columns, beam and slab	LS		
b.	Selected 300mm x 300mm glazed wall tiles	LS		
3.09	**CEILING FINISHES**			
a.	Supply and install suspended grid of 1220mm x 610mm x 9mm thick ceiling board fixed on suspended ceiling system; as shown on drawing & schedule.	LS		
3.10	**PAINTING AND DECORATION** Supply and apply painting as per schedule of finishes with 7 years of warranty the following :			
a.	Emulsion painting to all round internal wall, ceiling, coloum and beam surfaces	LS		
b.	Weathershield paint c/w sealer all round external wall	LS		
c.	Oil paint to woodwork and metalwork	LS		
3.11	**SANITARY FITTINGS** Supply and fix the following sanitary fittings including jointing and all necessary accessories as shown on drawings & schedule.			
a.	Pedastal. (WC)	LS		
b.	Wash hand basin.(B)	LS		
c.	Fixed shower head. (SH)	LS		
d.	Pillar tap. (PT)	LS		
e.	Hand bidet. (BT)	LS		
f.	Floor traps. (FT)	LS		
g.	Mirror (M)	LS		
h.	Sink	LS		
	balance carried forward			

ITEM	DESCRIPTION	UNIT	RATE (RM)	AMOUNT (RM)
	balance brought forward			
	BILL NO. 3 - BUILDING WORKS (*Cont 'd*)			
3.12	**PLUMBING & SANITARY INSTALLATION** *Cold water installation - all work to be carried out by licenced plumber*			
	Water meter			
a.	Supply and install of new water meter with stainless steel stand at location shown in the drawing inclusive the connection to existing main pipe .The work to be carried by local registed plumber to submit the necessaries submission before commencement of work and arrange for inspection with SATU on completion.	LS		
	Internal piping for plumbing system			
b.	Supply and install complete cold water piping system as shown in the drawing inclusive stopcock, bend, valve and other accessories for connection of piping system from water tank at roof top to all outlet and taps	LS		
	Water tank			
c.	To supply and install 300 gallon fibre glass water storage tank c/w necessary support, overflow, ball valve, warning & scour pipe	LS		
	Waste, soil and vent pipe			
d.	Supply and install complete waste,soil and vent pipe including fittings and jointing as shown on drawing.	LS		
	Testing			
e.	Testing of installation in accordance with local Authority requirement and to entire satisfaction of S.O.	LS		
3.13	**ELECTRICAL WORKS**			
	Electrical wiring installation - *(all work to be carried out by TNB registered contractor)*			
a.	Supply and install main DB board and DB electrical wiring for lighting, power, fan, air - cond point inclusive of trunking, G.I conduit, TNB meter board; Contractor is required to engage a Professional Electrical Consultant to apply and obtained power supply from Authority.	LS		
	Passive fire protection Supply and install the following :-			
b.	9kg ABC dry powder	LS		
c.	Emergency light	LS		
d.	KELUAR (exit) sign	LS		
	Street lighting			
e.	Supply and install street public lighting constructed of short arm lighting octagonal hot-dipped galvanised pole with new lantern; concrete footing including underground cable; as per detail drawing and specified.	LS		
	TOTAL BIL NO. 3 - BUILDING WORKS			

CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326) BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

ITEM	DESCRIPTION	UNIT	RATE (RM)	AMOUNT (RM)
	BILL NO. 4 - EXTERNAL WORKS			
4.01	**APRON & PERIMETER DRAIN**			
a.	Construct and complete apron and halfround perimeter drain as shown on drawings.	LS		
4.02	**SEWERAGE WORK** Supply, lay and install the following individual sewerage system including excavation, bedding, backfilling, jointing and all necessary accessories as shown on drawings & schedule.			
a.	100mm diameter uPVC as sewer pipe laid and jointed in trench	LS		
b.	850mm x 850mm manhole pit constructed of brickwall, plastering work and heavy duty cover.	LS		
c.	Ecosept (P6) septic tank system as per details drawing and manufacturer's instruction or other equal and approved.	LS		
4.03	**FENCING & GATE** Construct and complete the following fencing and gate works including excavation, bedding, backfilling, jointing and all necessary accessories as shown on drawings & schedule.			
a.	Supply and install anti-climbed fencing constructed on galvanised post including concrete footing; complete with stainless steel fastener, clip and post cap; with 250mm high concrete base	LS		
b.	Brickwall fencing; plastered on both side and painted	LS		
c.	Brick post complete with concrete coping on top; plastered on both side and painted	LS		
d.	works	LS		
e.	Supply and install M.S hollow gate, including medium duty gate roller with galvanised iron as gate wheel track embeded into concrete base	LS		
4.04	**FLAG POST**			
a.	Supply and install M.S as flag post; as per detail drawing and specified	LS		
4.05	**TURFING**			
a.	Supply and lay Axonopus Compressus as close turfing including 50mm thick black earth including watering within the duration of the Contract; as per detail drawing and specified.	LS		
	TOTAL BIL NO. 4 - EXTERNAL WORKS			

CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326) BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

ITEM	DESCRIPTION	UNIT	RATE (RM)	AMOUNT (RM)
5.00	**BILL NO.5 - INFRASTRUCTURE WORKS**			
5.01	**DRAINAGE SYSTEM**			
a.	900 x 900mm Precast culvert completed with sump as per engineer's specification in the drawing	LS		
b.	900 x 600mm Precast concrete 'U' drain complete with sump as per engineer's specification in the drawing	LS		
c.	To provide protection of existing drainage and make good on completion	LS		
5.02	**ROADWORKS**			
a.	Construction and complete of premix service road including of road kerb painting parking line and testing as per detail and specification in the drawing	LS		
5.03	**WATER RETICULATION** *All water reticulation work to be executed by licensed plumbing approved by local SATU*			
a.	155mm diameter under ground multilayer uPVC pipe connected from existing water main pipe	LS		
b.	150mm diameter under ground MSCC pipe connected; crossing roadworks	LS		
c.	Air valve and sluice valve; with other necessary accessories; complete with pc chamber and steel cover if required	LS		
d.	Supply and install pillar hydrant (Pili Bomba)	LS		
e.	Tapping works to location and methods as approved by SATU	LS		
	TOTAL BIL NO.5 - INFRASTRUCTURE WORKS			

PREAMBLE NOTES

PREAMBLE NOTES

P.1 Description of Works

The works described in this Specification comprise **CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326) BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.**

P.2 Conditions of Contract

Subject to the amendments schedule hereunder, the Conditions of Contract shall be agreement and Schedule of Conditions of Building Contract issued under the sanction of Pertubuhan Arkitek Malaysia and Institution of Surveyors of Malaysia, referred to hereafter as the Conditions of Contract or as the Conditions.

Any provisions of this Specification, having the force of effect of Conditions attached hereto, referred to in the Conditions of Contract.

Allow for stamp duty which is chargeable on this Contract and make due allowance for the conditions under the Preliminaries in the Tender. The appendix to the Conditions shall be filled in as

	Clause	
Defect Liability Period	15, 16 and 30	TWELVE (12) MONTHS
Percentage to Cover Professional Fee	20 (A)	EIGHT (8%) PERCENT
Date of Possession	21	**...……...**
Date of Completion	21	**...……....**
Liquidated and Ascertained Damages	22 at the rate of	RM150.00 PER DAY
Period of Delay	26	

i) By reason of loss or damages caused by any one of the Contingencies referred to in Clause 20(A) or Clause 20(B) if applicable. ... Three (3) months

ii) for any other reason ... One (1) month

P.2 Conditions of Contract (Cont'd)

Prime Cost sums for which the Contractor desires to tender	27 (g)	
Period of Interim Certificate	30 (1)	... One (1) month
Period of Honouring of Certificates	30 (1)	...Thirty (30) days
Percentage of Certified Value Retained	30 (3)	...Ten (10%) percent
Limit of Retention Fund	30 (3)	...Five (5%) percent
Period of Final Measurement and Valuation	30 (5)	...Twelve (12) months

The Public Liability Insurance required under Clause 18 of the Conditions shall not be less than **RM500,000-00** per claim with the number of claim unlimited.

The Worker's compensation and Employer's Liability Insurance required under Clauses 18 and 19 of the Conditions of Contract shall not be less than 30 % of the contract sum, less wages of Employees' contribution to SOCSO. The fire insurance required under Clause 20 shall be full recovery values of Contract plus percentage to cover Professional Fee.

P.3 Specification

The intent of the Contract and this Specification is to provide for the work set out and described herein to be completed. Where an item is usual or necessary or is reasonably or properly to be inferred in the type of work generalised in this Specification but not specifically mentioned, it shall be deemed to be included in the specification.

All sections of the specification and drawings shall be taken in conjunction and any provisions or clauses in any one section shall be taken as referring to all other sections if such provisions or clauses are in anyway applicable. No responsibility, either direct or implied, is assumed by the Architect for omission or duplication by the builder or his sub-contractor due to any real or alleged error in the arrangement (as district from the content) of these specifications.

Should there be any discrepancy between the drawings and specification, the contract shall be deemed to cover the alternative which involved the greater cost. No variation will be allowed for any error or omission. The contractor shall perform the operations and supply and fix the materials and components mentioned herein and/or shown on the drawings and shall provide therefore all necessary labour, equipment and incidentals, unless the responsibility is expressly stated to be that of others.

The words "supply", "provide" and the like, shall be deemed to mean, supply and fix, unless expressly stated to the contrary.

The words "authorised", "approved". "selected", "directed", "rejected", and the like, shall be deemed to include the words "by the architects" unless expressly stated to the contrary.

Reference to standard specifications or manufacturers' directions shall apply to current editions.

P.4 Drawings

Where any item or work is not wholly indicated on the drawings, carry out and complete the item so as to correspond entirely with work of a similar nature drawn in detail elsewhere on the drawings, and in full accordance with the specification. Follow figured dimensions on the drawings are diagrammatic only and should never be scaled. Check and verify dimensions wherever possible before starting work. In making alterations or additions to existing work, be guided by existing dimensions, but before deviating from the drawings obtain approval from the Architect. Spots level where shown on drawings should be used in preference to contour and ground profile lines for height calculations. Contours and profiles are interpolations only.

P.5 Shop Drawings

Where shop drawings are to be used, the Contractor shall submit copies to the Architect for examination. Copies shall be in duplicate, including copies for consultants where necessary.

Submission in the first instance shall be made 21 days before the information on the drawing is required for fabrication to commence. Examination by the Architect shall not diminish the Contractor's responsibility for preparing, co-ordinating and approving shop drawings and for ensuring that they are in agreement with the contract documents and correct as to all relevant information.

The Architects may endorse shop drawings to indicate general or design approval, amendments, corrections, and the like, but no such endorsement shall constitute an Architect's instruction under the contract, unless expressly stated to the contrary.

Shop drawings which are unsatisfactory shall be corrected and resubmitted by the Builder without variation to the contract.

The Contractor shall issue one copy of the original shop drawings and of any amendments to all interested parties, including the Clerk-of- works, with all notification drawing attention to the amendments. Current copies shall be kept in a binder on the site and superseded copies destroyed.

P.6 Copies of Documents

Note that under Clause 3 of the Conditions the Architect shall, without charge to the Builder, furnish him with one (1) copy of the Contract Drawing and the Specification. The Architect shall without charge, furnish two (2) copies of further drawings, details, instructions and explanations. The Builder shall allow for purchasing additional copies, if required, at the ruling commercial rate for printing in the case of reproduction and handling in the case of specification.

P.7 Form of Submission

Submit tender on Tender Form provided, in a sealed envelope, marked "Tender for :-

CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326) BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

The submission of a tender shall be held to imply that the tenderer:

Has visited the site before tendering and allowed for everything pertaining to the works which such

Inspection should reasonably disclose, and accepts that claims by the Contractor, which are attributable to neglect of this precaution, shall be rejected by the Architect.

Has fully examined the Tender Documents and makes a bonafide offer to complete the whole of the works described therein for the sum stated in the tender or the Contract Sum. Undertakes to execute with the proprietor the Form of Contract referred to in the Specification and embodying all the Conditions and terms stated herein.

Failure to comply with any tender instruction may result in a tender being declared informal. However, the proprietor reserves the right to waive any information in tender received.

P.8 Return of Document

Tenderers shall return the Specification and all drawings supplied to the office of the Architect at the time lodging the tender, failing which the tender may be declared informal and Tender Deposit forfeited.

P.9 Tenders shall be on the Tender Form provide and on a lump sum basis.

P.10 Possession of Site

The successful tenderer must take possession of site within two 2 weeks from the date of issue of Letter of Acceptance or any time as advised by the Architect.

P.11 Completion Costs

Tenderers shall be deemed to have allowed for all costs including overtime, for clerk of works as well, bonus and incentive payment, taxes and any other charges necessary to complete the works by the date for practical completion arrived at as stated above.

P.12 Site Information

The Architect, at his sole discretion may permit the tenderer to make site tests if he so desires, subject to the submission of details for approvals.

Rock shall be as defined in the 'excavation' section but within the scope of this defination tenderers shall from their own assessment of the nature of the rock to be encountered.

P.13 Performance Bond

a. The Contractor shall, as a condition precedent to the commencement of any work under this contract, deposit with the Architect a Performance Bond in the Form of Bank Guarantee addressed to the Client. The amount is equal to five percent of the Contract Sum, for the due observance and performance of this Contract.

b. If the Contractor fails to execute the contract or commits any breach of his obligations under the Contract, the Proprietor or the Superintending Officer on its behalf may utilize and make payment out of or deductions from the said Performance Bond.

c. The Performance Bond shall be released or refunded to the Contractor upon completion of the works

P.14 Specification Addenda

Any tendered who is in doubt as to the true meaning of any part of the Contract Documents may submit to the Architects a request for interpretation thereof. Any interpretation will be made only by a Specification Addendum by number and state that the tender included items contained in such addenda.

P.15 Social Security Scheme SOCSO

a. Provided the contractor will not be required to take out take Workmen's Compensation Insurance Policy if the workers employed in works are liable for coverage under the Employees' Security Scheme ACT 1969, the Contractor shall register his employees and contribute under the Social Security Scheme SOCSO in the places where the Scheme is or will be implemented any comply with the provisions of the said Act. He shall submit the code numbers of all the workers on site to the Superintending Officer for checking.

b. The Contractor shall make payment of all contributions from the time to time on the first day which the same ought to be paid and until the completion of his Contract and upon demand the Contractor shall produce to the Superintending Officer the last receipt for payment of such contributions.

c. If any default is made by the Contractor in complying with the terms of this clause the Superintending Officer may without prejudice to any other remedy available to Employer for breach of any terms of this contract:-

   i. Withhold all payments which would otherwise be due to the Contractor under this contract, and out of such moneys so withheld satisfy any claim for compensation by workmen that would have been borne by SOCSO had the Contractor not made default in maintaining the contribution and/or

   ii. Pay such contributions as have become due and remain unpaid and deduct the amount of such contributions from any money due to become due to the Contractor.

Nothing in this clause shall be construed to take away or to waive or any manner to modify the right of the Employer to be indemnified by the Contractor in respect of all compensation, costs and other expenses whatsoever which by reason of the Employer under the said Legislation or other Law.

STANDARD SPECIFICATION FOR BUILDING WORK

..: KUMPULAN PERUNDING 1988 :..

STANDARD SPECIFICATIONS FOR BUILDING WORKS

STANDARD SPECIFICATION OF MATERIALS AND WORKMANSHIP

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STANDARD SPECIFICATIONS

GENERAL CLAUSES

Definitions and Meanings

A The following descriptions shall apply to the whole of the works regardless of the trade headings under which they occur and shall be read in conjunction with this Specification and Contract Documents.

B This Specification is a standard specification and items of work specified which are not shown on the Drawings are not applicable.

C Throughout this Specification, all instructions are directed to the Contractor.

D Throughout this Specification and all Bill of Quantities the following abbreviations have been used:-

BS	-	The latest standard for a particular building material or component issued by the British Standards Institution, 2 Park Street, London W1.
C.P. (BS)	-	The latest British Code of Practice issued by the Council for Codes of Practice, British Standards Institution, 2 Park Street, London W1.
C.P. (CE)	-	The latest Civil Engineering Code of Practice issued by the Institution of Civil Engineering, 1 Great George Street, London SWI.
A.A.SH.T.O.	-	The American Association of State Highway and Transportation
A.S.T.M.	-	The American Society for Testing and Materials
I.S.O.	-	International Standards Organisation
M.S.	-	Malaysian Standard issued by S.I.R.I.M.
A.S.	-	Australian Standards
S.W.G.	-	Imperial Standard Wire Gauge
B.G.	-	Birmingham Gauge
C.B.R.	-	California Bearing Ratio

E "Prime Cost Sum" or "P.C. Sums" shall mean a sum provided for work or services to be executed by a Nominated Sub-Contractor, Supplier or other Nominated Firms; such sums shall be expended in the manner stipulated in the Conditions of Contract.

F "Provisional Sums" shall mean a sum provided for the entire cost of anticipated work that cannot be properly drawn or described or cannot be entirely foreseen, defined or detailed at he time of preparing the tender documents. Such sums shall be expended in the manner stipulated in the Conditions of Contract.

G The term "Superintending Officer" or "S.O." where used in this Specification shall mean the Architect and such person or persons as may be deputed by him to act on his behalf for the purpose of this Contract.

H The terms "approved" and "directed" are to mean the approval and directions of the S.O. or his authorised representative.

GENERAL CLAUSES (Cont'd)

Dimensions, etc.

A All dimensions given in this Specifications are in metric units. Where the Drawings and Bills of Quantities calls for works or materials in imperial units, the imperial units (or nearest equivalent based on direct conversion of metric units) shall apply.

Manufacturer's Products and Catalogue References

B Manufacturer's products and catalogue references quoted in this Specification are indicative of type and quality only and is not necessarily binding. Other manufacturer's products may be accepted provided they are equal in all respects to those specified and are approved by the S.O.

C Strictly observe all manufacturer's written instructions, particularly in respect of handling,preparing, fixing and protecting. Ensure that the manufacturer's instructions and other information are at site whilst the related work is being executed.

D Should a manufacturer instructions and this Specification be at variance, the Contractor shall immediately notify the S.O. and seek his further directions.

Materials and Workmanship Generally

E All materials and workmanship shall be of the respective kind described under this Specification and in accordance with the S.O.'s instructions. All materials and goods to be supplied and workmanship performed shall be subject from time to time to such tests as the S.O. may direct at the place of manufacture or fabrication, or on the site or at such place or places as may be specified under this Specification. Maintain for inspection complete records of sources of supply of specified materials.

F Any unspecified items are left to the choice of the Contractor. The Contractor is to ensure that such materials and components are of good quality, fit for their intended purpose and in compliance with good building practice.

Works Not Buildable

G Should any specified materials, components or drawn details appear to be unfit for purpose or difficult to apply as intended, or if considered to be likely to be detrimental to the Works at anytime, the Contractor shall immediately inform the S.O., who shall then direct as to the next course of action to adopt.

Statutory Regulations

H Unless otherwise specifically described in this Specification, all equipment and material to be supplied under this Contract shall be in accordance with the regulations made under the Machinery Ordinance 1953, the Electrical Ordinance 1949 and any latest LLN Bye-Laws and amendments affecting such work, and in force and effect at the time of this Contract. The Works shall also comply with any other relevant Statutory Regulation, Bye-Laws or Orders currently in force in the country. Where not covered by such regulations, they must be in accordance with such authoritative standards in the country of manufacture.

Testing to Authority Requirements

A In addition to all tests required by the Contract Documents, the Contractor shall comply with the regulations of all authorities which have jurisdiction with regards to the carrying out and completion of the Works in respect of testing of works, materials and goods.

B In particular, the Contractor shall be responsible for ensuring that fire door assemblies (which include associated ironmongery and other components as may be required) and any other building components comply with and pass any tests required by BOMBA and shall submit to the Architect/S.O. certificates or other official documents/letters as evidence of passing such tests. This shall apply notwithstanding that ironmongery or other components making up such fire door assemblies, or such other building components, may be specified in the Contract Documents or by way of subsequent instructions.

C To the extent that ironmongery or other components making up such fire door assemblies, or such other building components, are specified in the Contract Documents or by way of subsequent instructions the Contractor may substitute such ironmongery or components for equal or better quality ironmongery or components if necessary to pass such tests, but always with the consent of the Architect (which consent may not be unreasonably withheld). Any additional cost of such substituted ironmongery or components shall be borne by the Contractor unless the ironmongery or components were specified by way of subsequent instructions whereupon the additional cost of such substituted ironmongery or components shall be included in the valuation of such instructions, provided that such substitutions are shown to have been necessary.

DEMOLITIONS AND ALTERATIONS

Generally

A The extent of the work to be demolished and/or altered is indicated on the Drawings. The Contractor shall examine the Drawings, existing works and site so as to satisfy himself as to the true nature and extent of the work to be pulled down, altered, etc.

B The Contractor shall investigate and ascertain sufficient information about the structures to be demolished and effect on surrounding works, prior to commencement of works

C Allow for any shoring, scaffolding, screens, tarpaulins, casings, dust sheets, etc. necessary forcarrying out the works in an efficient manner, even though they are not specifically referred to in this Specification or shown on the Drawings or described in the Bills of Quantities.

Safety and Stability of Structures

D The Contractor shall take all responsibility for the stability and upholding of existing and adjoining structures during the work.

E Employ methods that cause no shock or vibration likely to damage surrounding property or buried services. All items of removing, pulling down, etc. shown on the Drawings or described in the Bills of Quantities are to include for all props, struts, scaffolding, shores, etc. and other protection and temporary supports.

F All partly demolished structures shall be properly secured. Make good such structures to the extent required to ensure safety of persons, weather protection, stability and security. Any dangerous or unnecessary projections should be removed immediately or, if earmarked for reinstatement, be properly secured in place.

G All debris constituting a health or fire risk shall be removed. The Contractor shall ensure no overloading of existing structures by accumulated debris.

Temporary Coverings and Screens

H Provide and remove on completion all temporary coverings and screens wherever needed for security, noise or dust control, weather protection or other purposes to facilitate the Works.

Disconnecting Services

I All existing electrical, plumbing or building services shall be disconnected, diverted, sealed off or removed as may be directed by the S.O.

J Liaise with relevant Service Authorities as necessary, and pay for all fees in connection therewith

DEMOLITIONS AND ALTERATIONS(Cont'd)

Sequence of Demolition/Alteration Works

A Carefully take down in small portion all walls, structures, etc. to be demolished. Ensure minimum inconvenience or disturbance to the public or to occupants of adjoining premises.

B Unless otherwise directed by the S.O., make every attempt to undertake work as follows:

(a) Work which exposes the building to weather, e.g. roof repairs - once such work is commenced, complete it as quickly as possible.

(b) Cutting away and alteration work generally - undertake with the minimum amount of disturbance to those parts of the building intended to be left undisturbed.

(c) Work involving existing work and components - undertake with same standard and appearance as that originally achieved.

C Carry out in such sequence or manner as the S.O. directs. The S.O. may stop the pulling down of any particular portion of existing work at any time, should it be expedient to do so or arising from any cause whatsoever.

Salvaging

D Take care and protect all materials described as for re-use, taken to store, etc. from the time of the Contractor entering and taking possession of the site.

E Materials described as to be handed over to the Employer shall be inventoried and carefully packed and labelled for handing over.

F Clean and stack on site any bricks suitable for re-use for general brickwork.

Unwanted Materials to be Contractor's Property and to be Credited

G The whole of the materials arising from the Works, apart from items identified for re-use or handing over to the Employer, will become the property of the Contractor. All such materials are to be removed from site and credited to the Contract.

H The Contractor must price each item of "Demolition and Alteration" works separately, and shall separately show the amount he is prepared to allow as credit for the old materials, to be set off against the cost of the works.

Unwanted Materials

I Remove debris and materials not required for retention or re-use on site. The Contractor shall not allow such materials to accumulate or become a health or fire risk.

S.O.'s Right on Old Materials

J The S.O. reserves the right to require that any of the old materials described to be cleared away shall be retained on site or re-used in the Work, in which case, the amount shown in the credit column against the particular item will be deleted and the Contractor will be allowed an agreed amount for clearing and preparation. Saving on new material shall be adjusted as provided under the Contract.

DEMOLITIONS AND ALTERATIONS (Cont'd)

Quantities, Dimensions, Sizes, etc.

A Quantities entered in the Bills of Quantities for this section of work are approximate and intended for guidance only. The true extent of the work must be ascertained by the Contractor during his site visit. No consideration will be given to claims for extra payment due to the site items being different to those entered in the Bills of Quantities.

B All dimensions, sizes, etc. given in the descriptions of pulling down, etc. are approximate only. Where quantities are given, openings have been deducted.

C Where openings are to be formed in existing walls, the sizes are nett sizes. The Contractor shall allow in his rates for further cutting out for facing to jambs, insertion of lintels, steps, sills, etc.

Terms and Definitions

D The following terms and definitions shall have the meanings hereunder ascribed:-

(a) Remove - Taking down, breaking up and unfixing of work or materials and removing from site, and shall include removing all incidental items, clearing away debris and making good to existing works around.

(b) Carefully remove - Carefully taking down, breaking up and unfixing of work or materials and removing incidental items which are to be retained, and shall include handling all such components with care and protecting from damage and making good to existing works around.

(c) Set aside for re-use - Cleaning, repairing and restoring to serviceable condition, piecing in woodwork where ironmongery or hardware had been removed, take to store, protect, mark with the old position and, if known, the new position, and if required, removal from and return to the site.

(d) Overhaul - Cleaning, oiling, renewing parts, repairing and restoring to serviceable condition all components and incidental parts, keeping remaining parts in good condition.

(e) Making good or make good - Making good of affected and surrounding works in its fullest sense to match existing works and through, around, into, over and up to new items, openings and the like and proper jointing to existing work.

(f) Make good structure - Making good as defined above, and cutting, toothing and bonding, pinning up, levelling, preparing, filling and facing up.

(g) Make good finishing - Making good as defined above, of all finishing to ceilings and soffits, walls and floors of skirtings, architraves and joinery.

(h) Cutting or adapting - Forming opening in existing structures, or adapting, openings including quoining up jambs, forming recessed reveals, cutting, toothing and bonding, levelling and preparing bottom of opening, cutting and pinning lintels and the like and wedging and pinning up and over.

(i) Extend finishing - Extending plaster, tiling, skirting or other such existing wall, floor and ceiling finishing over the areas affected or required to be made good, including cutting to line and applying one coat of primer to plaster or woodwork or other surfaces scheduled for decoration.

DEMOLITIONS AND ALTERATIONS (Cont'd)

Terms and Definitions (Cont'd)

(j) Blocking up openings	- Blocking up openings including cutting, toothing and bonding, wedging and pinning up and levelling and preparing bottom of openings
(k) Overhauling and repairing door and frame	- Piercing out and repairing damaged portions of door frame and lining; repairing and refixing architraves including renewing as necessary; refixing frame and lining; hacking out broken glass and reglazing, raking out and repointing frames; overhauling, oiling and adjusting ironmongery; easing and adjusting door; taking out door and shooting bottom to clear new floor finish and rehanging.
(l) Overhauling and repairing window	- Piercing out and repairing damaged portions of window frame and lining; repairing and refixing architraves including renewing as necessary; refixing frames and lining; hacking out defective putties and reputtying; hacking out and repointing frames; overhauling, oiling and adjusting ironmongery; easing and adjusting window.
(m) Taking out door	- Taking out door; taking out frame, lining, and frame architraves and all associated joinery; taking out threshold and any steps; taking out pelmet and curtain rails; taking up floor springs; and any hardware preparing opening to receive new work.
(n) Taking out window and frame	- Taking out window; taking out frame, lining, architraves, shutters, shutter boxes and all associated joinery; taking out internal and external sills; taking out pelmet and curtain rails; preparing opening to receive new work.
(o) Taking out sanitary fittings	-Taking out sanitary fittings complete with brackets, bearers, backboards, drainers and the like; disconnecting wastes and services; stopping off pipes out of sight and making good.

EXCAVATOR

Earthworks Generally

A Earthworks and general excavations shall be carried out by machine in a workmanlike manner complying to the requirements of B.S. 6031 - "Earthworks" and B S 8004 - "Foundations", subject to any qualifications given herein this Specifications.

B All excavations and fillings are measured nett and the Contractor shall allow in his prices for increases in bulk after excavation.

Site Visit/Survey Drawing

C The Contractor shall visit the site of the Works and acquaint himself with the nature of the site and types of materials to be excavated.

D Prior to commencement, the Contractor shall be required to submit a survey drawing providing all existing ground levels for the S.O.'s approval.

E The Contractor shall report the existence of any bench marks, and protect such bench marks pending further instructions.

F The Contractor shall carry out such investigations, surveys or tests necessary to check the accuracy of the actual levels and dimensions on site against those shown on the Tender Drawings. In the event of any discrepancy, he shall immediately notify the S.O., who will then issue whatever instructions deemed necessary.

Inspection of Excavations

G The Contractor shall report to the S.O. when the excavations are ready to receive concrete and no concrete shall be laid until after the excavations have been inspected and approved by the S.O. or his authorised representatives. Any excavations dug too deep shall be made up in concrete grade C 1 5P or as required all at the Contractor's own expense.

Site Exploration

H No trial holes or site investigations have been undertaken.

I The Contractor shall carry out his own investigations and make all necessary local enquiries to ascertain the nature and conditions of the ground, water table and other factors affecting the proposed excavations.

Underground Cables, Service Pipes, etc.

J The Contractor shall carry out soil investigations and make all necessary enquiries from Local Authorities concerning the possible existence of live services on the site. Report all findings to the S O. and await further instructions on procedure to be adopted.

K Before commencing any excavations the Contractor shall study all existing Drawings and, together with the S O. or his representative, carry out a joint inspection of the site in order to identify and locate any circumstances that might indicate the presence of underground cables, water or other service pipes at or in the vicinity of such excavations. Thereafter, the Contractor shall carry out the excavations in such manner and sequence as the S O. may direct.

L If during excavations, the Contractor's workmen uncover any cables, water or other service pipes, work shall be stopped immediately, and shall not be re-commenced until the matter has been reported to the S O., who will then issue whatever directions he deems appropriate, The Contractor shall adequately protect such uncovered services pending instructions.

M No instruction issued by the S O. under such circumstance shall be deemed to relieve the Contractor of any of his obligations and responsibilities under the Contract.

EXCAVATOR Cont'd)

Preparation of Site

A The natural ground surface covering the limit of the works as shown on the Drawings shall be removed of all debris and trees, stripped of all turf and undergrowth and the underlying soil containing vegetable or organic matter shall be removed to a depth of between 225mm to 300mm generally or such other depth as may be required by site conditions or as directed by the S O The roots of all trees shall be removed by grubbing or burning as directed. All such spoil excavated shall be removed off the site and disposed of to the Contractor's own dump or as directed.

B Stump holes shall be backfilled with selected excavated materials and well compacted as specified hereafter.

Excavation to Reduce Levels

C Carry out all bulk or oversite excavations to reduce levels to the specified formation level. Spoil shall be used for backfilling, carried to stockpile or removed from the site as required or directed by the S.O.

D Stockpiling of excavated materials shall be kept to a minimum; as far as possible, excavated materials should be transported directly to areas of fill.

Filling for Formation

E Filling shall be carried out to the specified formation levels.

F Following preparation of site as described above, the stripped ground shall be inspected by the S O or his representative before the first layer of fill is placed on it.

G All materials used for fill including imported material shall generally be free of organic matter such as leaves, grass, roots and other objectionable matter.

H Soil, granular material, shale, etc. permitted for use as fill shall be spread in successive layers of not more than 200mm in loose depth for the whole width of the work area and shall then be compacted to dry density of not less than 95% of its maximum dry density or until maximum compaction is achieved as hereafter defined. Proper allowance shall be made for subsidence and shrinkage.

I No fractions exceeding 150mm diameter shall be placed less than 300mm below formation level. Where the maximum particle size exceeds 75mm the top layer of filing shall be brought to the final level and profile by a layer of material of consolidated thickness of 38mm of which the maximum size is 25mm and which conforms to the characteristics of the class of material specified for the top layer.

J Any deviation in the finished surface from the correct levels and profiles indicated shall be compacted by loosening and removing and adding material and re-shaping and compacting as described.

Protection and Maintenance of Formation

K All measures shall be taken, as far as it is practicable, to restrict traffic on the completed formation. The Contractor shall re-grade and re-roll the formation from time to time as required by the S.O to maintain the surface finish and required profile throughout the time it is exposed.

Rock Excavation

L Should rock be met within the course of excavation, it must be removed by wedges and levers.

M For the purposes of measurement, "rock" shall be defined as materials of a large coherent mass of such size and strength which would normally require to be removed by blasting, drilling and/or wedging, if carried out by hand.

N Removal of loose boulders of a volume not exceeding one cubic metre encountered in all classes of excavation will not be treated as rock excavation and shall be paid for at normal excavation rates.

EXCAVATOR (Cont'd)

Rock Excavation (Cont'd)

A No rock shall be excavated without prior inspection and confirmation by the S.O. The S.O. shall be informed as soon as any "rock" is met with during the course of excavations. He shall examine the material in its original position and decide whether or not such material is classified as rock, in accordance with the classification stipulated herein. The S.O.'s decision shall be final.

Other Hard Materials

B Materials such as earth gravel, disintegrated or decomposed masses, geologically semi formed "rock" such as very dense cemented sand and other such hard and complex materials that can be excavated and removed by the standard use of earth moving machines, shall be considered normal classes of materials excavated and shall be paid for at normal excavation rates.

C A bulldozer equipped with a ripper shall be considered an ordinary earth moving machine.

Blasting

D No blasting shall be permitted at areas which are within 300 metres from any structure, building or main roads.

E Blasting will only be permitted with the express written approval of the S.O.

F When blasting is carried out, the Contractor shall ensure, by adherence to proper safety distances and by the use of heavy blasting mats, that no damage or injury is caused to persons or property on or off site. Special care shall be taken when blasting on wet ground to ensure that individual explosives are reduced to such a size as to preclude damage to any buildings or structures. The Contractor shall be held solely responsible for any damage or nuisance caused by blasting operations.

G Explosives shall be properly stored in a licensed store or magazine with a separate compartment for storing detonators. Explosives shall be handled only by licensed shot-fires. The Contractor shall institute strict security measures to ensure no unauthorised issue or improper use of explosives brought onto the site. Relevant security regulations pertaining to storage, handling, transport and use of explosives shall be strictly adhered to.

H Explosives shall be used in the quantities and manner recommended by manufacturers. The S.O.'s written permission shall be obtained for each location or series of locations where the Contractor wishes to blast. Such permission shall not relieve the Contractor of his liabilities under the terms of this Contract.

Surface Accuracies

I The finished levels of the formation shall conform to the contours or levels indicated on the Drawings

J Any deviation exceeding 12mm from the finished levels indicated shall be corrected at the Contractor's expense by scarifying, cutting out and removing all resulting loose materials, adding new materials as required and re-shaping and rolling. No materials, loosened by scarifying or cutting out, may be left in position or re-used in filling.

Compaction Equipment

K Compaction shall be carried out by approved rollers of the type found to be most suitable and capable of achieving the required density.

EXCAVATOR (Cont'd)

Compaction Method

A Immediately prior to rolling and if so required, at intervals throughout rolling operations, the material shall be watered with approved sprinklers to obtain the optimum moisture content for compaction. The natural foundation or formation shall be lightly scarified and filling shall be bladed or otherwise agitated to ensure adequate mixing of water to the full depth of the layer being compacted. Rolling shall then follow as closely as possible after wetting of the material but shall proceed only when the material is within a fixed percentage of its optimum moisture content, the percentage of which shall be agreed with the S.O. If the moisture content of the material is in excess of the allowable maximum, the material shall be scarified to the extent required and allowed to dry as necessary prior to compaction. The optimum moisture content shall be assessed by means of modified density tests described in the following clauses.

B Rolling shall be continued until the material is uniformly compacted to a density not less than 95% of the maximum dry density obtained.

C Rolling shall be expeditiously carried out such that each pass of the roller shall connect up with the previous pass to achieve full coverage of the area being rolled.

D All depressions and ridges that develop under rolling shall be corrected by loosening and adding or removing materials by bulldozer or blader grader as necessary. Grading and rolling shall then be carried out alternately so as to maintain a smooth, even and uniformly compacted surface.

Maximum Dry Density and Optimum Moisture Content

E The maximum dry density of the formation and the optimum moisture content as referred to in these Specifications shall be determined by testing in accordance with Test No. 13 of B.S.1377 (Modified AASHTO)

Control Density Tests

F Arrangements shall be made by the S.O. for the following tests to be carried out. The Contractor shall however provide attendance in respect of taking samples for these tests. These tests shall be carried out as follows:

(a) Where Density Tests are Applicable

The dry density of the material after compaction shall be determined in accordance with Test No. 15 of B.S. 1377 except that a pouring cone of approved pattern shall be used and the test holes shall be approximately 150mm diameter and shall extend at their full diameter to the full depth of the layer being tested.

At least one test shall be made for every 600 square metres of each layer of compacted material. Work shall be zoned and so arranged as to allow the density tests to be taken at least one day ahead of any further work on the area concerned.

(b) Where Density Tests are not Applicable

Control density tests as specified above are not applicable when 40% or more of the material is retained on a 20mm B.S. sieve. With such material it will be considered that the maximum compaction has been achieved when the material has been rolled at or near its optimum moisture content and until the S.O. is satisfied that no further compaction is necessary.

If so directed the material shall be sprayed with water and scarified before rolling.

EXCAVATOR (Cont'd)

Excavated for Foundations, Trenches, etc.

A Excavate for foundation trenches, foundation pits, etc , to the lengths, widths and depths shown on the Drawings or directed by the S.O., with sides trimmed and bottoms levelled and stepped as required. A portion of the excavated material shall be returned, filled around walls, etc. and rammed in 150mm layers until consolidation is complete. The surplus excavation shall be carted away to the Contractor's own dump or as directed. No clay shall be returned to foundation trenches or holes.

B All excavation shall be carried down to hard ground as directed by the S.O. On no account shall foundations rest on made or filled ground except with the approval of the S.O.

C The Contractor shall report to the S.O. when excavations are ready to receive concrete. Concrete shall only be deposited when excavation have been inspected and approved by the S.O. Any excavations which in the opinion of the S.O. has been dug too deep shall be brought up to the required level with concrete as specified for foundations, all at the Contractor's risk and cost.

Disposal of Unwanted Materials

D Surplus or rejected excavated materials, not required for filling is to be taken neatly out from the site by trucks. Spill-over shall immediately be cleaned up as much as possible by attendants specially engaged for the purposes so that roads and pavements are kept clean and tidy at all times. The Contractor shall cart away and dispose of spoil as directed.

Suitable Fill Material

E All earth used for filling shall, unless otherwise stated, be selected hard dry material derived from excavations.

F All materials used for fill, including imported material, where required, shall be free of organic matter such as leaves, grass, roots and other objectionable material.

G The backfilling of excavations, unless otherwise described, shall be done with selected materials deposited, compacted and watered in layers not exceeding 150mm in depth. Each layer shall be rammed solid before the next is added. Proper allowance shall be made for subsidence and shrinkage. The Contractor shall at his own expense make up any subsidence that may occur when directed.

H No clay shall be returned to foundation trenches or holes.

I All surfaces to be covered with concrete shall be blinded with sand unless otherwise directed by the S.O. or shown on the Drawings.

EXCAVATOR (Cont'd)

Materials Unacceptable for Fill

A Materials unacceptable for fill shall comprise:-

(i) Materials from swamps, marshes or bogs, running silt, peat, logs, stumps, perishable materials, slurry or mud; or

(ii) Any material:

(a) Consisting of highly organic clay or silt;

(b) Which is clay having a liquid limit exceeding 80 and/or a plasticity index exceeding 55;

(c) Which is susceptible to spontaneous combustion;

(d) Consisting of such clinkers, clinker ashes and domestic ashes which by virtue of their physical or chemical composition or of their moisture content will not compact to form a suitable fill.

(iii) Organic matter such as leaves, grass, roots, etc.

Backfilling

B Backfill excavations, after the laying of foundations, drains, etc. with filling as specified or with spoil from the excavations, free from roots, vegetable fibres and other deleterious matter. No clay shall be returned to excavations under floors and aprons. Cart away and deposit all surplus spoil and debris elsewhere at the Contractor's own dump site, unless otherwise directed by the S O

Planking and Strutting

C The Contractor shall ensure that at all times the sides of excavations are maintained in a safe and stable condition and shall be responsible for the adequate provision of all timbering, planking and strutting required for this purpose. Comply with any instructions which may be issued by the S O. in this respect.

Safety of all Excavations

D The Contractor shall be solely responsible for the safety of all excavations. Planking and strutting, shoring, etc. shall be to the approval of the S O and the Authorities.

Keeping Excavations Free From Water

E The Contractor shall at all times keep excavations free from water, slop, mud, etc. by baling or pumping as required.

F Maintain at all times adequate means of water disposal to ensure that water from any source does not enter the excavations or collect on the site.

Hardcore

G Hardcore, unless otherwise described, shall consist of clean, hard, broken brick, concrete, stone or other chemically inert material broken to pass a 100mm ring, deposited, spread and levelled, in layers not exceeding 150mm thick, mechanically well rammed and consolidated and blinded with sand and water. The Hardcore shall be to the full thickness as stated or required after ramming and consolidating

CONCRETOR

Codes of Practice

A All concrete works shall be executed in accordance with the requirements of B.S. 8110 - "The Structural Use of Reinforced Concrete in Buildings", subject to any qualifications given below.

Cement

B The cement used shall be ordinary setting or rapid hardening Portland Cement of approved manufacture and shall comply with the requirements of M.S. 522 and B.S. 12: 1978. The Supplier's certificate is required with each consignment showing the date and place of manufacture. Manufacture's certificates of tests will in general be accepted as proof of soundness, but the S.O. may at his discretion require additional tests to be carried out in an approved laboratory on any cement which appears to him to have deteriorated through age, damage to containers, improper storage or for any other reason. The S.O. may, without tests being made, order that any bag of cement, a portion of the contents of which has hardened, or which appears to be defective in any way, be removed from the site.

C Sulphate resisting Portland Cement shall comply with the requirements of B.S. 4027. Cement shall be transported to site in covered vehicles adequately protected against adverse weather. It shall be stored in a weather-proof cement store with the floor raised at least 300mm above ground level to the approval of the S.O. Cement shall be taken for use in the Works in the order of its delivery to the store.

D Cement shall be obtained from a single identified source to ensure consistency of mix and colour, unless otherwise approved by the S.O.

Concrete Additives

E Water reducing and waterproofing agents, where required, shall be of approved types to be used strictly in accordance with the manufacturer's instructions.

F No other additive may be used in the making of concrete unless approved by the S.O.

G Relevant tests based on trial mixes shall be carried out prior to the use of admixtures in the Works. The trial mix shall be made mix shall be made using job-site materials and under job site conditions. A control mix shall be made using a conventional trial mix, viz without using the admixture, to determine the water/cement ratio and mix proportions required to give the specified strength with the required slump. Using the same mix proportions as in the control mix, a test shall be prepared using the recommended amount of the admixture. The results of the relevant tests obtained from the control mix and trial mix shall be compared. Only if results are found to be satisfactory, and comparable to the effects stipulated by manufacturers would the admixture be allowed for use.

H Admixture containing calcium chloride or calcium formate as active constituents shall, under no circumstance, be used in structural concrete containing reinforcement, prestressing tendons or other embedded metal.

Aggregates

I The fine and coarse aggregate shall be naturally occurring sand or crushed stone, obtained from approved sources. Aggregate shall comply with the requirements of B.S. 882 -"Specification for Aggregates from Natural Sources for Concrete". They shall be hard, strong, durable, clean and free from adherent coatings and shall not contain any harmful material in sufficient quantity so as to affect adversely the strength, durability or impermeability of the concrete or to attack the steel reinforcement. They shall not contain water soluble-sulphur trioxide (S03) in excess of 0.1 percent and they shall be obtained from a source approved by the S.O.

CONCRETOR (Cont'd)

Aggregates (Cont'd)

A The fine aggregate shall be naturally occurring sand and shall not contain silt or other fine material exceeding 6 percent by volume when tested according to the Standard Method given in B.S. 812 Clause 15. It shall not contain organic material in sufficient quantity to show a darker colour than the standard depth of colour No. 3 when tested according to the Method in B.S. 812, Clause 28 "Organic Impurities".

B The use of mining sand or crushed stone will not be permitted as fine aggregate.

C The coarse aggregate shall be crushed granite or other hard stone and shall not contain clay lumps exceeding 1 percent by weight. A representative dry sample shall not show an increase in weight exceeding 8 percent after immersion in water when tested as laid down in B.S. 812 Clauses 19 - 21, Method A or B, "Absorption of Aggregate Coarser than 10mm B.S. Sieve". It shall be well shaped and not flaky. The nominal size of coarse aggregate shall be as stipulated below.

Aggregates Grading

D The grading of aggregate shall be analysed as described in B.S. 812, Clause 12 - "Sieve Analysis" and shall be within the limits specified below:-

TABLE 1 - SIEVE ANALYSIS OF AGGREGATES

Fine Aggregate (Natural Sand)

B.S. Sieve	5mm	2.36mm	1.18mm	0.60mm	0.30mm	0.15mm
Percent Passing	95-100	70-95	45-85	25-60	5-30	0-10

Coarse Aggregate (Nominal Size 20mm)

B.S. Sieve	20mm	1 Omm	5mm
Percent Passing	95-100	25-55	0-10

E The grading within the limits specified above shall be to the satisfaction of the S.O. and when tested, as provided for in this Specification, shall approximate closely to the grading of samples approved. If necessary, the fine aggregate shall be washed and/or screened to comply with the foregoing standards.

CONCRETOR (Cont'd)

Storage of Aggregates

A The fine and coarse aggregate shall be stored separately and in such a manner that segregation of the various sized particles shall not occur. Aggregate stockpiles shall be formed on a platform of weak concrete, timber or similar approved hardstanding. The aggregate shall also be kept clean and free of foreign matter.

B Stockpiles of aggregates shall be arranged with proper drainage and protection from rainfall in order to prevent excessive changes in moisture content taking place during concreting.

C Aggregates shall not be unloaded onto roadways or pathways and the S.O. may reject any stockpile or part thereof if improper storage has, in his opinion, caused contamination with foreign matter.

Sampling and Testing of Aggregates

D Samples of the fine and coarse aggregate approved by the S.O. shall be kept on site, and shall give a fair indication of the grading and general quality of the aggregate for comparison with the aggregates delivered during the course of work. Tests shall be carried out on samples of the latter taken at intervals as required by the S.O. The method of sampling and the amount of aggregate to be provided for the tests shall be in accordance with B.S. 812 Section One "Sampling of Aggregates". The tests shall be those laid down in B.S. 812 Section Two to Six inclusive. The tests will be carried out by the Contractor or his representatives. Should a sample fail to comply with any of the tests the S.O. may, at his discretion, either reject the batch from which the sample was taken, order it to be washed and/or screened, or permit it to be used with variations in the proportions of the concrete mixes specified. Any batch of aggregate rejected by the S.O. shall be immediately removed from the site and replaced entirely all at the Contractor's own cost.

E When aggregates which are satisfactory to the S.O. have been selected, the Contractor shall secure the entire supply of each material from the same source so as to maintain the same quality and grading throughout the works.

F The Contractor must arrange for and secure ample supplies for completion of the Works.

Sand

G Sand for cement mortar shall conform to B.S. 1200 and shall be clean freshwater river sand free from clay and other impurities. Sand shall, if necessary, be washed in clean fresh water before being incorporated in the Works.

Water

H All water used in the concrete work shall be fresh, clean water from public mains and shall comply with the requirements of B S 3148. Water storage tanks shall be covered and insulated against variations in its temperature.

Reinforcement

I Mild steel rod reinforcement shall be plain round hot rolled mild steel bars complying with the requirements of B S 4449.

J High yield deformed steel rod reinforcement shall be high tensile steel bars complying with requirements of B.S. 4449, Part I with a minimum yield stress of 60,000 p.s.i.

CONCRETOR (Cont'd)

Reinforcement (Cont'd)

A Welded wire fabric, twisted square bar fabric or expanded metal shall comply with the appropriate part of B.S. 4483: 1969 - "Steel fabric for the Reinforcement of Concrete" or Malaysian Standard M.S. 7.8: 1973

B Prior to any material being brought onto the Site, the Contractor shall furnish manufacturer's certificates for acceptance. A test sheet for any batch of bars, giving the results of each of the mechanical tests required under the relevant B.S. shall also be provided. Any reinforcement found not in accordance with the relevant B.S. in the course of being worked, shall be rejected by the S.O., notwithstanding any previous acceptance on the strength of the test certificates. The S.O. may call for additional tests to be made at the Contractor's expense on samples taken from the batch of bars from which the faulty reinforcement came. If the samples do not comply with the relevant B.S. then the S.O. may reject the whole batch and require its removal from the Works site.

Cleaning, Bending and PlacingReinforcement.

C The reinforcement shall be cleaned free of loose mill scale and rust before being placed in the forms. It shall additionally be free from oil, grease, or other harmful matter at the time when the concrete is placed.

D The reinforcement shall be bent cold using an approved bar-bending machine. The bending dimensions and tolerances and the dimensions of anchorages, hooks, binders, stirrups, links and the like shall be in accordance with B.S. 4466:1981 - "Specification for Bending Dimensions and Scheduling of Reinforcement for Concrete".

E The internal radius at the corner of stirrups and binders shall not be less than the radius of the longitudinal bars embraced by the stirrups or binders.

F Bars incorrectly bent shall be used only if the means used for straightening and re-bending be such that it does not injure the material. No reinforcement shall be bent when in position in the Works without approval, whether partially embedded in hardened concrete or otherwise.

G The reinforcement shall be placed in the forms and held firm against displacement by approved types of small precast concrete fixing blocks and wire ties. Fixing blocks may be left embedded in the concrete in cases where the S.O. approves. Bar intended to be in contact when passing each other shall be securely held together at intersection points with tying wires; binders and stirrups shall tightly embrace the longitudinal reinforcement to which they shall be securely wired or spot welded.

H The wire ties shall be No. 16 S.W.G. soft annealed iron wires; the ends shall be turned in from the face of the formwork and shall not be left projecting beyond the reinforcement bars. No concrete shall be placed in the forms until the reinforcement has been inspected and passed by the S.O. or his representative. The exact amount of cover over the reinforcement shall be obtained when the reinforcement is placed and shall be held during concreting.

Welding of Reinforcement

I Welding of reinforcement by electric arc may be permitted by the S.O. under suitable safeguards and only with the prior approval of the S.O. Welding shall be carried out in accordance with B.S. 5135: 1984 - "Specification for Process Arc Welding of Carbon and Carbon Manganese Steel". Butt welds shall be carried out on a specimen prepared to represent each form of butt welded joint used in welding the reinforcement and for each position of welding. The method of making weld tests shall be that laid down in B.S. 709. The specimen shall pass the tests to the satisfaction of the S.O. before approval is accorded to use the joint which the specimen represents. Tack welds between reinforcing bars, used merely to fix them in position, shall not be subjected to tests.

CONCRETOR (Cont'd)

Prescribed Concrete Mixes

A Reinforced concrete shall comply with the requirements of the B.S. 8110 "The Structural Use of Concrete"; mixes shall comply with the requirements of B.S. 5328:1981 - "Methods of Specifying Concrete"

The prescribed concrete mixes shall be in accordance with the following table:

TABLE 2 - PRESCRIBED CONCRETE MIXES

Grade	Traditional Nominal Mix	Min. Weight of Cement per Cubic Metre of Finished Concrete kg.	Aggregate per 50 kg. Cement m3		Max. Aggregate Size mm	Slump Range mm	Cube Strength in N/mm2			
							28 days of mixing		7 days of mixing	
			Fine	Coarse			Preliminary Works		Preliminary Works	
C7-5P	1:3:6	-	-	-	20	25-75	-	7.5	-	-
CI0P	1:2-1/2:5	240	-	-	20	25-75	-	10	-	-
C15P	-	280	-	-	20	25-75	-	15	-	-
C20P	124	320	0.07	0.14	20	25-75	28	20	18.9	14
C25P	1:1-1/2:3	360	0.05	0.10	20	25-75	34	25	22.7	17
C30P	1:1:2	400	0.035	0.07	20	25-75	40	30	26.7	20

B The concrete shall be batched by weight or by volume, and only sufficient water to obtain a workable mix shall be added. Water shall be measured by volume and shall be controlled to make due allowance for moisture contained in coarse and fine aggregate. Weight batching shall be in an approved machine which shall indicate the weights to the nearest pound within an accuracy of ± 2%.

C In mixing by volume, the gauge boxes shall be used proportional in size to one bag of cement (50 kg.) so that a full bag of cement or multiple bags shall be used for each mix loaded on to mixer. For gauging purposes one bag of cement (50 kg.) shall be considered equivalent to 0.035 cubic metre. The proportions given in the "Table of Concrete Mixes" shall be considered as the minimum requirement for the various grades of concrete. The aggregate cement ratio and the water cement ratio shall be adjusted during preparation of trial mixes to obtain the specified cube test strengths for each grade of concrete. Trial mixes shall be prepared and tested as hereinafter specified, before any concreting works can commence and at all times when any changes are made in the source of supply of aggregates. Concrete which fails to achieve the specified strength will not be accepted and any part of the structure cast with unacceptable concrete shall be removed and recast in conformity with this Specification at the Contractor's own expense

CONCRETOR (Cont'd)

Prescribed Concrete Mixes (Cont'd)

A The volume of the aggregate specified in the "Table of Concrete Mixes" refer to the materials in a dry state. If considered necessary by the S.O., tests shall be carried out twice daily, or more frequently to ascertain the moisture content of the aggregate. Allowance shall be made for the water contained in the aggregate when calculating the quantity of water to be added to the mix

Designed Mixes

B Designed mixes shall be prepared by the Contractor strictly in accordance with the requirements set down in B.S. 5328 and this Specification.

C The Contractor shall be required to submit details of the proposed design mixes to the S.O. for approval which shall include, but not limited to

i) Type(s) of cement;

ii) Sources of cement and aggregates;

(iii) Any admixture used; type(s) and name;

(iv) Proposed quantity of each ingredient per cubic metre of fully compacted concrete;

(v) Grading details of coarse and fine aggregates, preferably in tabular or graphical form;

(vi) Grading details of the combined aggregates, preferably in tabular or graphical form, together with details for the proportions of coarse and fine mix;

(vii) Aggregate: cement ratio (by weight);

(viii) Water: cement ratio (by weight);

(ix) Workability, in terms of slump and compaction factor;

(x) Cement content per cubic metre of fresh fully compacted concrete;

(xi) Design strength of concrete; which shall be the relevant specified compressive strength;

(xii) Location and position designed mix intended to be use.

C The requirements for cement, aggregates and water shall be as earlier specified.

D Unless otherwise agreed, admixtures shall comply with B.S. 1014, B.S 3587, B.S. 3892 and B.S. 5075.

CONCRETOR (Cont'd)

Designed Mixes (Cont'd)

A At least 6 weeks before commencing any concrete works, the Contractor shall design and make trial mixes using samples of aggregates and cement proposed for the works. The trial mixes shall be made in the presence of the S.O. using the mixing plant proposed for the works. For each trial mix, a set of six cubes shall be made from each of three consecutive batches. The cubes shall be made, cured and tested in accordance with B.S. 1881, and the Contractor shall pack them in wet sand in suitable boxes for transportation to a laboratory approved by the S O. Three cubes from each set shall be tested after 7 days and three after 28 days.

B The compressive strength for each grade of concrete specified shall comply with the following table.

TABLE 3 - COMPRESSIVE STRENGTH

Concrete Grade	Characteristic Compressive Strength at 28 days
	N/mm2 (= MPa)
C2.5	2.5
C5	5.0
C7.5	7.5
C10	10.0
C12.5	12.5
C15	15.0
C20	20.0
C25	25.0
C30	30.0
C35	35.0
C40	40.0
C45	45.0
C50	50.0
C55	55.0
C60	60.0

CONCRETOR (Cont'd)

Designed Mixes (Cont'd)

A The minimum cement content in Kilograms of cement per cubic metre of fresh fully compacted concrete shall be in accordance with Table 4 below, unless otherwise directed by the S.O.

TABLE 4 - MINIMUM CEMENT CONTENT

Proposed Use	Concrete Grade	Minimum Cement
		kg/m3
Prestressed concrete	all*	300
Reinforcement concrete	all*	240
Concrete containing no embedded metal	[C20	220
	[C15	180
	[C10	150
	[C7.5	120

B The trial mixes shall be repeated until the proportions necessary to produce a concrete complying in all respects with this Specification have been determined.

C The S.O. shall instruct such tests to be carried out on the concrete as are necessary to ensure compliance with the specified requirements.

D No concrete of any grade shall be placed in the Works unless the S.O. has given his approval in writing

E Upon approval of a designed mix or mixes, the Contractor shall not make any variations in the proportion of each ingredient, the type and proportion of admixtures allowed, the source of cement, aggregate and water, and anything else likely to adversely affect the compressive strengths of the concrete mix. The S.O. may instruct further tests to be carried out, all at the Contractor's own expense.

Ready-Mixed Concrete

F The Contractor may be allowed to use ready-mixed concrete from an approved source. The requirements for concrete mixes must be strictly complied with. The S.O. shall be afforded all reasonable opportunity and facility to inspect the constituent materials and the manufacture of the concrete and to take samples or to make any tests.

G Approval shall be given by the S.O. insofar as the concrete complies with this Specification and the recommendation of B.S. 5328.

H The S.O. may require tests on ready-mixed concrete to ascertain the cement content and the water/cement ratio. The producer of the ready-mixed concrete shall make such tests on the concrete as and necessary to ensure compliance with the specified requirements. Produce on requests all test certificates for inspection by the S.O.

CONCRETOR (Cont'd)

Ready-Mixed (Cont'd)

A The Contractor is to maintain records of all supplies of ready-mixed concrete placed on the works, viz:

(a) Delivery notes giving details of material used and mix proportions.

(b) The time at which each batch of concrete was mixed and details of any additives used.

(c) Position in the works where concrete is placed.

B Concrete shall be transported in a truck mixer complying with the requirements of B.S. 4251, Ready-mixed concrete is to be agitated continuously by rotation of the mixer drum whilst on transit to the site, and while awaiting discharge. When non-agitating vehicles are used, the mixed concrete shall constantly be protected from the gain or loss of water.

C In case of truck-mixed concrete, the water may be added either at the Supplier's plant, or on arrival at site under the Contractor's supervision. Water must not be added during transit.

D If transported in truck mixers or agitators, concrete shall be discharged from the delivery vehicle within 2 hours from the time of loading. When non-agitating vehicles are used, the concrete shall be discharged within 1 hour after time of loading.

E The concrete is to be compacted in its final position in as short a time as possible after mixing

Preliminary Trial Mixes

F The S.O. shall if he so desires to be present at all preliminary tests. As soon as possible after commencement of works, the Contractor shall make trial mixes using samples of aggregates and cements representative of those to be used. If possible, the concreting plant and the means of transport to be employed in the Works shall be used to make the trial mixes and to transport them a representative distance. A clean dry mixer shall be used and the first batch discharged. Preliminary test cubes shall be taken from the proposed mixes as follows:

G For each grade a set of 9 cubes shall be made from each of 3 consecutive batches. Three from each set of 9 shall be tested at an age of 7 days, 3 at 14 days and 3 at an age of 28 days.

H The cubes shall be made, cured, stored, transported and tested in compression in accordance with the relevant parts of B.S. 1881. The tests shall be carried out in a laboratory approved by the S.O.

I At each age of test, no cube strength shall fall below the appropriate specified minimum. Concreting in the works shall not commence until the specified minimum crushing strength at 28 days has been attained. Before commencing the Works, the Contractor shall submit to the S.O for his approval full details of the trial mixes and the mixes he proposes to use, with their anticipated average strength, which shall be based on the satisfactory results of these preliminary tests, and shall obtain such approval before commencing the works.

CONCRETOR (Cont'd)

Testing of Concrete Works

A The sampling and testing of concrete shall be undertaken in the following manner:

(1) For Strength

On each day when work on concreting is in progress, samples of each grade of the concrete as placed, shall be taken and work test cubes made from each 40 cu. metres of concrete or part thereof, while at the same time consistency test shall be made from the samples and the compacting factors or slumps recorded. A record of these tests shall be kept on the Works, identifying them with the part of the work executed. The samples shall be taken, and the test cubes made and matured, in accordance with the Standard Method laid down in B.S. 8110. The samples shall be taken and the cubes made weekly and, in addition, whenever any of the materials or the proportions of the mix are changed or whenever so directed by the S.O. Six test cubes shall be made from each sample taken. Three shall be tested after seven days and the remaining three after twenty eight days, in an approved laboratory.

The number of cubes may be reduced by the S.O. if satisfactory results are consistently obtained or increased up to a maximum of twelve when in the opinion of the S.O. additional tests are required during the early stages of the Works.

The strength requirements for each grade of concrete given in the "Table of Concrete Mixes" shall be considered to be obtained if all the cubes individually satisfy the specified minimum given in the Table. If the test results at any age indicate that the specified requirements have not been complied with, the Contractor shall advise the S.O. accordingly and shall submit his proposals for adjusting the mix design and/or improving the standard of quality control before proceeding with the concreting. In addition, when the cubes tested at seven days show a minimum resistance to crushing less than that stipulated above, the S.O reserves the right to order work on concreting to stop until the results of the tests at twenty eight days are known. If the resistance to crushing of the cubes at twenty eight days is less than that stipulated, the Contractor shall, if ordered by the S.O.:

(i) hack out, remove and replace at the Contractor's expense all concrete mixed and placed on the day when the sample was taken, or

(ii) carry out such other remedial works as the S.O. may consider necessary at the Contractor's expense.

The remedial measures to be undertaken shall be at the sole discretion of the S.O.

The sampling, making, curing and testing of the cubes shall be carried out by the Contractor or his representatives. The S.O. or his representatives may, if they so elect, be present while the cubes are being made and tested.

(2) For Consistency

While work on concreting is in progress, tests on workability of the mix shall be carried out thrice daily and, in addition, whenever any materials or the proportions of the mix are changed, or when directed by the S.O. The tests shall, at the discretion of the S.O., consist of either the Slump Test or the Compacting Factor Test, as described in B S. 1881. All necessary apparatus for testing shall be supplied by the Contractor.

CONCRETOR (Cont'd)

(2) For Consistency

The slump shall be as small, and the compacting factor as low as practicable, consistent with the efficient working and full compaction of the concrete mix in the formwork using the specified methods of compaction.

The concrete shall be of such consistency that it can be readily worked into the corners and angles of the formwork and around reinforcement without segregation of the materials or bleeding of free water at the surface. On striking the formwork, it shall present a face is uniform, free from honeycombing, surface crazing or excessive dusting.

In order to satisfy the S.O. that the workability of the proposed mix in each grade of concrete is adequate for the requirements of the Specification, the Contractor shall carry out a series of workability tests on the Preliminary Trial Mixes as described earlier.

Adjustment to Mix Proportions

A During production, adjustments to mix proportions may be made subject to the approval of the S.O. in order to minimise variability of strength and to achieve the target mean strength. Such adjustments are regarded as part of proper production control, but the specified limits of minimum cement content and maximum water/cement ratio shall be maintained. Changes in cement content must be declared. Such adjustments to mix proportions shall not be taken to imply any change to the current margin.

Construction Joints

B Construction joints shall be located in the positions as shown on Drawings or as required. Such joints shall be in a plane at a right angle to the axis of the member concerned or, when forming the upper surface of lifts in certain wall or beams, shall be horizontal. At joints other than those occurring in a horizontal plane the concrete shall be prevented from flowing laterally by the use of rigid stopping-off forms. Slightly chamfered, wooden fillets 25 x 50mm shall be fixed to stopping-off forms to produce rebates in the face of the joint; these rebates shall be formed centrally in the case of walls and slabs and shall run the full length of the joints.

C The face of the joint already formed shall have all laitance removed, and the aggregates exposed (by means of high pressure water jetting between 2 and 4 hours after the concrete has been placed in and just before concreting is resumed), scrubbed clean and thoroughly saturated with water. The face shall then be rendered with a 25mm thick layer of mortar composed of one part of Portland Cement and 1-1/2 parts of sand against which the freshly mixed concrete shall be immediately deposited and thoroughly tamped into the cement mortar.

D Concreting of beams shall be continuous throughout the length of the beam and without transverse construction joints unless express permission to employ a transverse joint is given by the S.O. Such joints when permitted, shall be vertical and at the centre of the span.

E Construction joints in slabs shall be placed parallel to the principal reinforcement and the slabs shall be cast in one operation, without transverse joints. When express permission is given by the S.O. to use transverse joints, such joints shall be at midspan vertical and parallel to main beams.

F Not less than seven days shall elapse between the placing of concrete in any two adjacent areas of concrete in slabs, beams and shells.

CONCRETOR (Cont'd)

Concreting Plan

A The concreting plant shall be suitable in type, capacity and design for its purpose. The performance of the plant and its deposition shall be to the satisfaction of the S.O. All batching equipment shall be calibrated against known weights before any concrete is produced in the Works and at least once a month thereafter unless there are reasonable grounds to suspect the accuracy in which case the tests shall be made at more frequent intervals. All plant used shall be maintained in good working conditions at all times.

Mixing

B The concrete shall be mixed in a mixer of approved type and adequate capacity. The quantity of water added to each batch in the mixer shall be as approved by the S.O., and reduced by the quantity calculated from the tests of aggregate water content. This calculated quantity may be varied by not more than ± 5% in order to maintain a constant workability. The mixing shall continue until there is a uniform distribution of the materials and the mass is uniform in colour and consistency and in no case shall the time of mixing be less than two minutes or more than five minutes after all the ingredients have been placed in the mixer. Any concrete surplus to immediate requirements shall be thrown away. Under no circumstance may the surplus be used later.

C The first batch from clean mixer shall be discarded, or use in part of the Works where the finish is not important. Adjustments of the mix to compensate for loss of fine material in the first batch shall not be made.

D Hand mixing will only be allowed for small quantities of concrete which are to be used for a specific purpose. In the event of hand mixing, 10 percent extra cement shall be added to the mix proportion specified.

Transporting

E The concrete shall be transported from the mixer to the place of deposit in the works as rapidly as practicable and by means which will prevent segregation of the materials and/or loss or contamination of ingredients. It shall be deposited as near as practicable in its final position to avoid re-handling or flowing. The concrete shall be conveyed by chutes only with the permission of the S.O. and arrangements for this shall be to his satisfaction. Concrete shall not be allowed to fall freely more than 1.5 metres.

Placing and Compaction of Concrete

F The concrete shall be placed in the Works as soon as possible after mixing in such a manner as to avoid segregation of the concrete and displacement of the reinforcement, other embedded items, or formwork, and shall be thoroughly and uniformly compacted by hand tamping, rodding, spading and mechanical vibration. It shall be thoroughly worked into the corners of formwork by hand tamping and rodding. After tamping and rodding into place the concrete shall not be subject to disturbance other than such which is incidental to compaction by vibration. The concrete shall be placed in the formwork in layers not exceeding 450mm deep and each layer shall be thoroughly compacted before more concrete is added.

CONCRIETOR (Cont'd)

Placing and Compaction of Concrete (Cont'd)

A The concrete maintained between two walls of formwork shall be compacted by vibrators of the internal type and concrete in slabs with no formwork on its upper surface shall be compacted either by vibrators of the pan type or by a vibrating beam type. The vibrators shall be of sufficient power and of a kind approved by the S.O. They shall be operated by workmen skilled in their use who shall be additional to the labourers employed for placing and tamping the concrete. The vibrators shall be used solely for compacting the concrete and not for distributing it into place. Immersion vibrators shall penetrate the full depth of the layer and where the underlaying layer is of fresh concrete shall enter and re-vibrate that layer to ensure that successive layers are well knitted together. The internal vibrators shall be inserted and withdrawn slowly and at a uniform pace of approximately 100mm per second. Compaction shall be deemed to be completed when cement mortar appears in a circle around vibrators. Internal vibrators shall be inserted at points judged by the area of mortar showing after compacting, with a certain allowance made for over-lapping and they shall not be allowed to come into contact with the formwork or the reinforcement and shall be inserted at a distance of 75mm from the former. Pan vibrators shall be placed on the surface of the concrete which shall have previously been tamped and levelled leaving an allowance in height for compaction, until the cement mortar appears under the pan. The vibrator shall then be lifted and placed on the adjoining surface and this operation shall be repeated until the whole surface has been compacted. Alternatively, a vibrating beam spanning the full width of the surface may also be used. Concreting shall be carried out continuously between and up to pre-determined construction joints specified as before in one sequence of operation. The surface of the concrete shall be maintained reasonably level during placing. In the event of unavoidable stoppage in positions not pre-determined the concreting shall be terminated on horizontal places and against vertical surface by the use of stopping-off boards. Any concrete which has attained its initial set while being placed shall be discarded. Placing of concrete shall be suspended during rain. The S.O. will decide whether concreting can be continued under light drizzles. The Contractor is to execute all concreting in such sequences so as to minimise the effects on the permanent works of temporary stoppage of concreting due to rain. The Contractor shall also provide adequate covers and measures for the protection of the permanent works from inclement weather.

Records

B Records shall be kept by the Contractor of the positions in the works of all batches of concrete of their grade. Two copies of these records shall be supplied to the S.O.

Holes, Etc. in Concrete

C All holes, openings, pockets, ducts, chases, recesses and other cavities shall be formed and all fittings cast in before the concrete is placed. No holes shall be cut in any concrete without the prior approval of the S.O.

CONCRETOR (Cont'd)

Curing and Protection of Concrete

A The concrete shall be protected by approved means during hardening from direct sunshine, dry wind, rain, traffic or shock. No concrete shall be permitted to dry for at least ten days, and this shall be ensured by the continuous use of clean, saturated sacking on other than horizontal surfaces and inundation of all horizontal surfaces and the Contractor shall make due allowance for any additional labour and water required in this connection. All work shall be protected from damage by shock or overloading or falling earth.

Concreting in Hot Weather

B (i) Mixing - In hot weather suitable means shall be provided to shield the aggregate stockpiles from the direct rays of the sun or to cool the aggregates by spraying with water and to insulate the mixing water tank and pipelines to ensure that the temperature of the concrete when deposited shall not exceed 90'F.

(ii) Placing - In hot dry weather suitable means shall be provided to avoid premature hardening of concrete placed in contact with hot dry surfaces. Where necessary the surfaces, including reinforcement, against which concrete is to be placed shall be shielded from the direct rays of the sun and shall be sprayed with water to prevent excessive absorption of water by the surfaces from the fresh concrete.

Formwork

C Formwork shall be constructed of clean sound well-seasoned timber, sheet metal or other approved materials.

D The formwork shall be of such quality and strength as will ensure complete rigidity throughout the placing, ramming, vibrating and setting of the concrete and shall be sufficiently tight to prevent loss of liquid from the concrete.

E Where formwork is described as wrot, it shall be constructed of tongued and grooved wrought boarding or lined with sheet plywood, hardboard, metal, etc. so as to present a smooth finished appearance free from board marks and holes etc., with cement mortar (1:1) trowelled smooth and for any necessary rubbing down, polishing off, etc., to give this appearance.

F Formwork shall be so designed and constructed that the concrete can be properly placed and thoroughly compacted without loss of water. It shall be adequately strutted, braced or tied and capable of withstanding the pressure resulting from the placing of the concrete, whatever method of compaction is employed, without undue deflection or loss of alignment.

G The Contractor shall make allowance in the formwork for any camber specified.

H Formwork shall be approved by the S.O. before concreting is started but the Contractor shall be solely responsible for ensuring that it is sufficiently strong and rigid for its purpose.

CONCRETOR (Cont'd)

Cleaning and Treatment of Formwork

A All rubbish, particularly chippings, shavings and sawdust, shall be removed from the interior of the formwork immediately before concrete is placed and the formwork face in contact with the concrete shall be cleaned and either thoroughly wetted, or treated with a suitable mould oil or approved release agent. Release agents shall be applied uniformly. Care should be taken that oil or materials of like composition is kept out of contact with the reinforcement and does not accumulate at the bottom of formwork. If the form is not used within 24 hours, a further coat of mould oil is to be given before fixing in position.

B The Contractor shall be responsible for ensuring that the release agent is chemically and physically compatible with the finishes to be applied on the concrete face later. Where there are no applied finish, the Contractor shall be responsible for ensuring that the release agent will not stain the surface of the finished concrete.

C Formwork may be treated with limewash or oil to facilitate removal but the Contractor will not be allowed to line the formwork with paper.

D All formwork shall be inspected by the S.O. after preparation and prior to depositing of concrete. No depositing of concrete shall be commenced until the formwork has been approved.

Striking or Removal of Formwork

E No formwork shall be struck until the concrete has developed sufficient strength to support itself and resist surface damage and any stresses arising during the construction period. All formwork shall be removed without shock or vibration to the concrete. Before formwork is stripped, the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened.

F Unless otherwise decided by the S.O. formwork shall not be struck earlier than as stated in the following Table. The striking time given is for guidance only, and the Contractor shall be solely responsible for any injury to the Works and any consequential damage caused by or arising out of the striking and removal of formwork. Any instruction, permission or approval by the S.O. relating to the striking and removal or formwork shall not relieve the Contractor from his responsibility.

Location	Striking Time	
	Ordinary Portland Cement	Rapid Hardening Portland Cement
Slabs props	10 days	5 days
Slabs soffits	4 days	3 days
Beam props	21 days	8 days
Beam soffits	8 days	5 days
Vertical forms (unloaded)	3 days	2 days

CONCRETOR (Cont'd)

Striking or Removal of Formwork (Cont'd)

A All formwork shall be struck and removed in such sections, order and manner as the S.O. may direct.

Concrete Tolerances

B Positions of members shall be accurate within 6mm but this tolerance must not be cumulative.

C Size of member shall be accurate to within - 0 + 3mm

D The displacement of shuttering boards at joints shall not be greater than 0.78mm.

E The displacement from straightness of members shall be within 1.6mm in 3.Om but this tolerance must not be cumulative.

F The twist in members shall not exceed 3mm in 3.Om but this tolerance must not be cumulative.

G Columns which are exposed and have a fair-faced finish and those which house windows and other frames tight to the faces shall be accurate in position, square, size and straightness to within ±1.6mm.

H The S.O. reserves the right to require any concrete which he deems unsatisfactory in this respect to be entirely demolished and reconstructed at the Contractor's expense.

Precast Concrete

I The relevant clauses specified earlier under a structural concrete shall equally apply to precast concrete.

J All precast concrete is to be vibrated. Precast concrete shall be coated with mould oil of a non-staining nature.

K Concrete shall be well rodded and tamped into mould, no facing up is to be done where work is to be left exposed, and the faces are to be true, clean and regular with clean arrises.

L The Contractor shall protect precast concrete units from damage during lifting, handling or storage and, where necessary, provide adequate protection to prevent the concrete from damage due to rubbing by slings or contact with other units or any other cause.

M During assembly, the Contractor shall provide and maintain sufficient and proper temporary supports for each precast concrete until such time as the S.O. permits its load to be transferred to the adjacent structure.

N Precast units shall be bedded, jointed and where required pointed in cement and sand mortar (1:4)

BRICKLAYER

Codes of Practice

A Workmanship shall generally comply with the requirements of B.S. 5628: Part 3 - "Use of Masonry" subject to any qualifications given below.

Bricks Generally

B All bricks, unless otherwise stated, shall be of standard size, hard, sound, well burnt, machine made wirecut clay bricks from an approved kiln, strictly to the approval of the S.O.

C Bricks shall be stacked on a dry level surface in a manner that permits free air circulation. Adequate measures shall be taken to protect bricks from rain and contact with soil, clinkers and ashes.

Samples

D Samples of bricks at random from the load shall be deposited with and approved by the S.O. before being used and all subsequent deliveries shall be up to the standard of the sample approved. No soft, broken, twisted or otherwise defective bricks will be permitted to be used.

Common Bricks

E The common bricks, unless otherwise described, shall be wire cut clay bricks, even in size, smooth in texture and with sharp well defined arrises and shall be obtained from an approved manufacturer.

F Clay bricks shall conform to B.S. 3921 with a minimum compressive strength of 20 N/m M2.

Facing Bricks

G The facing bricks shall be hard, well burnt, machine made, wire cut klinker bricks with a vitreous finish, of size 215mm x 102.5mm x 65mm approximately and from an approved source. They shall all possess the same colour and texture and shall not exhibit any efflorescence.

Calcium Silicate Bricks

H Calcium silicate bricks shall comply with the requirements of B.S. 187, Class 3 with a minimum compressive strength of 20.5 N/mm2.

Block Walls

I Cement and sand blocks shall be to approved sizes cast in approved moulds and laid in a manner specified for brick walls. The blocks are to be constructed of one part of cement to six parts of sand. All blocks must be cast clean and true to shape with sharp arrises. The mixture measured by volume is to be turned over three times in a dry state until it achieves an even colour and consistent texture throughout. Water is then to be added gently through a rose, the quantity being just enough to secure adhesion. After wetting, the mixture shall be turned over three times and well rammed into the middle of the mould and then smoothed over with a steel face trowel. After removal from the moulds, the blocks are to be matured under shade in separate rows. The blocks must not be removed from the shade for a minimum of 9 days. Twenty four (24) hours after removal from the moulds, the blocks must be kept wet by continuous watering through a fine spray whilst maturing.

J No blocks are to be used on any part of the building until they have matured for at least 14 days.

BRICKLAYER (Cont'd)

Block Walls (Cont'd)

A The shell of each hollow block shall be 38mm thick minimum on all sides. The minimum compressive strength of blocks shall be 7 N/m M2 after 24 days. Samples shall be taken at random from the Contractor's stockpile for testing by the S.O. Any blocks found to be substandard or not to specified requirements will be rejected and the stockpile from which the blocks were taken will be subject to rejection by the S.O. and removed from site.

B Hollow block walls shall be reinforced at every second course with approved brick reinforcement commencing one course above floor level.

Cement

C The cement shall be as previously described in "Concretor".

Mortar Plasticiser

D The mortar plasticiser shall be approved type used strictly in accordance with the manufacturer's instructions.

Sand

E Sand for mortar shall be hard, clean, naturally occurring sand or crushed rock and shall comply in all respects with B.S. 1200 and be well graded from 5mm down in accordance with Table 1 therein.

Cement and Sand Mortar

F The cement and sand mortar shall, unless otherwise described, consist of one part of Portland Cement to six parts of sand by volume for work above damp proof course, with the addition of an approved mortar plasticiser used strictly in accordance with the manufacturer's instructions. The ingredients for mortar shall be measured in proper gauge boxes on a boarded platform or in an approved mechanical mixer.

G Mortar for bricklaying below d.p.c. or lowest ground floor level shall be cement mortar only in the proportion of one part cement and three parts sand. An approved ready-mixed "Plasticiser" cement mortar (ready-mixed "Walcrete" cement mortar or equal and approved) may be used for bricklaying with the prior approval of the S.O. and shall be applied in strict accordance with the manufacturer's recommendations.

H The mortar is to be hand-mixed on a non-absorbent jointed platform with kerbs. Gauge boxes are to be used for measuring all materials which are to be strike measured and not tamped down. The ingredients are to be thoroughly mixed when dry, with clean water then added through a rose. Mortar is to be mixed in small quantities and are to be used within one hour after mixing. Mortar boards and platforms are to be cleaned off daily; left-over mortar are to be discarded.

I No mortar which has taken its initial set will be allowed for bricklaying purposes.

BRICKLAYER (Cont'd)

Walling Generally

A Construct brick walls to the required thicknesses and in standard bricks as shown on the Drawings and leave surfaces ready for plastering or rendering. Build in cramps, frames and precast units as necessary. If bricks to the specified thicknesses are not available, the Contractor shall make up to the specified thickness with cement and sand (1:3) at his own expense.

B All bricks shall be soaked in water for at least half an hour immediately before being laid and the tops of walls left off shall be well wetted before work is re-commenced. All bricks shall be well buttered before being laid and all joints shall be thoroughly flushed up as the work proceeds.

C Brickwork shall be protected from the sun's rays during the day on which it is laid and also during the following day by covering with gunny bags and/or kajangs and any other means to ensure that this is done.

D All brickwork, except half brick walls and where required by bond shall be in English bond. Half bricks walls shall be in stretcher bond. All shall be built in level courses, no four courses to rise more than 25mm in addition to the height of bricks laid dry.

E Brickwork shall be carried out in a uniform manner, no one portion being raised at one time than 1.2 metre above adjoining parts while being built and the working junctions to be raked backed and not toothed up. All variations in level are to be evenly stepped. Bats are to be used only for bond, and all perpends, quoins, etc. shall be kept strictly true and vertical.

F All joints of brickwork to receive plaster or rendering shall be raked out to a depth of 12mm as the work proceeds.

G Cavities in cavity walls are to be kept clean by whatever means necessary. Cavities below ground level shall be filled with mortar or lean concrete as directed by the S.O., with the top sloping outwards.

Fair Face Brickwork

H Where brickwork is described as fair faced, these shall be constructed of selected common bricks which are of regular sizes, evenly burnt, with perfect arrises and true faces where exposed. All selected bricks shall be, as far as possible, of an even colour. Fair faced brickwork shall be kept clean and rubbing or staining will not be permitted. Scaffold boards shall be turned back during heavy rain and at night to ensure this.

Pointing to Faced and Fair Faced Brickwork

I All joints in faced and fair faced brickwork shall be raked out as the work proceeds and pointed with a neat flush joint in cement and sand mortar (1:3) unless otherwise described

Brick Reinforcement

J Provide brick reinforcement to all half brick walls and lesser. The course shall be 82mm wide x 22 gauge approved expanded metal built into every fourth course, and complying with the recommendations of the manufacturer. The reinforcement is to be lapped 150mm at all joinings, and carried through the full thickness of the end walls at corners and junctions.

K The bottom-most reinforcement shall be at least 150mm above floor or foundation level

BRICKLAYER (Cont'd)

Damp Proof Course

A Damp proof course shall be of the hessian-based lead foil type and shall comply with the requirements of B.S. 743, Type 5D (weighing not less than 3.8 Kg./m2). It shall have 225mm minimum laps at joints and 100mm laps at angles and shall be laid on 25mm bed of cement mortar (1:1) and coated on the upper surface with hot bitumen.

Openings for Doors, Windows, etc.

B Openings for doors, windows, etc. are be properly marked out and left unbuilt until the frames have been fixed in position.

Building in Cramps, Bonding Ties, etc.

C Provide where brickwork or blockwork abuts concrete column 6mm diameter mild steel bonding ties 450mm girth, hooked both ends, one end cast into concrete column and other end built into brickwork or blockwork at every fourth course.

D Build in mild steel fixing cramps of the type and size described or shown on Drawings for doors and window frames. The cramp shall be bent one end, drilled and screwed to back of frame and the other end fanged and built into brickwork at 600mm centres.

E Build in and bed in mortar all plates, templates and frames. Rake out joints to receive flashings and weathering and point up upon completion.

Chases, etc

F Form all necessary holes, chases and cutting away for all services and make good on completion. Chases are to be formed to the least depth possible. On no account are structural concrete members to be cut or hacked without the prior approval of the S.O.

G Chases in concrete hollow block walls shall be avoided or minimised to avoid impairment to the stability of the wall.

DRAINLAYER

Codes of Practice

A Drainage works shall comply with the requirements of B.S 8301 Building Drainage, subject to any qualification given below

Drainage Work Generall

B All drainage work shall be executed by a Licensed firm and shall comply with the requirements of the Local Authorities Bye-Laws. The Contractor shall execute the Works strictly in accordance with the approved plans, and shall arrange for the necessary formalities to be complied with.

C Execute all drainage works with the materials specified or shown on the Drawings.

Cement and Aggregate

D The cement and aggregate shall be as previously described in "Concretor".

Sand Bricks

E The sand and bricks shall be as previously described in "Bricklayer".

Trenches Generall

F Excavations for pipe trenches shall be to straight lines and gradients required for the pipes and beds. Trenches shall be to the minimum practicable width but shall not be less than 450mm or 1-1/2 times pipe diameter plus 250mm whichever is the greater. Excavate by open cut method unless otherwise approved. The ground receiving beds shall be carefully graded prior to laying of the pipes. Fill in trenches carefully to avoid damaging pipes and remove and deposit surplus excavated material, keep excavations free from water and construct all necessary planking and strutting.

G In the event of the excavations being carried down deeper than the required depths, they shall be filled to the proper level with concrete specified for pipe beds at the Contractor's expense.

H Trenches shall be left open for the inspection of the S.O. and the Local Authority's inspector and shall not be covered up until the drains have been properly tested and approved.

Buried Services

I During the course of excavations, should the Contractor's workmen uncover any cables, ducts, pipe mains, etc.,work shall be stopped immediately and shall not again be started until the matter has been reported to the S.O., who will issue whatever instructions he deems appropriate.

J All pipes, ducts, cables, mains and other services exposed during excavations shall be effectively supported and the Contractor shall take all necessary precautions to prevent any damage thereto all damage shall be made good at the Contractor's expense

Stormwater Drains

K Form all stormwater drainage channels to the type, size, alignment and grade shown on the Drawings. The absolute minimum grade is 1 in 400

L Unless otherwise shown on the Drawings, precast concrete channels shall be cast in concrete grade C20P and shall be dense, homogeneous channels with clean true edges and surfaces. The drain channels shall be reinforced with fabric reinforcement as shown on the Drawings or as required

DRAINLAYER (Cont'd)

Stormwater Drains (Cont'd)

A Channels shall, unless otherwise stipulated, be bedded on concrete grade C15P base of required thickness. All joints (6mm maximum) shall be grouted and pointed in cement mortar (1:3). Where channels join main drains, set the channels on 150mm thick bed of concrete grade C15P. On made-up ground or steep slopes, set the channels on 100mm thick bed of concrete grade C 1 5P.

B Backfill concrete drain sides with selected excavated material, well compacted to desired formation. Backfilling shall only be carried out after work has been inspected and approved.

Drain Covers and Gratings

C Provide mild steel gratings and precast reinforced concrete grade C20P covers to drains, to details as shown on Drawings, and at areas where required.

Clayware Field Drain Pipes and Fittings

D All clayware fields drain pipes and fittings shall comply with the requirements of B.S. 1196 1971.

Vitrified Clay Pipes

E Vitrified clay pipes and fittings for soil and surface water drains shall comply with the requirements of B.S. 65.

Salt Glazed Stoneware Pipes and Fittings

F Salt glazed stoneware drain pipes and fittings shall comply with B.S. No. 65 "British Standard tested" quality. They shall be well glazed and impervious and free from fire cracks and other defects. Joints shall be made with tarred gaskin caulked home so as not to occupy more than one quarter of the socket depth. The socket shall then be completely filled with cement mortar (1:1) and a 45 degree fillet formed around the joint with a trowel. Care must be taken to ensure that all excess mortar is cleaned off whilst each joint is made and the inside of the pipe cleaned out to leave a clear and unobstructed waterway.

Asbestos-Cement Pipes and Fittincis

G Asbestos-cement pipes and fittings shall be Class "B" range complying with the requirements of B.S. 3656.

Cast Iron Pipe and Fittings

H Cast iron drain pipes laid underground shall be coated spigot and socket type of approved manufacture and complying with B.S. 437. Cast iron drain fittings shall comply with B.S. 78. Joints shall be made with a gasket of hemp or yarn and molten lead well caulked home. The inside of each pipe shall be carefully cleaned out after jointing to leave a clear and unobstructed waterway.

Test Certificates

I Each batch of pipes supplied shall be accompanied by the manufacturer's test certificate certifying compliance with the tests specified in the relevant British Standards. in the absence of such certificates, the Contractor shall, whenever required by the S.O., arrange for and carry out at his own expense all the appropriate tests on samples from each batch to confirm that the pipes supplied complies with the requirements of this Specification and B.S. Should pipes supplied fail the tests, the whole batch from which sample was taken will be rejected and the Contractor shall obtain supply from a new source at his own expense. No pipe shall be used in the Works without the prior approval of the S.O.

DRAINLAYER (Cont'd)

Pipelaying, etc.

A All pipes, specials, etc. shall be carefully examined for damage prior to fixing or laying and prior to connecting and backfilling.

B Pipes shall be laid in straight lines and to even gradients, and each pipe shall be properly boned in. Pipes shall be laid with the sockets leading uphill and shall rest on solid and even foundations for the full length of the barrel. Socket holes shall be formed in the foundation as short as practicable but sufficiently deep to allow the drainlayer room to work right round the pipes. No pipe shall be laid until the trench has been inspected and approved by the S.O.

C All gullies, outlets and connections must be laid in position and at the correct levels in accordance with the Drawings before laying pipes or forming foundations.

D The Contractor shall set out the work in accordance with the Drawings and as directed by the S.O. on site and shall provide all materials including pegs and sight rails, boning rods, etc. The pipes shall be laid to lines and levels as shown on the Drawings and as directed by the S.O. Gradients shall be smooth and even and set out and checked by the use of sight rails and boning rods. Where the route in plan is shown as a curve (without the use of special bends) the line will follow a smooth curve obtained by equally off-setting (i.e. crimping) a number of joints throughout the curve. In no case must crimps exceed 2 degrees on any one joint.

E Where pipes are laid on earth formation, the trench shall be widened and deepened sufficiently at the joints to allow the joints to be properly laid and such that the barrel or pipe bears evenly over its full length on solid ground.

F Where pipes are laid on rock formation, the trench shall be excavated 150mm deeper and made up to required bed level with 150mm of properly consolidated selected material or concrete grade C15P. Care shall be taken to ensure that no part of the pipe shall rest on any projecting pieces of rock.

G All pipes, specials, etc. shall be carefully examined for damage prior to fixing or laying and shall be thoroughly cleaned before being used. The interior of the pipes shall be kept clean throughout the works and where necessary shall be cleaned by drawing through with properly fitted mops. Wherever work is suspended the ends of the pipe mains shall be closed with drumheads or plugs.

H All joints shall be made according to the manufacturer's instructions or as directed by the S.O. Written instructions as to the method of jointing may be obtained from the S.O.

I All flange joints and socket joints shall be painted with two coats of bituminous paint. Where possible joints should be moulded or painted on the same day as they are made i e. as pipelaying proceeds. Joints shall be perfectly clean and dry before moulding or painting.

Concrete for Pipe Bedding, Haunching and Surround

J All drain and pipes shall be bedded on concrete grade C1 5P unless otherwise specified. They shall also be provided with concrete surrounds and haunchings over the lengths and at the locations indicated

K Cement, sand and coarse aggregate for the concrete shall be of the respective types and quality specified under "Concretor"

L Concrete for the bedding, haunching and surround to pipes shall be well rammed or vibrated and worked under and around the pipes

M The pipes shall be laid evenly on the barrel at the required level. There shall be no hollows, voids or foreign material under the pipe. No concrete blocks or wedges shall be used. The bedding shall be completed to the correct profile as shown on the Drawing. Care shall be taken to ensure proper bedding at and on either side of the pipe joints after completion of testing.

DRAINLAYER (Cont'd)

Concrete for Pipe Bedding, Haunching and Surround (Cont'd)

A No concrete shall be placed under or around the pipes until the pipe joints have been inspected and approved by the S.O.

B Concrete shall be placed right up against the trench excavation, where the trench excavation has been carried out to a greater width than the required section or approved width, the Contractor shall provide the additional concrete at his own expense.

Cutting Pipes

C All cutting of pipes required for bends, junctions and connection to chambers, etc. shall be carried out by an approved type of wheel cutter such that a true, straight edge is obtained. Cutting of small diameter concrete or stoneware pipes with a hammer and chisel shall only be carried out by a competent drainlayer.

Backfilling of Pipe Trenches

D When the drainage system has been tested and approved by the S.O., the Contractor shall make good any faults in materials or workmanship. After final approval by the S.O., the Contractor shall carefully fill in and ram all excavations for the drains/pipes with good clean earth and level the ground to the required level and profile as shown in the Drawings or directed by the S.O.

E The backfilling of the pipe trenches shall follow the installation and testing of the pipes as closely as possible. Before the pipes have been tested, only sufficient backfilling or the trenches to prevent snaking of the pipes during tests shall be permitted and all joints shall be left exposed to provide inspection for leakage.

F The greatest care shall be taken during backfilling to ensure:

(a) A good bed for the pipe by tamping selected material to at least 300mm thick over the crown of the pipe where no concrete bedding or surround is provided.

(b) Thorough compaction of backfill. The selected backfill shall be good earth, free from stones or other hard materials, at or about optimum moisture content.

G The initial backfill shall be carefully spread along the trench bottom between the pipes and the trench walls to a depth of about 150mm and shall be hand tamped. Similar 150mm layers are to be spread and tamped until a height of 300mm is reached over the top of the pipe.

H The material for the remainder of the backfilling need not be as carefully selected as the initial backfilling material but it shall be reasonably free from stones of hard materials and shall not be too wet or too dry. It shall be placed in 300mm layers and be thoroughly compacted, employing approved mechanical tampers.

Painting

I Upon completion, all pipework, fittings etc., in chambers or exposed positions shall unless otherwise specified by wire brushed clean, primed and painted with three coats of an approved bituminous paint.

Sewer Manholes and Inspection Chambers

J Manholes and inspection chambers shall be constructed to the dimensions, depths and details as shown on the Drawings or as required on site.

K All manholes shall unless otherwise specified be constructed of brickwork bonded in 1:3 cement (ordinary Portland) mortar and rendered internally with a 20mm thick layer of 1:2 sulphate-resisting cement-sand mortar. The sulphate-resisting Portland cement shall comply with B S. 4027.

DRAINLAYER (Cont'd)

Sewer Manholes and Inspection Chambers (Cont'd)

A All bricks shall comply with B.S 3921 and shall be hard well-burnt, machine made, pressed bricks from an approved kiln and to the satisfaction of the S.O.

B Half brick wall shall be in stretcher bond with every fourth course reinforced with "Exmet" or other approved brick reinforcement.

C All bricks shall be thoroughly soaked in water before use and the tops of walls left off shall bewetted before commencing work. All joints shall be raked out to provide key for rendering as specified

D Concrete base slab where indicated in the Drawings shall be made of concrete grade C20P using ordinary Portland cement complying with B.S. 12.

E Channels shall be benched up to the soffit levels of sewers with similar concrete and the top of the benching finished smooth to slope upwards from the edge of the channel to the chamber walls at a gradient of approximately 25mm to 300mm, the benching being floated to a smooth, hard surface with a 20mm thick coat of 1:2 sulphate-resisting Portland cement-sand mortar.

F Manhole covers and frame shall comply to B.S. 497. They shall be either Grade A, Grade B or Grade C (light duty) quality depending on their function and duty and shall be installed at the locations shown in the Drawings. Clear opening dimensions shown on the Drawings or described in the Bills of Quantities are indicative only. The Contractor shall ensure that the manhole covers shall fit properly into openings in manholes.

G Unless otherwise specified, Grade A covers and frames shall be used in carriageways carrying relatively fast-moving commercial vehicles and shall incorporate a permanent non rock design feature Grade B covers and frames shall be installed in carriageways carrying relatively slow-moving commercial vehicles Grade C covers and frames shall be installed in areas inaccessible to motor vehicles.

H To facilitate removal of the covers, the seating of all covers shall be liberally greased after casting of the frames in the concrete manholes.

I All step irons shall be heavily galvanised malleable iron castings complying with B.S. 1247. Unless otherwise shown on the Drawings, general purpose pattern step irons with 118mm tails shall be used in the walls one brick thick or more and rounded bar pattern step irons shall be used in half brick walls.

J All bases, benchings and concrete surround to chamber rings shall be constructed of concrete grade C20P using sulphate-resisting Portland cement complying with B.S. 4027.

K All precast concrete slabs, chamber rings, shaft rings and tapers shall be constructed with concrete grade C20P using sulphate-resisting Portland cement. Their inner surface shall be lined with a 20mm thick coat of 1:2 sulphate-resisting Portland cement-sand mortar.

L On completion of the works, the Contractor shall thoroughly clean and wash out all the pipelines, manholes, chambers, etc. of sand, silt and other debris. After cleaning, the pipelines and other components of the sewerage system shall be inspected by the S.O. Only after the whole works have been certified satisfactory by the S.O. following the inspection shall the sewers be put into use. Any defects found during the inspection shall be rectified and made good by the Contractor at no additional cost to the satisfaction of the S.O

DRAINLAYER (Cont'd)

Cast Iron Gully Trap

A The cast iron gully shall be made from a mixture of cast iron scrap and a suitable grade of pig iron. It shall be free from airholes and sandholes, neatly dressed and carefully fettled. All castings shall be free from voids whether due to shrinkage, gas inclusion or other causes. The finished product shall be supplied with a coat of black bituminous composition. The spigot and socket end of the gully shall comply with B.S. 78. The aluminium strainer shall be of aluminium alloy HE 30 TF conforming with B.S. 1474 or similar approved alloy. Minimum thickness of the cast iron gully trap shall be 12mm.

Cast Iron Grease Intercepto

B The cast iron grease interceptor shall be cast from a mixture of cast iron scrap and a suitable grade of pig iron. It shall be free from airholes and sandholes, neatly dressed and carefully fettled. All castings shall be free from voids whether due to shrinkage, gas inclusion or other causes. The finished product shall be supplied with a coat of black bituminous composition. The spigot and socket end of the grease interceptor shall comply with the B.S. 78. The aluminium strainer shall be of aluminium alloy HE 30 WIP conforming to B.S.1474 or similar approved alloy. Minimum thickness of the cast iron grease interceptor shall be 12mm.

Testing

C The whole of the drainage work shall be tested when laid and at the completion of the Contract, in the presence of, and to the entire satisfaction of the S.O. and Local Authority and shall be retested, if necessary, until passed. The Contractor shall provide all necessary equipment required for carrying all such tests.

D All sewer pipelines must be tested for watertightness in accordance with C.P. 2005: 1968(Sewerage)

E Any pipes found to be leaking or "sweating" excessively, or out of line or obstructed shall be cut and replaced and all joints properly carried out, all to the entire satisfaction of the S.O , and at the expense of the Contractor.

F The method of testing shall be generally as laid down in the following Clause on "Water Test".

G The tests shall be repeated as often as necessary until the whole length under tests satisfies the test requirements, and the whole Drainage System is approved by the S.O.

Water Test

H The water test shall be carried out as follows

i) All openings below the top section shall be hermitically sealed and, if considered necessary by the S.O., to an additional height as ordered.

ii) The system shall be filled with water to the highest point.

iii) The water level shall be maintained by the system at its filled heights for a period of fifteen (15) minutes by the addition of water.

iv) The quantity of water added to maintain the water level must not exceed 13 litres for every fifty (50) joints, proportionately more or less for a lesser or greater number of joints.

v) Every joint shall be carefully examined for leaks while the system is filled with water.

I All gravity pipelines and sewers of 525mm diameter or lesser shall be tested by the above method

DRAINLAYER (Cont'd)

Testing of Manholes

A Manholes shall be tested for watertightness by filling them completely with water and observing for subsidence. It will be necessary to fill the downstream length of drain in order that the drain plug may be removed upon completion of the test.

Commissioning of Sewer Pipelines and Manholes

B On completion of the works, clean and wash out all pipelines, manholes, chambers, etc of sand, silt and other debris

C Upon satisfactory testing and inspection by the S.O and Local Authorities, the sewerage system shall be commissioned and put into use

PAVIOR

In-Situ Pavings and Screeds Generall

A All pavings and screeds shall, where possible be laid before the initial set has taken place on freshly laid concrete.

B The water content of the mix **must** be only the minimum required to give a workable mix. The paving must be thoroughly rammed within 30 minutes of laying and the surface trowelling must be delayed until the paving is stiffened sufficiently to prevent laitance being brought to the surface by the trowels. The paving shall be rubbed down, if necessary, to produce a smooth even surface.

C The concrete sub-floor shall be brushed with a stiff broom to remove laitance and to give a roughened surface or alternatively, shall be hacked at the Contractor's expense to provide a suitable key. Walls shall be similarly keyed if required.

D Pavings and screeds shall be laid monolithic with the concrete sub-base whilst it is still green and trowelled smooth.

E Pavings and screeds shall be laid in alternate bays, unless otherwise directed by the S.O. If the concrete sub-floor has been laid in bays, then the joints of the paving must occur exactly above the joints of the sub-floor.

F The thicknesses of pavings and screeds as specified are deemed to be nett finished thickness and the Contractor is to allow for filling up depressions, indentations, making good uneven surfaces, etc. to a level surface.

G Where pavings and screeds are laid to falls and/or currents, at no place should the minimum thickness be less than 12mm.

H All pavings and screeds shall be cured for at least 7 days. During this period, the pavings shall be kept damp by covering with 25mm thick layer of wet sand or gunny sack and shall be kept free from traffic.

I Protect all pavings and screeds from any contamination that could weaken the bond of applied finishing layers. Traffic shall not be permitted over screeds receiving direct applications of their finishings. Protect with temporary covers, where necessary.

Cement and Sand Pavings and Screeds

J The cement shall be as previously described in "Concretor".

K The sand shall comply in all respects with B.S. 1199 and shall be well graded from 5mm in accordance with Table 1 therein.

L The water shall be as previously described in "Concretor".

A Unless otherwise stated, the cement and sand pavings and screeds shall compose of one part of cement and three parts of clean washed sand measured in proper gauged boxed and mixed on a properly boarded watertight platform.

B Cement pavings shall be laid to the thickness described or shown on the Drawings. Pavings shall be finished to a perfectly smooth, trowelled and even surface. Pavings shall be finished to falls as required.

C Screeds of thickness 40mm and below shall be carried out in one layer. Over 40mm thick, screeds shall be carried out in two layers; with the lower layer thicker than the upper layer, but neither shall be less than 20mm thick. The upper layer shall be placed as soon as the lower layer has been compacted.

D Form skirtings and upstands projecting 20mm from the wall to the length described or shown on the drawings with a rounded top and small radius cove junction with the flooring. Skirting and upstands shall thoroughly bond to the floor layer.

PAVIOR (Cont'd)

Cement and Sand Pavings and Screeds (Cont'd)

A Where cement and sand paving and screed are described as "waterproofed", an approved integral waterproofing agent like "Aquapel 3 cc" or equivalent shall be added. All additives shall be applied strictly in accordance with the manufacturer's instruction.

Granolithic Paving

B Granolithic paving shall be laid to the thickness specified or shown on the Drawings.

C Granolithic paving shall compose of 2 parts cement, one part or clean washed sand and 5 parts of granite chippings. The granite chippings should be able to pass a 6mm sieve and retained by a 3mm sieve; the chippings shall be thoroughly washed and free from dust. The composition of the granolithic paving may be varied only with the express approval of the S.O.

D Pavings shall be finished to a perfectly smooth, trowelled and even surface, or finished to falls as required.

E Skirtings shall be formed as for cement and sand paving.

Floor Hardeners

F Provide proprietary floor hardener system as described or shown on the Drawings. The floor hardener system shall be applied strictly in accordance with the manufacturer's recommendations.

G The treated surface shall be mechanically trowelled or power floated to the desired finished texture.

H Delivery, storage and use of materials shall comply strictly with the manufacturer's recommendations.

In-Situ Terrazzo

I Terrazzo work shall be undertaken by a Specialist skilled in executing such works.

J In-Situ terrazzo shall compose of one part approved coloured cement and three parts selected limestone or marble chippings. The chippings should pass through a 12mm sieve and be retained by a 3mm sieve. Screeded beds or backings to received in-situ terrazzo shall be cement and sand (1:3)

K The cement and chippings shall be thoroughly dry mixed before adding water. Keep water and cement ratio constant and the minimum consistent with thorough compaction.

L The Contractor would be required to make on site a sample of terrazzo work. The sample shall demonstrate specified thicknesses of backing and polished facing by means of a typical example of floor panel with dividing strip and integral skirting. The sample once approved shall establish the precise mix ratio of materials and shall set the minimum standards to be obtained throughout the Works.

M Terrazzo topping shall be laid whilst the screed is still green. Thoroughly compact every layer without bringing laitance to the surface. The terrazzo shall be trowelled to a dense even surface.

N Form bays or panels in screed using aluminium or brass dividing strips securely fixed into the screed. Each panel shall not exceed 4 sq. metres with top edges of the dividing strips extending sufficiently high to finish flush with the finished terrazzo topping.

PAVIOR (Cont'd)

Floor Tiling Generally

A Floor tiling works shall comply with the requirements of C.P. 202, subject to any qualifications given below

B The whole of the floor tiling shall be executed by an approved Tiling Specialist Contractor

C Before any tiling or paving work is commenced, the Contractor shall submit to the S.O for approval the names of the specialist tilers they are proposing to employ on the Works.

D Samples of all materials are to be submitted for approval. All samples which are approved shall indicate the minimum standard to be maintained throughout the whole Works.

E Tiles shall be regular machine made, even and consistent in size, colour and texture, with sharp well defined arrises, free from cracks, chips and blemishes and shall be obtained from an approved manufacturer.

F All tiles shall be properly set out, prior to laying, to ensure that the joints are regular and continuous, and to minimise unsightly cutting Tiling shall be carried out such that joint locations and flooring patterns meet with approval.

G All tiling work shall be laid to approved patterns. The Contractor shall agree patterns, joint patterns and locations with the S.O. before commencing on the works.

H All damaged or discoloured tiles or tiling works badly laid with surface imperfections and irregularities shall be hacked out on the instruction of the S.O. and replaced all at the Contractor's own expense.

I No tiles shall be laid until the base surface is completely dry, clean and free of loose material such as to provide a good keyed surface to received the tiling.

J The screeded surface to receive the tiles shall be finished with a steel float and must be absolutely level.

K Where tiles are described as laid to falls, the necessary gradients shall be formed on the cement and sand screeded beds.

L The finished tiling are to be cleaned and polished to the complete satisfaction of the S.O.

M Provide a layer of sawdust or other approved protective covering over newly completed tiled floors and maintain and renew as necessary, and clear away on completion and clean, polish and leave floor in perfect condition.

Mosaic Floor Tiling

N Mosaic floor tiles shall be first quality vitreous fully glazed or semi-glazed tiles and shall be in selected size, colours and manufacture as described or shown on the Drawings

O Tiles shall be bedded, jointed and pointed in cement and sand mortar (1:3) and laid to approved patterns to the total thickness described or shown on the Drawings.

P After laying of tiles, dampen joints and fill with neat tinted cement grout spread over the floor, and clean off on completion. All surplus grout shall be properly cleaned off.

Q Skirting shall match pavings with square top edges and 45 degree angle tiles at junctions with pavings

R Execute all required cuttings, angles, stopped ends, fair returned ends, etc on tiling where required

PAVIOR (Cont'd)

Mosaic Floor Tiling(Cont'd)

A Risers shall have rounded top edge formed with cove tiles and 45 degree angle tiles at junctions with pavings.

B Clean off all dirt, stains, etc. make good and/or replace all damaged and defective tiles and polish with hydrochloric acid to an approved finish.

Ceramic Floor Tiles

C Ceramic floor tiles shall be fully glazed floor tiles of the selected type and manufacture as described or shown on the Drawings. Tiles shall be of selected sizes, colours and patterns. The colour of the tiles shall be selected by the S.O. prior to ordering and laying. The tiles shall be true to shape, flat and free from any flaws.

D Ceramic tiles shall be laid to approved patterns to the total thickness described or as shown on the Drawings, and bedded, jointed and pointed in cement and sand mortar (1:3) on screeded beds and backings.

E After laying of tiles, dampen joints and fill with neat tinted cement grout spread over the floor, and clean off on completion. All surplus grout shall be immediately wiped off.

F Matching skirting tiles shall be provided at all junctions between floor and wall tiling. All angles to skirtings shall be neatly cut to fit to all abutments.

G Upon completion, the tiled floors are to be scrubbed with water to remove all slurry, dirt, stains, etc. and polished to final desired surface finish. All damaged, defective, stained or discoloured floor tiles shall be hacked out and replaced at the Contractor's own expense.

H After final polishing, the whole floor is to be washed with hot water and pure soft soap and waxed strictly in accordance with the manufacturer's instructions.

Homogeneous Floor Tiles

I Homogeneous floor tiles shall be the selected type and quality, and of approved manufacture, as described or shown on the Drawings. Tiles shall be of selected sizes, colours, texture and patterns.The colour and texture of the tiles shall be agreed by the S.O. prior to ordering and commencement of work.

J Homogeneous floor tiles shall be laid to approved patterns to the total thickness described or shown on the Drawings, and bedded and jointed on cement and sand screeded beds and backings using approved tile adhesive. Laying patterns shall be agreed with the S.O. prior to commencement of work.

K Tile adhesive shall be of approved type, compatible for use with the selected tiles.

L After laying, the tiling shall be pointed and grouted using approved proprietary grout materials.

M All laying and grouting using proprietary systems shall be carried out strictly in accordance withthe manufacturer's instructions.

N Matching tile skirtings shall be provided at all junctions between wall and floor finishes.

O Upon completion, the tiled floors are to be scrubbed with water to remove all slurry, dirt, stains,etc. All damaged, defective, stained or discoloured floor tiles shall be hacked out and replaced at the Contractor's own expense.

P Protect floors as earlier specified.

PAVIOR (Cont'd)

Terrazzo Tiles

A Terrazzo tiles shall be of selected sizes, patterns and colours. All tiles shall be composed of 6mm limestone or marble chippings and tinted white cement, and shall be obtained from a source approved by the S.O.

B Tiles shall be laid to approved patterns and bedded and jointed in cement and sand mortar (1:3) and pointed in tinted cement to match tiles.

C Clean off all dirt, stains, etc. Defects in tiles shall be made good with suitable tinted cement grout. All damaged and discoloured tiles shall be replaced.

D Polishing is to be carried out by a mechanical polisher with graded abrasives and any necessary water and oxalic acid to an approved finish.

E All internal angles and coves shall be rubbed by hand with carborundurn blocks to a polished finish.

F Form in-situ terrazzo skirting to the height and profile required and projecting 20mm from the wall face with a rounded top edge and coved at base. In-situ terrazzo skirting shall compose of three parts selected local limestone chippings and 2 parts tinted or white cement trowelled on to give a dense and even surface. Rub down on completion to a smooth finished surface, free from holes and blemishes and including polishing with oxalic acid to an approved finish and wax polish on completion.

Quarry Floor Tiles

G Quarry tiles shall generally conform to the requirements of B.S. 1286. The tiles shall be of the size, quality, patterns and colours described or shown on the Drawings, and shall be obtained from an approved source.

H The tiles shall be laid to approved patterns and bedded and jointed in cement and sand mortar (1:3) to the total thicknesses described or shown on the Drawings. After laying, the tiled floor shall be pointed and grouted with tinted cement to match.

I After laying, the tiles are to be scrubbed with water to remove slurry, dirt, stains, etc. and polished to desired surface finish. After final polishing, the whole floor is to be washed with hot water and soap waxed strictly in accordance to the manufacturer's instructions. All damaged, defective stained or discoloured floor tiles.

J Form quarry tile skirting to heights described and projecting 20mm from the wall face with a rounded top and small radius cove junction with flooring.

Vinyl Tiles/Sheets

K Vinyl tiles or sheets are to be of approved type, pattern and colour as described or shown onthe Drawings. The colour and pattern shall be selected by the S.O. prior to commencing work.

L The tiles shall generally be 300 x 300mm, and of the thicknesses specified for the various locations. Unless otherwise specified, sheets shall be 2mm thick.

M Vinyl tiles and sheets shall be laid to a seamless finish with an approved acrylic emulsion adhesive on cement and sand (1:3) screeded beds and backings to the total thicknesses described or shown on the Drawings. Roll over all laid vinyl sheets with a 50 kg roller. Cut and fit tiles and sheets to corners and junctions.

N The screeded beds is to be absolutely level, smooth, dry and free of dust, foreign matter, paint, oil or grease, etc. before laying of the tiles or sheets. Any cracks, breaks or irregularities must be levelled with concrete or packing compound. Laying shall be carried out strictly in accordance with the manufacturer's installation specifications.

PAVIOR (Cont'd)

A After laying, wash and scrub flooring to remove all slurry, adhesives, stains, dirt, etc. and leave an even and perfectly level surface. Ensure all joints are truly flush and polish as recommended by the manufacturer.

Carpet Broadlooms

B All carpet broadlooms shall be of approved type, quality and composition as described or shown on the Drawings and shall be of selected patterns and colours. Carpet shall be laid in accordance with the manufacturer's instructions on cement and sand (1:3) screeded beds and backings. The beds and backings shall be absolutely clean and level before the carpet are laid.

C The Contractor shall submit samples and name of the manufacturer or supplier to the S.O. prior to ordering or commencing on the Work. Full descriptive literature on the carpet to be supplied shall be given as follows:

(i) Brand Name:
(ii) Pile Fibre:
(iii) Pile Weight:
(iv) Pile Height:
(v) Pile Construction:
(vi) Total Weight:
(vii) Yarn Brand:
(viii) Manufacturing Process:
(ix) Primary Backing:
(x) Secondary Backing:

D All carpet shall be laid with close butt joints with underlay, stretched and balanced so that all seams are parallel with minimum bows with suitable rustproof metal gripper strips securely installed. The carpet shall be installed in largest practical pieces and selvage shall be trimmed as required to assure colour uniformity and pattern match at seams. Alternatively, carpet may be laid, without underlay, directly onto the screeded beds with proprietary adhesives.

E All carpet shall have its edges trimmed and neatly fitted around all perimeters, openings and obstructions.

F Carpet tiles shall be of approved type, quality, composition, pattern, colours and sizes described or shown on the Drawings.

G Carpet tiles shall conform to the following specifications:

(i) Pile Yarn : 100% Nylon

(ii) Yarn Brand : Zeltron, Dupont Antron or equivalent

(iii) Backing : Thermoplastic

H The pile weight, height, construction and total thickness shall be as described or shown on the Drawings.

I The Contractor may offer alternatives based on his own specifications, and in such cases full descriptive literature of the proposed carpet tiles shall be submitted for approval.

J Carpet tiles shall be laid to the patterns selected and agreed by the S.O.

PAVIOR (Cont'd)

Wood Parquet Block Flooring

A The whole of the Wood Parquet Block Flooring shall be executed by an approved Parquet Floor Contractor.

B Parquet blocks shall generally be 10mm thick kiln-dried Kempas, butt jointed timber blocks, unless otherwise described or shown on the Drawings.

C Samples of blocks shall be submitted to the S.O. for approval. All samples, once approved, shall indicate the minimum standard to be maintained throughout the whole Works.

D Blocks shall be regular machine made, even and consistent in size with sharp well defined arrises, matching colour, texture and grain, free from splits, chips and blemishes.

E No blocks shall be laid until the base surface is completely dry, clean and free of loose material to provide a good keyed surface to receive the block flooring. The screeded surface to receive the blocks shall be finished with a steel float and must be absolutely level.

F A thick bed of sawdust or other approved protective covering shall be evenly spread over all areas of newly laid block flooring. Maintain and clear away at completion and leave floors in perfect condition.

G Blocks shall be laid to an approved pattern with an approved waterproof adhesive in accordance to the manufacturer's instructions.

H Setting of blocks shall be carried out in such manner to ensure that all joints are regular and continuous.

I Polishing is to be carried out by a mechanical polisher. All defects, blemishes, etc. shall be made good with an approved filler. All damaged, stained or discoloured blocks shall be replaced.

J Clean off all dust, dirt, stain, etc. prior to dressing floor with an approved floor dressing. Gaps are to be sealed with an approved sealer.

K Unless otherwise stated, all wood parquet block flooring shall be dressed with three coats of approved floor dressing applied strictly in accordance with the manufacturer's instruction.

L Provide wrot timber skirtings of sizes and profiles described or shown on the Drawings edge and fixed on and including sawn timber grounds. Timber skirting shall be neatly butt jointed and painted to match the colour of the wood parquet block flooring.

Non-Slip Nosing Tiles

M Provide approved non-slip nosing tiles to match general tiling at edge of thresholds and treads.

N Nosing tiles shall be of the size, type and quality described or shown on the Drawings.

O The nosing tiles shall be of selected colours, laid lengthwise and bedded, jointed and pointed in cement mortar (1:3)

Dividing Strips

P Provide brass or aluminium dividing strips of sizes as described in the Bills or shown on the Drawings. Dividing strips shall be provided at junction of different floor finishes. The dividing strips shall be set vertically and finished flush with the flooring.

ROOFER

Cement and Sand

A Cement and sand shall be as previously described under "Concretor"

Waterproof Cement and Sand Rendering

B Provide cement and sand (1:3) rendering waterproofed with approved waterproofing admixture, mixed strictly in accordance with the manufacturer's instructions, to all concrete flat roofs and gutters. The rendering shall be applied to the required thicknesses and finished to required falls and gradients.

C All surfaces to be rendered are to be brushed clean and well wetted before the rendering is applied. The rendering shall be kept damp and adequately cured to prevent shrinkage and cracking. Mortar for rendering shall be mixed mechanically or by hand as directed by the S.O. and the Contractor is to make allowance for the use of additional cement necessitated by the method of mixing instructed. Only whole bags of cement are to be used in any one batch of mix.

Insulation Screed

D Insulation screeds shall be of approved proprietary system and laid to the overall thicknesses specified or shown on the Drawings.

E The insulation screed shall be hand or machine mixed and applied directly on the concrete sub-base, and then trowelled to a smooth dense surface. Application shall comply strictly with the manufacturer's instructions.

F The insulation screed must be allowed to dry for a minimum of 3 days before the waterproofing membrane is applied.

Waterproofing to Concrete Roofs

G All concrete surfaces to receive waterproofing, whether flexible sheet materials and brush or spray-applied coatings shall be finished smooth preferably to wood float finish. Surfaces to be dry and clean, free from oil, and swept to remove dust and loose stones. Ensure that all pipe or pipe sleeves are formed and ready for waterproofing. All surfaces must be primed before applying the waterproofing membrane. Apply primers and full coats by brush unless otherwise specified.

H Waterproofing shall be the proprietary system described or shown on the Drawings. Application shall be carried out by approved specialist applicators, strictly in accordance with the manufacturer's specifications.

I The membrane shall be turned up at the kerbs and parapets and turned into a sealing chase and pointed with sealant or mastic.

J Provide membrane collars, sleeves, etc. at areas where pipes, conduits, etc. are found, and properly seal and ensure watertightness to manufacturer's details.

K Protect sheet and liquid membranes until covered by subsequent construction or handing over.

L The Contractor shall, jointly with the manufacturer, provide a Standard Waterproofing Guarantee for a minimum ten years against failure of any kind, viz. leaks, etc. on the stipulated terms and conditions. A sample of the Standard Waterproofing Guarantee is attached on the next page.

ROOFER (Cont'd)

Standard Waterproofing Guarantee Form

THIS AGREEMENT is made the .....day of 20 .....

Between

.....

.....

(hereinafter called "the Employer") of the one part and.

.....

.....

(Insert Name of Contractor)

of.....

.....

(Insert Principal Address of Contractor)

(hereinafter called "the Contractor") of the second part

and.....

.....

.....

(Insert Name of Manufacturer)

of .....

(Insert Principal Address of Manufacturer)

WHEREAS:

(1) The Contractor has entered into a contract with the Employer dated .....day of .....20 ..... whereby the Contractor agreed to carry out and complete the waterproofing (hereinafter called "Waterproofing System") to the required concrete roof areas under the Contract for.....

.....

.....

(Insert Name of Project)

(2) Under the Contract, the Contractor is required jointly with the manufacturer to finish the Employer with a guarantee against failure of any kind to the said Waterproofing System.

(3)

AND WHEREAS the Contractor and/or the Manufacturer hereby jointly and severally guarantee the Employer for the performance of the Waterproofing System in the manner herein specified.

NOW IN CONSIDERATION OF THE ABOVE THE CONTRACTOR AND/OR THE MANUFACTURER HEREBY AGREES TO GUARANTEE THE EMPLOYER AS FOLLOWS:

1 In the event of the failure of the waterproofing and/or watertightness to the said Waterproofing System, the Contractor and/or the Manufacturer shall at their own expenses as and when requested for by the Employer, in writing forthwith effect re-waterproofing works to the defective area or areas and shall make good to the absolute satisfaction of the Employer all damages caused by leakage of the said Waterproofing System and all consequential damages such as painting, panelling, tiling, electrical and/or other works of a similar nature caused by the failure of the waterproofing and/or watertightness to the said Waterproofing System.

ROOFER(Cont'd)

Standard Waterproofing Guarantee Form (Cont'd)

2. In the event the remedial works undertaken by the Contractor and/or the Manufacturer is proven to be not effective as determined by the Employer and/or not to the satisfaction of the Employer, the Contractor and/or Manufacturer shall effect such additional works in such a manner as the Employer or the Employer's representative(s) may direct and shall carry out all tests as may be directed by the Employer or its representative(s) until all defects thereto have been remedied to the absolute satisfaction of the Employer and/or its representatives

3. It is agreed that should the Contractor and/or Manufacturer fail to commence work and/or perform their obligations under this guarantee within fourteen (14) days from the date of any written notice and complete the said work to the satisfaction of the Employer within a stipulated and mutually agreed time thereafter, the Employer shall be entitled at his own absolute discretion to employ and pay such person(s) as the Employer deems fit and necessary to remedy the said defects and the Contractor and/or Manufacturer shall forthwith reimburse the Employer all costs and expense whatsoever and howsoever incurred by the Employer in making good the said defects as soon as possible but not later than one (1) calendar month from the date of notice from the Employer requesting the said reimbursement. PROVIDED THAT the Employer shall be entitled to offset or deduct the said reimbursement from any monies due to the Contractor from the Employer for work done and/or otherwise.

4. All costs and expenses arising out of the performance of the obligations under this Guarantee shall be solely borne by the Contractor and/or the Manufacturer

5. If any difference shall arise between the parties concerning the interpretation of this Agreement or relating to any rights, duties or obligations hereunder or in any manner arising out of this Agreement then in any and all such cases the difference shall be referred to arbitration in Malaysia pursuant to the Arbitration Act, 1952 (Act 93) or any statutory modifications or re-enactment thereof for the time being in force The award shall be final and binding on the parties thereto.

6 The proper law of this Agreement shall be the law prevailing in Malaysia and this Agreement shall be construed and the rights and liabilities of the parties hereto shall be governed and determined by and be subject to such law

7 Time wherever mentioned in this Guarantee shall be the essence of the Guarantee.

8 It is mutually agreed that this Guarantee shall be valid for a period of ten (10) years effective after the issuance of the Defects Liability Period Certificate as provided under the said Contract.

9 The Contractor and/or the Manufacturer shall pay all stamp duties payable in respect of this Agreement

ROOFER (Cont'd)

Standard Waterproofing Guarantee Form (Cont'd)

10. All notice required or authorised to be given under this Agreement shall be in writing and shall be sufficiently served if sent by registered post addressed to the party concerned at the address set forth above or at its last known place of business. All notices so sent by the registered post shall be deemed to have been received on the day after the date on which such notices are posted.

Given under our hand the date first above mentioned.

Signed for and on behalf of the said Contractor in the presence of)
)
)Name: .....
)Designation: .....

.....
Witness

Name: .....

Designation: .....

Signed for and on behalf of the said Manufacturer in the presence of)
Contractor in the presence of)Name: .....
)
)Designation: .....

.....
Witness

Name: .....

Designation: .....

Signed for and on behalf of the said Employer in the presence of)
Contractor in the presence of)
)Name: .....
)Designation: .....

.....
Witness

Name: .....

Designation: .....

ROOFER (Cont'd)

Interlocking Concrete Roof Tiles

A Interlocking concrete roof tiles shall be of approved type and colour and conforming to the requirements of B.S 550

B All tiles shall be equal to the samples approved by the S.O. and shall be of a uniform colour. All broken, chipped or defective tiles shall be immediately removed off the site and replaced with sound tiles.

C Tiles shall be laid to the pitch indicated on the Drawings on suitably sized tanalised timber battens to details as described or shown on the Drawings. Roof tiles shall be laid to "broken joints" and to a maximum gauge recommended by the tile manufacturer. Each course shall be laid so that the tiles are properly set out to suit the slopes.

D Each tile in every alternative course shall be nailed by galvanised iron nails. In addition, each eaves tiles and tiles adjacent to hips, valleys and ridges shall be nailed. All laying and fixing shall be carried out strictly in accordance with manufacturer's instruction and recommendation.

E Eaves shall overhang fascia by minimum 50mm.

F Form cement mortar (1:3) fillet along the full lengths of verges.

G Ridges and hips shall be formed by half round ridge tiles and 1/3 round hip tiles.

H Ridges and hips shall be bedded with cement and sand (1:3) mortar at the edges neatly pointed with tinted cement mortar to match general tiling. End ridge tiles shall be stopped by cement and sand mortar infill.

I Execute all necessary cutting and fitting at abutments and top edges.

Asbestos Cement Roofing Sheets

J Corrugated asbestos cement roofing sheets shall be of the sizes, colour and patterns described, and of approved quality and weight, free from flaws, broken edges, etc.

K The sheets are to be laid with end laps of minimum 225mm and 38mm corrugations side laps, or as required for the specific type of roofing sheet.

L The sheets shall be fixed with galvanised steel drive screws to timber purlins and properly secured.

M All cuttings, whether straight, raking or circular on roofing sheets shall be properly and neatly cut with a hand saw.

Metal Roof Decking

A Metal roof decking shall be the proprietary specialist system described or shown on the Drawings, and shall generally be coated corrugated steel sheets, free from twist, buckle or other surface imperfections. Galvanising shall be clean and free of obvious surface contamination and defects. The Contractor shall provide complete details of the type, section, sizes, gauge, thickness, etc of the roof decking, including fixing method.

B Fascias shall be constructed using similar materials

C Metal roof decking shall be laid such that ribs run parallel to roof framing members, and at 90 degree to purlins. Roof sheets shall be securely fixed by straps, and completely watertight. No puncturing of the deck would be permitted. Lapping shall be as per manufacturer's instructions

ROOFER (Cont'd)

Metal Roof Decking

A Galvanised self-drilling screws complete with neoprene washers shall be used in fastening cladding to steel purlins, girts and other supports. Holes for fasteners shall be drilled accurately on the centreline of the corrugation directly over the supporting purlin or girt. Cladding with wrongly positioned holes shall be rejected; no repair of such holes with biturnastic or other sealant shall be permitted.

B Suitable ridge capping, side flashing and side capping pieces of the type and size recommended by the manufacturer shall be supplied and fixed at locations shown on the Drawings.

C Cladding for roof shall be supplied with suitable preformed roof connectors. Ridge ends shall be fitted with suitable end closers and lined with biturnastic seal.

Galvanised Mild Steel Gutters, Flashings and Cappings

D The galvanised mild steel flashings and Cappings shall be of gauge indicated and shall generally comply as regard manufacture to the requirements of B.S. 2989.

E Provide 22 gauge galvanised mild steel gutters with soldered seams and joints and fixed to plywood lining, timber battens or with mild steel straps.

Fibreglass Insulation Quilt

F Unless otherwise described in the Bills or shown on the Drawings, fibreglass insulation quilt shall be 50mm thick, with a nominal weight of 9.60 kg/m3. It shall have a thermal conductivity of 0.032 - 0.035 Kcal/mh degree centigrade at normal room temperature.

G Insulation quilt shall be laid over galvanised chicken wire mesh, unless otherwise specified.

H Insulation quilt must be protected from exposure to rain whilst laying.

Rockwool Insulation

I Rockwool insulation shall generally be 50mm thick of sheet size 1200 x 600mm, with a nominal weight of 60 kg/m3, unless otherwise described or shown on the Drawings. It shall have a thermal conductivity of 0.029 Kcal/mh degree centigrade at 20 degree centigrade.

Roof Sisalation

J Provide double-sided aluminiurn reflective foil sisalation to roof areas as described or shown on the Drawings. The roof sisalation shall be lapped a minimum of 150mm at joints and ends.

CARPENTER, JOINER AND IRONMONGER

Codes of Practice

A Carpentry works shall generally comply with the requirements of B.S 5268 subject to any qualification given below.

B Joinery works shall generally comply with the requirements of B S 1186, subject to any qualification given below.

Timber Generally

C All timber for Carpenter's and Joiner's work shall be of best quality, suitable for the purpose for which it is intended and is to be well seasoned and sawn square all round, free from excess of wane or discoloured sapwood, injurious open shakes, large, loose or dead knots, decay and live insect attack and shall be to the approval of the S.O.

Strength Grouping of Timber

D Unless otherwise described, all timber for Carpenter's and Joiner work shall be in accordance with the following strength groupings:

GROUP A		GROUP B			GROUP C		GROUP D
Naturally Durable	Requiring Treatment	Naturally Durable	Requiring Treatment		Requiring Treatment		Requiring Treatment
Balau	Kandis	Merbau	Bekak	Merpauh	Bayur	Meranti-Bakau	Ara
Bitis	Kempas	Red Balau	Berangan	Nyalin	Bintangor	Meranti-Dark Red	Damar-Minyak
Chengal	Kulim	Resak	Dedali	Perah	Durian	Meranti-Light Red	Geronggang
Giam	Mata Ulat	Tembusu	Derum	Petaling	Gerutu	Meranti-White	Jelutong
Kekatong	Meransi		Kapur	Rengas	Kasai	Meranti-Yellow	Petal
Keranji	Mertas		Kelat	Sengkuang	Kedondong	Mersawa	Pulai
	Pauh Kijang		Keledang	Simpoh	Kembang-Semangkok	Nyatoh	Sesendok
	Penaga		Keruing		Ketapang	Penarahan	Terap
	Punah		Kungkur		Machang	Perupok	Terentang
	Tualang		Mempening		Medang	Ramin	
			Mengkulang		Melantai	Rubberwood	
			Merbau		Melunak	Sentang	
			Merawan		Mempisang	Sepetir	

CARPENTER, JOINER AND IRONMONGER (Cont'd)

Pressure Impregnation of Timber

A All timbers requiring treatment shall be impregnated under vacuum and pressure with an approved proprietary wood preservative to the following nett dry salt retention:-

Use	Tenalith "C"	Celcure "A"
Structural timber and joinery for use in the interior of buildings (above ground)	5.6 kg/m3	5.6 - 8.0 kg/m3
Exterior, such as weather boarding door and window frames and sill (above ground)	8.00 kg/m3	8.0 kg/m3

B The Contractor shall produce a Certificate from the Supplier confirming that the timber has been pressure-treated in accordance with the manufacturer's instruction and showing the quantities and sizes of timbers treated and the nett retention of dry salt obtained.

C All timbers shall be cut to final dimensions before impregnation. Any timber which is rip, sawn or deeply wrot after impregnation shall be impregnated again as for untreated timber to the entire satisfaction of the S.O.

D Ends of pressure-treated timber which are cut shall be sealed with approved proprietary preservative like "Welmanel", "Celcure "B" or "Celpruf' all applied strictly in accordance with the manufacturer's instructions.

Storing of Timber

A All timber shall be stored under a shed, and properly stickered and stacked to enable air to circulate freely around all faces. Storage shall be as follows

(a) Each grade separately stored, with treated timber separate from untreated.

(b) On levelled bearers off the ground, permitting free air circulation and preventing sagging.

(c) Protected from weather; keep any temporary covers from close contact with the timber.

Sizes

B The sizes of sawn timber, except where otherwise specified, shall be within the margin of permissible variation stated hereunder:

(i) For widths, depths or thickness not exceeding 150mm, within ±3mm of the specified size.

(ii) For widths, depths or thicknesses exceeding 150mm, within ±5mm of the specified size.

C The Contractor shall provide at his own cost any necessary blocks, wedges or battens to compensate for irregular surfaces caused by any variation in size of timber permitted.

CARPENTER, JOINER AND IRONMONGER (Cont'd)

Sizes (Cont'd)

A All carpenter's work shall be left with a sawn surface except where visible such shall be wrot. Provide all carpenter's work of the required timber grading.

B All joinery timber shall be wrot and finished with glass paper as required. All sizes stated for joinery work are finished sizes, for which a deviation of ±2mm is allowed from stated sizes.

CARPENTER, JOINER AND IRONMONGER (Cont'd)

Nails, Screws, Fixings, etc.

C All nails, screws, spikes, bolts, etc. are to be of the best quality and of the weights and lengths suitable for the purpose required. Nails and screws shall be punched and the holes stopped.

D Various proprietary fixings are available for particular or specialised jobs. These shall only be used where appropriate in accordance with the manufacturer's instructions and to approval of the S.O. when not specifically detailed.

E Where holes are required for fixings, their formation in metal or synthetic materials shall be by drilling and in brick, stone or concrete shall be by percussion methods i.e. jumper and hammer.

F Where cartridge operated hand tools are used such as "Ramset" or similar approved, performed holes are not required. They must not be used on ceramic tiles, hollow blocks, cast iron and other brittle material, lath and plaster, fibre board and similar soft materials.

G Fixing of timber to concrete or brickwork shall be by:

1 Hardened steel pins direct into concrete or brickwork for fixing small sections such as skirtings and architraves. The head shall be punched home and filled.

2 Preformed plugs such as "Rawlplug" or similar approved informed holes.

3 Plastic compounds such as "Philplug Fixrite" or similar approved in-formed holes.

4 Expanding bolts such as "Rawlbolt", "Expandabolt" or similar approved.

5 Cartridge operated hand tools such as "Ramset" or similar approved but shall not be used within 50mm of any edge.

H Where work is described as "plugged" in Carpentry or Joinery, it shall mean plugged to brickwork or concrete by casting in or morticing for and inserting fibrous inserts or other approved fixing materials and fixing with suitable nails or screws, to any wall or concrete surface. Alternatively the fixing shall be carried out by means of a cartridge operated hand tool as earlier described. Where the walls are of hollow block construction, concrete fixing blocks shall be built in, as required.

I Care must be taken to locate any buried pipes, cables, or other services when fixing timber to concrete or brickwork. If any hole hits reinforcement, the fixing must be repositioned.

CARPENTER, JOINER AND IRONMONGER (Cont'd)

Nails, Screws, Fixing, etc. (Cont'd)

A Fixing of timber to metal shall be by:

1 . Self tapping screws in thin sheet. 2. Bolts in preformed holes (tapped as required) 3. Cartridge operated hand tools.

All fixings shall be as instructed by the S.O.

B Boards and linings, other than tongued and grooved, and less than 175mm wide on face, shall be secured with 2 nails at each fixing position or joist. The nails shall be not less than 12mm nor more than 20mm from edges. Boards and linings other than tongued and grooved, and more than 175mm wide on face, shall be secured with 3 nails at each fixing position or joist. The outer nails shall be not less than 12mm nor more than 20mm from the edge. Tongued and grooved boards and linings less than 100mm wide on face shall be secured with one nail at each fixing position or joist. Tongued and grooved boards and linings more than I 00mm wide on face shall be secured with 2 nails at each fixing position or joist.

D All nails shall have a length of not less than:

1 . Plain boards and linings, 2-1/2 x thickness

2. Tongued and grooved boards and linings, 2 x thickness

E All boards and linings shall be secured with hammer driven nails unless specified to be fixed with screws. When screws are specified they shall be not less than No. 8 gauge and not shorter than 2 x thickness.

F Unless otherwise specified, wall plates shall be fixed to concrete with 10mm diameter mild steel bolts 175mm (minimum) long at 1200mm (minimum) centres.

Carpentry Work

G All carpentry work shall be left with a sawn surface unless otherwise specified.

H All joints shall be properly framed and securely spiked. Longitudinal joints in plates, etc. shall be formed over supports and shall lap at least 150mm or twice the depth of the timber, whichever is the greater.

I All non-standard carpentry metalwork shall be fabricated from mild steel in accordance with "Steel and ironworker" section of this Specification.

CARPENTER, JOINER AND IRONMONGER (Cont'd)

Joinery Works

A The quality of timber and workmanship in all joinery work shall conform to the relevant requirements of B.S. 1186.

B All joinery timbers, unless otherwise specified, shall be wrot on all faces and shall be slightly rounded on all exposed arrises.

C All joinery is to be put on hand immediately upon receipt of details and kept in the drying room as soon as possible.

D All labours on joinery timber viz. rebates, splayed edges, grooves etc. shall be executed to exact sizes by skilled joiners and shall be to the standards specified in the relevant British Standards.

E Joinery must not be fixed until plaster, etc. has completely dried out and any tucking in or pointing necessary be undertaken after joinery is in position, should be kept to a minimum.

F All joinery that splits, shrinks or warps for want of seasoning, or unsound due to bad workmanship shall be removed and replaced at the expense of the Contractor. No joinery shall be primed unless it has been inspected and approved by the S.O.

G All framed work shall be put together immediately upon the general work being commenced but not wedged or pinned and glued until the framing is prepared in readiness for immediate fixing. All framings shall be put together with well-fitting mortice and tenon joints wedged up solid and pinned with 10mm diameter Grade "A" hardwood pins and glued.

H All doors, windows, shall be constructed in accordance with the detailed drawings complete with frames, stops, architraves, etc

I All fitments either constructed on site or pre-fabricated in the Contractor's Workshop shall be in accordance with the detailed Drawings.

J The Contractor shall be responsible for accuracy and shall make site checks on actual dimensions of recesses, etc., whenever necessary. All inaccuracies shall be rectified at the Contractor's expense.

K All timber for joinery fittings shall be properly seasoned and dried to an agreed moisture content not exceeding 18%. The S.O. shall have the right during the construction of the fittings to check all timber being used and to reject any timber found to have a moisture content exceeding 18%.

L Joinery fittings are to be constructed exactly as shown on the Drawings. The Contractor shall not commence work until the S.O. has approved the Contractor's full size setting out Drawings. The Contractor shall not deviate in any way from detail drawings provided, unless otherwise approved

M All work must be carried out by experienced Cabinet-Makers in a sound and workmanlike manner with properly fabricated joints, dove-tailed, mitred or morticed and with concealed pins and screws. All joints shall be glued before pinning and screwing.

CARPENTER, JOINER AND IRONMONGER (Cont'd)

Joinery Works (Cont'd)

A In selecting timber for the various parts of the journey fitment, the Contractor shall make every effort to obtain pieces of matching grain and shade.

B All joints in worktops and counters are to be kept to a minimum. Where tops are shorter than the standard length of plywood or laminated plastic lining they are to be in one piece and on no account will joints be allowed.

Pre-fabricated Units

C Pre-fabricated units shall be fabricated in properly equipped workshops in accordance to the details shown on the Drawings. Timber shall be of the strength grouping and cross-section specified and properly jointed together.

D Pre-fabricated units shall be handled and stored on site in the following manner:

(a) Use adequate labour to handle singly or handle banded units with mechanical plant, in either instance without causing stress and distortion.

(b) Store upright supported at the designed bearing points; provide secure temporary stays to maintain upright.

(c) Protect from weather as for general timber.

E Protect from damage all installed pre-fabricated units.

Plywood

F All plywood in doors, fitments or panelling shall be manufactured from hardwood and in compliance with B.S. 6566: Grade 11 on both faces and shall be of Weather and Boil Proof Quality. Marine plywood shall comply with the requirements of B.S. 1088. Each sheet of plywood delivered to the site shall bear the following markings:

(a) Manufacturer's name or identification.

(b) B.S. No. 6566.

(c) W.B.P. (Weather and Boil Proof)

(d) Grade of Finish

(e) Thickness

CARPENTER, JOINER AND IRONMONGER (Cont'd)

Chipboards

A Chipboards shall be of the type manufactured from wood chips or shavings combined with a thermosetting synthetic resin glue binder bonded and hot-pressed together.

B Medium density chipboard shall comply with the requirements of B.S. 2604.

C Chipboard shall be of the thickness, type and quality shown on the Drawings, and approved by the S.O., and fixed at the locations required

D Boards which are to be painted or varnished shall be properly sanded down with holes and crevices filled with approved wood putty or filler.

Cement Boards

E Cement boards shall be "Cemboard" or other equal and approved compressed board of the thickness, size and patterns described in the Bills or shown on the Drawings.

F "Cemboard" ceiling panels shall be fixed to framing with butt "V" joints using nails or screws. Alternatively, butt joints may be covered by timber cover fillets, all to details as shown on the Drawings.

G Ceiling panels shall be set out symmetrically to approved patterns from the centreline of the ceiling.

H The "Cemboard" panels shall be painted with one of alkali-resisting primer on all faces before fixing.

Gypsum Plasterboards

I Gypsum plasterboard shall be of the thickness, size and patterns described or shown on the Drawings. The gypsum plasterboard shall comply with the requirements of B.S. 1230 and are to be obtained from an approved manufacturer.

J The plasterboards shall consist of an aerated gypsum core encased in and firmly bonded to especially prepared durable paper liners.

K The plasterboards shall be supplied with tapered edges for smooth seamless jointing.

L The gypsum plasterboards shall be stacked on a level surface in a dry storage space. The manufacturer's wrapping should only be removed immediately before use.

M Ceiling linings shall be fixed to framing or suspension system to approved patterns, and set out symmetrically from the centreline of the ceiling.

CARPENTER, JOINER AND IRONMONGER (Cont'd)

Perforated Acoustic Particle Board

A Perforated acoustic particle board shall be of the thickness, size and patterns described or shown on the Drawings. The perforated acoustic particle board shall be obtained from an approved manufacturer.

B Ceiling linings shall be installed to approved patterns and fixed to framing or suspension system strictly in accordance to the manufacturer's instructions.

Tongued and Grooved Boarded Ceilings

C Tongued and grooved boarded ceiling shall consist of Group A or B timber boards of sizes as described or shown on the Drawings. Boards shall with secret-nailed fixed to timber joists and tongued and grooved together.

D Fixing patterns and jointing details shall be agreed with the S.O. prior to commencing works.

E The boarded ceiling shall be sanded down upon completion and finished with one undercoat and two finishing coats of high gloss enamel paint, unless otherwise described.

Flush Doors

F All flush doors and panels, whether Contractor-made or proprietary shall be solid semi-solid or cut from boards. The doors shall be of metal free construction, and shall have perfectly flat, smooth plywood facings free from core patterning with hardwood lipping housed to all edges. Semi-solid doors shall have suitable solid blockings. Where flush doors are described as "fire resistant" they shall be constructed to pass the fire tests described in B.S. 476: Part 8 for the time periods stated

G Unless otherwise described or shown on the Drawings, doors to toilets shall have one face lined with marine plywood.

Decorative Doors

H Solid decorative timber doors shall be of approved make and obtained from an approved source. The doors shall be in patterns and colours; selected by the S.O.

I Door leaves shall be constructed of Group A or B timbers to the required thickness and size.

J The solid decorative timber doors shall be free of any exposed pith, arris knots, stains, discolourations, checks, or any defects, or combination of defects, natural or otherwise. Timber surfaces shall show the same character of grain throughout.

Louvred Doors

K Louvred doors shall be constructed to the thickness, size and pattern described or shown on the Drawings.

L Unless otherwise described or shown on the Drawings, louvred doors shall be constructed of Group A or B timbers stiles, top, bottom and middle rails, and divided into two open panels. The open panels shall be infilled with splayed timber louvre blades spaced 50mm (minimum) apart. The louvre blades shall be securely housed into slots formed in the timber stiles at 450 angle.

CARPENTER, JOINER AND IRONMONGER (Cont'd)

Fire-Rated Doors

A Fire-rated doors shall be obtained from approved manufacturers, and constructed to pass the tests in B.S. 476: Part 8, and to the approval of the Chief Inspector of Fire Services Department, Malaysia.

B Fire-rated doors of the rating specified must be obtained from a manufacturer approved by the Local Inspectorate of Fire Services, Malaysia and shall be installed strictly in accordance to the manufacturer's instructions. The fire resistance rating of the door supplied and delivered to site shall be clearly marked on their surface. The contractor shall produce Certificates from the Inspectorate of Fire Services and manufacturer's test certificates to substantiate the rated fire resistance of the door delivered. If approval of the Inspectorate on any door is not substantiated to the satisfaction of the S.O., it shall be removed from site at the Contractor's own expense and the approved doors supplied.

C Single leaf and double leaf panels consist basically of fire resistant material, faced on both sides with first grade plywood of high moisture resistance (H.M.R.) quality. Single leaf doors shall have internal timber edge strips fitted to both stiles. Double leaf doors shall have internal timber edge strips fitted to hinged stiles only with aluminium extrusions to both meeting stiles, and smoke seals shall be fitted to the initial closing leaf. Door leaves shall be to the required thickness for providing the fire rating specified. Veneers or laminated plastic linings shall be provided, if necessary, and shown on the Drawings.

D Timber door frames must be installed true and plumb into door openings and grouted solid with cement mortar (1:3) to ensure compliance with fire rating regulations.

E After installation of the doors, the Contractor shall obtain final approval in the form of an official letter from the Fire Authorities.

Ironmongery

F All ironmongery to windows, doors and joinery fitments shall be of the brand described or shown on the drawings, and shall be obtained from an approved local manufacturer. All ironmongery shall be installed in accordance with the manufacturer's instruction. Care must be taken to ensure that all parts function correctly and are not stained. Any ironmongery or screws etc. damaged during installation are to be replaced at the Contractor's own expense. Fix all ironmongery with matching screws. Remove and re-fix to facilitate decoration or other work. Ease and adjust and oil on completion.

G Provide 1-1/2 pair hinges to all doors. Hinges shall be approved mild steel butt hinges and of specified sizes

H All locks are to be supplied with keys, and each key shall have a numbered aluminiurn identification tag.

I All crates shall be marked to show their contents and all boxes of accessories and screws, etc., shall be labelled with which fitting they shall be used

J Samples of all ironmongery to be supplied shall be produced for the S.O.'s approval before ordering

K Wrap and protect from use and oil all ironmongery on completion

General Ironmongery

L Provide cramps, dowels, stiffening plates and general ironmongery of every description as required for the joinery works.

STEEL AND IRONWORKER

Codes of Practice

A Structural steelwork shall comply with the requirements of B S 5950: Part 2, subject to any qualification given below.

Grade of Steel

B Structural steel shall comply with Grade 43A of B.S. 4360 and the requirements of B.S. 449: Part 1.

C Hollow sections shall comply with the requirements of B.S. 4848: Part 2.

D I-Section, tees and channels shall comply with the requirements of B.S. 4: Part 1.

E Angles shall comply with the requirements of B.S. 4848: Part 4.

Substitution of Materials

F Should the Contractor be unable to obtain the steel sections specified, he shall submit alternative proposals, including all relevant calculations and drawings, to the S.O. for approval. Fabrication shall not commence until such approval has been given. Any such approval given shall in no way relieve the Contractor of his responsibilities under the Contract.

G Any additional cost resulting from his alternative proposal, if accepted, shall be borne entirely by the Contractor and any savings accruing therefrom, shall be calculated and the Contract Sum accordingly adjusted.

Fabrication

H All workmanship and fabrication shall be in accordance with B.S. 5950: Part 2.

I The Contractor shall permit access at all reasonable times to all places where work is being carried out and shall provide all the necessary facilities for inspection of material and workmanship during fabrication. Under no circumstances shall any practice be adopted which results in injury to the material.

J No drifting of holes that would enlarge the holes or distort the metal shall be allowed. All edges of sections and plates shall be smooth and free from broken, ragged, burred or notched edges Straightening or forming shall be carried out in such manner that will not weaken the material.

K All sharp corners and edges which are to receive paint treatment shall be rounded to approximately 6mm radius on completion of fabrication.

L The Contractor shall allow for drilling all holes in steelwork after erection as may be required. No burning out of holes with an oxy-acetylene flame shall be permitted.

M Cutting of steel shall be by sawing, shearing, cropping or by machine flame. Hand flame cutting may only be used where it is impractical to cut by other methods. Dress or otherwise ensure cut edges are true to profile with burrs removed

STEEL AND IRONWORKER (Cont'd)

Transport and Storage of Steelwork

A The greatest care shall be taken in loading, unloading, transporting, tacking and erecting steelwork to avoid marking or damage to painted or metal coated steelwork.

B Painted or metal coated fabricated steelwork which is to be stored prior to erection shall be kept clear of the ground and shall be laid out or stacked in an orderly manner that will ensure that no pools of water or dirt can accumulate on the surface. Suitable packings shall be laid between the layers of stacked materials. Where cover is provided it shall be ventilated.

Test Certificates

C Steel test certificates shall include a ladle analysis of the chemical composition of the material.

Submission of Samples

D The Contractor shall submit to the S.O. a list of the suppliers from whom he proposes to purchase the materials necessary for the execution of the work. Each supplier must be willing to allow access for the S.O. or his representative, to his premises during ordinary working hours for the purpose of obtaining samples of the materials. Alternatively, if required by the S.O. the Contractor shall deliver the samples of the materials to the S.O. for approval. Samples shall be taken in accordance with the relevant B.S. Materials subsequently supplied shall conform within any specified tolerances to the quality of samples which have been approved by the S.O.

Welding

E All welding shall be by the electric arc process. Unless specifically excluded, the clauses shall apply equally to shop and site welding.

F Unless otherwise described in the Contract, metal arc welding shall comply with B.S. 5135:1984.

G Wherever possible the welds shall be laid in the flat or horizontal vertical position.

H All parts to be welded shall be accurately prepared so that on assembly they fit closely together. After assembly and before general welding commences the parts shall be securely connected by tack welds in the line of the welded seams. The tack welds shall be strong enough to prevent relative movement of the parts but small enough to be covered by general welding.

I Slag shall be removed from welds and spatter from surrounding surfaces after completion of welding and before grit blasting.

J Welding procedures shall be designed to eliminate weld cracking and minimise distortion. The welding procedure for making each joint shall be approved by the S.O. before work is commenced and recorded on the Shop Drawings.

K Welding shall not be undertaken when the surfaces are wet from condensation or other causes.

L Suitable allowance for the weld connections shall be made to ensure that the finished dimensions are correct within the specified tolerances

STEEL AND IRONWORKER (Cont'd)

Welding (Cont'd)

A The general welding programme for shop and site welds, including particulars of the preparation of fusion faces, the method of preheating where required, the method of making welds, and the type of electrodes shall be submitted to the S.O. for his approval before the work is put in hand. No departure from the agreed welding programme or from the details shown on the Drawings shall be made without the agreement of the S.O. Electrodes and fluxes shall be chosen that the properties of the deposited metal are not inferior to those of the parent metal. Electrodes and fluxes shall be used in accordance with the manufacturer's instructions. Electrodes for manual arc welding shall comply with B.S. 639 and shall be classified, coded and marked as specified therein.

B The procedures for welding and flame cutting established by the procedure trials shall be strictly followed.

C In the fabrication of built-up assemblies, all butt welds shall be complete penetration welds made between prepared fusion faces and all such welds in each component part shall be completed, wherever possible, before the final assembly. Where butt welds are to be ground flush, there shall be no loss of parent metal. The final grinding shall be in the direction of the primary dead load stress as directed by the S.O.

D The position of welds required for temporary attachment shall be agreed by the S.O. before the work commences.

Welding Plan

E The welding plant shall be capable of maintaining the welding voltage and current specified by the manufacturer of the electrodes. The Contractor shall supply instruments for verifying voltages and currents as and when required by the S.O.

Supervision for Welding

F Welding shall be carried out only under the direction of an experienced and competent supervisor. Unless otherwise agreed by the S.O., a record shall be kept to enable major butt welds to be identified with the welders responsible for the work but finished work shall not be marked by hand stamping for the purpose.

Weld Repairs

G Any welding rejected by the S.O. shall be cut out and re-welded to his entire satisfaction.

Welding and Flame Cutting Procedure Trials

H Before fabrication is commenced, welding and flame cutting procedure trials shall be carried out using representative samples of materials to be used in the Work

I The welding and flame cutting trials shall demonstrate to the satisfaction of the S.O. the procedures to be adopted in the fabrication of the work which shall include:

(i) Welding procedure in accordance with B.S. 5135, and

(ii) The heat control techniques required to ensure that the flame cut surfaces of steel are free from cracks, local hardness and other defects which would be detrimental to the finished work

J The trials shall include specimen weld details representative of the actual construction, which shall be welded in a manner simulating the most unfavourable conditions liable to occur in the particular fabrication. After welding, the specimens shall be held at a temperature not less than 100C for a period of not less than 72 hours and shall then be sectioned and examined for cracks and other defects.

STEEL AND IRONWORKER (Cont'd)

Welding and Flame Cuttinci Procedure Trials (Cont'd)

A The following groups of tests to B.S. 709 shall be carried out in accordance with the Testing Clauses of this Specification.

(a) Butt Welds

Transverse tensile tests.
Transverse and longitudinal bend tests.
Separate tests shall be performed in each case with the root of the weld in tension and compression respectively.

(b) Fillet welds

Fillet weld fracture test.

Qualification and Testing of Welders

B For the welding of any particular type of joint, welders shall show evidence to the satisfaction of the S.O. of having satisfactorily completed appropriate tests as specified by B.S. 4872: Part 1.

Testing of Welding

C The tests shall be carried out by the methods described in B.S. 709. The following requirements shall be met:

(a) General

The test results of welded joints shall not be inferior in any respect to the B.S. test requirements for the parent metal.

(b) Procedure Trials

(i) Tensile and Bend Tests

Should any one of the weld joint test pieces selected for transverse tensile and transverse and longitudinal bend tests fail to comply with the test, two additional test pieces shall be taken from the joint material represented by the test. Both shall then comply with the test requirements in order to qualify for acceptance.

(ii) Revised Procedures

In the event of failure to meet the test requirements the Contractor shall carry out further trials, using revised procedures and further tests to the satisfaction of the S.O.

STEEL AND IRONWORKER (Cont'd)

Testing of Welding (Cont'd)

(c) Production Tests

(i) Tensile and Bend Tests

Should any one of the weld joint tests pieces selected for transverse tensile and transverse bend tests fail to comply with the test requirements applicable to the parent metal of the joint represented by the test, additional specimens shall be cut from the same production test plates and the test repeated. Should either of the additional tests fail to comply with the requirements, the joint shall be rejected.

(ii) Re-welding and Re-testing

In the event of failure to meet the test requirements, the welded joint represented by the tests shall be completely cut off. The joint shall then be rewelded and the tests repeated.

(d) Non-destructive Testing

As directed by the S.O., the Contractor shall carry out non-destructive tests on the welds The tests shall be:

(i) For Butt Welds

Radiographic examination complying with B.S. 2600 or B.S. 2910 as appropriate and ultrasonic examination complying with B.S. 3923.

(ii) For Fillet Welds

Visual inspection and dye penetrant or magnetic particles tests.

The Contractor shall include in his price and programme for the necessary time taken for inspection. The S.O. will require all major welds to be subjected to inspection by gamma-radiography, ultrasonic or non-destructive methods.

Where inspection is by gamma-radiography, the Contractor shall make available sufficient space around the part being radiographed either at the works or on site for proper observance of the safety precautions against radiation, and shall include in his price and programme for so doing.

Where a weld is found to be faulty, it shall be cut out in such a way such as not to impair the subsequent strength of the structure and replaced with sound welds to the requirements of the Drawings and this Specification.

STEEL AND IRONWORKER (Cont'd)

Testing and Inspection of Structural Steelwork

A All tests shall be carried out to the satisfaction of and as directed by the S.O.

B The Contractor shall send copies of all test results to the S.O. immediately when they are available.

C The Contractor shall give the S.O. at least seven days notice in writing stating when the fabricated steelwork will be ready for inspection.

D Tests on materials which are to be used in the works shall be those given in the appropriate British Standard.

Erection for Inspection

E Unless otherwise directed, a section of the framed steelwork must be erected in the Supplier's yard for inspection.

Erection of all Steelwork

F When lifting and fitting steelwork into position, care should be taken such that the parts are not strained, twisted, bent or damaged in any manner at all. Should any part be strained, twisted or bent it shall be reinstated, at the Contractor's expense, by gently heating and bending and in a manner directed by the S.O. No hammering will be permitted. Any part that in the opinion of the S.O. is too badly damaged to be repaired shall be removed from the site of works and replaced at the Contractor's own costs.

G Securely fasten steelwork during erection in order that it can withstand all loadings. Proper and suitable slings and lifting appliances must be provided. The lifting of steelwork in bundles or in numbers which is liable to cause damage will not be permitted. Steelwork shall be properly stacked during and prior to erection to prevent damage to the members.

H The method of erection of all steelwork must be approved by the S.O. prior to commencement of the works.

I All assemblies to be fabricated by bolting or other mechanical methods shall be thoroughly cleaned and painted prior to assembly.

Bolts, Nuts and Washers

J Bolts shall be one of the following types as specified or shown on the Drawings.

(a) Ordinary bolts and nuts shall comply with the requirements of B.S. 4190. Plain tapered washers shall comply with the requirements of B.S. 4320.

(b) High strength friction grip bolts and nuts shall comply generally with the requirements of B.S. 3692. Washers for high strength friction grip bolts shall be load indicating washers appropriate for the type and the quality of the bolt used.

(c) Holding down bolts and nuts shall comply with the requirements of B.S. 1494: Part 2, Grade 4.6.

STEEL AND IRONWORKER (Cont'd)

Tightening High Strength Friction Grip Bolts

A High strength friction grip bolts shall comply with the requirements of B.S. 3692, and shall be of the load indicating type such that the achievement of the proof tensile load can be directly related to the feeler gauge measurement of gap closures on the bolt head or on the washer Fixing shall be in accordance with B.S. 4604: Part 1 The Contractor shall submit to the S.O for his approval, the type of load indicating system he wishes to use together with the manufacturer's name of the load indicating bolt or load indicating washer.

B Washers shall be of hardened steel and shall be provided under all nuts. Tapered washers shall be provided where surfaces under the bolt head or nut are not parallel.

C Where load indicating washers are used, they shall be placed under the head of the bolt.

D During the tightening operation, the bolt head shall be prevented from rotating.

E Any grip bolts which are slackened after having been fully tensioned once shall be discarded

Responsibility for Accuracy of Dimensions

F The Contractor shall be responsible for the accuracy of all dimensions shown on the Drawings

and shall verify all dimensions by site checks on space constraints, etc. All inaccuracies will be corrected at the Contractor's expense.

Non-Structural Steelwork Generall

G Mild steel plates, sheets and strips shall comply with the requirements of B.S. 1449 and hollow sections and steel angles with B.S. 4848 Part 2 and Part 4.

H Black bolts, nuts and screws shall comply with B.S. 916.

Workmanship Generall

I All welds, turns, sets, etc shall be sound. Threads shall be cut the full depth, both internally and externally, to all screwed work. Holes shall be drilled or punched and burrs cleaned off. Holes for screws, etc. shall be countersunk, and all countersinkings shall be concentric.

J All screw bolts shall have hexagon heads and nuts with "Whitworth" Standard thread and shall

be fitted with washers.

Welding

K Welding shall comply with the requirements of B.S. 5135. Welding shall be neatly carried out to produce smooth, neat joints and any rough surfaces shall be ground down as necessary before galvanising or painting is carried out. All welded joints must be filed smooth

Galvanising

L Galvanising shall be carried out by the hot dip process in accordance with the requirements of B.S. 729 Part 1. The weight of the zinc coating and continuity test requirements shall comply to the requirements stipulated. All galvanised shall be carried out after manufacture, unless otherwise specified. Any galvanised components which are to be welded shall have the galvanising removed at the appropriate area and the welded joints shall be heavily coated with zinc oxide paint

STEEL AND IRONWORKER (Cont'd)

Preparation Prior to Painting

A All steelwork shall be properly cleaned of all loose scale, rust, oil, grease, slag and other deleterious materials prior to painting.

Framed Work

B All framed work like grating, grilles, balustrades, etc. shall be fabricated from plates, flats, hollow sections or bars to the dimensions required. All joints shall be welded, unless otherwise shown to the contrary.

Pipe Handrails

C All pipe handrails, unless otherwise stipulated, shall be of mild steel (medium grade) tubulars complying to B.S. 1387 including all necessary fittings, preformed bends, elbows, etc. All bends elbows shall be pre-formed, of smooth turns and no welding shall be done at the bends. Welding shall only be permitted on straight sections.

Steel Roller Shutters

D Steel roller shutter shall be of approved type and manufacture, and shall be supplied complete with accessories and lock.

E Roller shutters shall be of the dimensions described or shown on the Drawings, galvanised and fixed at locations required in accordance with the manufacturer's instructions.

Vertical Blinds

F Vertical blinds shall be of approved type and manufacture, and shall be supplied complete with head rail, vanes, cord and ballchain control and all other accessories. Blinds shall be of the dimensions described or shown on the Drawings and installed all in accordance with the manufacturer's installation.

G Vanes shall be to widths described or shown on Drawings, composing high quality fabric weave and finish. Vanes shall not to fray or curl when in use.

H Headrail shall be manufactured from extruded aluminium in approved anodised colour with fitting grooves to locate a quick-release clip-in installation bracket. The control mechanism shall be entirely incorporated in the head rail. The hooks of vanes shall be of a self centering type which automatically maintains the vanes in parallel. The minimum vane overlap in the closed position shall be 17mm.

I Traverse of the vanes shall be controlled by polyster braided cord tensioned by weight to spring Rotation of vanes in any directions through 1800 shall be controlled by an wendless nickel-plated brass shall chain.

Metal Casement Windows

J Provide mild steel metal casement windows of approved manufacture and type to openings where required. The windows shall be fixed to brick or concrete surround with adjustable fixing lugs and pointed around in mastic and supplied with frames, glazing beads, locks, stays and all other accessories.

STEEL AND IRONWORKER (Cont'd)

Metal Casement Windows (Cont'd)

A The Contractor shall be responsible for accuracy of dimensions of openings, etc. and should verify and confirm with site measurements where necessary. All inaccuracies will have to be corrected at the Contractor's expense

Adjustable Louvre Styles, etc.

B Provide metal adjustable louvre styles with aluminium lacquered finish with lockable control handles of a brand by the S O. and fixed in accordance with the manufacturer's instructions

C Provide 12mm diameter mild steel horizontal anti-burglar bars to adjustable or fixed louvred windows at every louvre blade.

Steel Doors

D Steel doors shall be of approved manufacture, and to the dimensions or details described or shown on the Drawing.

E The steel doors shall be fabricated in compliance with the requirements of B.S 990

F Steel doors shall be obtained from an approved manufacturer, and shall be shop primed with two coats of red lead oxide or other approved rust resisting primer.

G Steel door frames shall be built in or fixed to concrete or brickwork to details shown on Drawings, and in accordance to the manufacturer's instructions.

H Doors shall be supplied complete with approved locks, hooks, stays or hinges and all necessary hardware for properly hanging and fixing.

Specialist Suspended Ceilings

I Provide all labour, materials and equipment required for the assembly and installation of specialist suspended ceilings including all timber packing, aluminium trims and the like necessary for the completion of the installation

J The ceilings and suspension system must be constructed to satisfy all requirements of the Inspectorate of Fire Services and other such authorities.

K The Contractor shall provide complete suspension system for each and every panel of the suspended ceilings independent of suspension and supports of other works.

STEEL AND IRONWORKER (Cont'd)

Specialist Suspended Ceilings (Cont'd)

A All suspension system, unless otherwise stated, shall be fabricated from corrosion resistant material. If they are of such materials that react with aluminiurn they shall be separated from the aluminium by materials that do not react with it.

B Fixing of suspension straps or hangers to concrete or brickwork with cartridge fired fasteners shall be carried out by means of an automatic cartridge operated hand tool, used in accordance with manufacturer's instructions. Alternatively, the fixing may be carried out by morticing and inserting fibrous inserts or other approved fixing materials and using suitable nails or screws.

C All ceilings components shall be aligned to true, level surface and straight lines. Deflection of any component must not exceed 1/360 of the span.

D Ceiling panels should be installed after all wet work is completed and dried to an acceptable level of humidity and all mechanical and electrical work in the ceiling plenum are installed.

E The panels shall be installed to patterns shown on the reflected ceiling plans.

F All ceilings shall be installed strictly in accordance with the manufacturer's written instructions.

G The Contractor shall provide all materials and fittings and perform any work which is obviously necessary for the complete installation of each panel of the suspended ceilings, even though such materials, fittings or works may not be explicitly mentioned in this Specification or shown on the Drawings.

Openings in Ceilings

H Openings for access openings, light fittings, conduits, air conditioning grilles, etc. shall be formed by the Contractor including providing all necessary additional trimmers and edgings.

I The Contractor shall allow for all necessary cutting, framing, suspension and edge trims according to the provision of such openings.

ALUMINIUM WORKS

Codes of Practice

A Aluminium works shall comply with the requirements of C.P. 118, subject to any qualification given hereunder.

B Aluminium works shall be undertaken by specialist experienced at working in accordance with the relevant Codes of Practice.

Work to Conform to Drawings

C All items of work shall conform to the overall sizes, designs and details shown on the Drawings. All aluminium units supplied under this Contract shall be fabricated to the best standard of workmanship under experienced factory supervision and control and shall be complete with all accessories. All members/sections shall be stout and strong enough for the purpose for which they are intended to be used.

D Unless otherwise stated or shown on the Contract Drawings, the Contractor shall provide shop drawings giving complete details of the type, section, sizes, gauge thickness, type of finish, etc. of the aluminium units to be supplied.

E Details of coupling members for composite units, full glazing instructions and method of fixing and anchoring to be employed must also be given.

F All openable parts of each unit shall have weatherstripping or seal made from materials that do not react with aluminium and such that any shrinking, warping or adherence to sliding or closing surfaces shall not impair the performance of the openable parts.

G The weatherstripping or seal shall be capable of being renewed without disturbing the glazing system and without having to remove the outer frame from the structure.

H All dimensions shall be verified before fabrication. Complete shop drawings of all works to be furnished shall be submitted to the S.O. for approval prior to factory fabrication.

Samples

I Samples of all aluminium sections, sheets etc. shall be submitted to the S.O. for approval before work is commenced. On approval, the samples shall indicate the minimum standards to be maintained for all subsequent work.

Protection of Aluminium Frames

J The Contractor shall be responsible for protecting the Works against damage, abrasion, staining, etc.

K All exposed aluminium work shall be protected by protective plastic tape ("Peelcoat" or similar) or grease during erection. After installation, all exposed aluminium surfaces shall be protected against damage by staining, abrasion, wet cement and other injuries until the work is handed over.

Cleaning on ComDletion of Works

L On completion of the Works, all protective material shall be removed and all work thoroughly cleaned with water and detergent. No abrasive agent shall be used. Any defective or damaged parts shall be immediately replaced, all at the Contractor's own expense.

ALUMINUM WORKS (Cont'd)

Material Requirements for Aluminium Work

A All aluminium material shall be free from defects that may impair strength durability or appearance, and shall be adequate in every way for their purpose. Surfaces shall be clean, straight and true with sharp defined profiles and smooth finish. All sections, sheets, etc. shall be free from bends or waves or other surface imperfections, true and straight vertically and horizontally with all arises, profiles, etc. true and sharp.

B Where aluminium doors, partitions, window frames and other aluminiurn components are shown on the Drawings, they shall be fabricated from aluminium alloy B6063-T5 complying with the requirements of B.S. 1474, with the components made up of extruded and pressed sections.

C The external surfaces of all extruded and pressed sections shall be etched and electrolytically anodised to a natural matt finish in compliance with the provisions of B.S. 1615 and the anodic film thickness of the finished product when tested with Isometer shall not be less than 15 microns.

D The Contractor shall submit a certificate from the manufacturer of the aluminium extrusions certifying the B.S. grade designation and thickness of the anodic coatings for each batch of extrusions delivered.

E The structural elements of the doors, partition and window frames including the joints, fasteners, etc. shall be of such form, thickness and extruded geometrical sections as to possess adequate stiffness to withstand wind loading of not less than 575 N/mm2.

Aluminium Window, Doors and Screens

F All windows, screens and doors shall be designed using approved sections structurally sound and fit for the purpose intended and provided in accordance with the schedules and details shown on the Drawings.

G Unless otherwise indicated, all windows, screens fixed panels and doors shall be constructed from aluminium sections and sheets of minimum sizes and gauge as per the samples submitted and approved by the S.O.

H Frames shall be square and flat and shall be constructed of sections cut to length, corners mitred and electrically welded and then cleaned to obtain a smooth surface. All joints and mitres shall be carefully and accurately assembled and machined so as to provide close smooth connections that will not be noticeable. Screws and bolt heads shall be concealed wherever possible and countersunk finished flush with exposed surfaces.

I All openable windows are to be provided with approved quality P.V.C. weather strip all round. The Contractor shall also provide necessary flashing around openings to ensure proper fixing of aluminium units.

J Drainage holes shall be provided to all framing section wherever necessary to discharge any water that may have accumulate through seepage into frames. All drainage shall be provided at location approved by the S.O.

Aluminium Gravity Shutters

K Aluminium gravity shutters shall be of the size, type and pattern selected and shall be obtained from an approved manufacturer.

L The shutters shall be supplied complete with all operating gear, casings, channels, brackets and all hardware and accessories, and fixed at locations shown on the drawings all in accordance with the manufacturer's specifications.

ALUMINIUM WORKS (Cont'd)

Metal Strip Ceilinci Linincis

A Metal strip ceiling linings shall be the proprietary system described or shown on the Drawings. Ceilings shall be to the profile and colour selected by the S.O

B The metal strip ceilings shall be installed on a metal hanger system complete with all necessary edge trims and accessories to the manufacturer's fixing details. Additional hangers shall be provided where luminaries or intergrated ceiling fittings are incorporated into the ceiling.

C The ceiling height required shall be clearly marked and approved by the S.O prior to installation.

D Form changes in levels or curves to ceilings in accordance to the manufacturer's details.

E Provide standard manufacturer's access hatch of size 600 x 600mm at areas where shown on the Drawings.

Aluminium Skirtings

F Aluminium skirtings shall be approved aluminium alloy extrusions conforming to B.S. 1474. Sections shall be clean, straight with sharply defined lines and shall be to the profile, dimensions and strength to suit its various purposes. All exposed aluminium members shall be natural anodised finish. The anodic coating shall be minimum 10 microns thick.

Finishes

G Unless otherwise described or shown on the Drawings, all aluminium surfaces shall be "Natural Anodised" Satin matt aluminium finish.

Fixing

H All aluminium units shall be properly fixed and installed in the positions shown with all necessary lugs, straps, brackets, etc. bedding with and including "neoprene" gaskets where required and everything else necessary for the proper fixing of the units all in accordance with the details as shown on the Drawings.

I Wherever required, frames shall be solidly bedded with waterproofed cement and sand (1:3) mortar or other approved grouting material to ensure watertightness.

J Backs of frames shall be painted with one coat bituminous paint before fixing.

K Where couplings are made, either direct or with mullions or transomes, joints must be bedded with silicone sealant to render them watertight. Couplings shall also be sealed with good quality silicone sealant.

L Fixing frames, straps, built-in lugs, brackets, etc. shall be of galvanised mild steel and of the appropriate gauge and size strong enough for their purpose Unless otherwise stated, they shall be treated with rust-proofing primer to render them rust proof

ALUMINIUM WORKS (Cont'd)

Fittings

A Fittings for swing doors shall be as follows:

(a) Single/Double action floor spring with stainless steel cover plate shall be fitted.

(b) Concealed bolts shall be provided at top and bottom of first closing leaf.

(c) Double cylinder deadlock of the specified brand shall be mortised into door style each leaf of door to be fitted with 2 No. aluminium push/pull handles (of design to be approved by the S.O.) of the same finish as the aluminium sections.

(d) Each lock shall be provided with three (3) keys.

B Fittings for hinged doors shall be as follows:

(a) Single action floor springs with stainless steel cover plate.

(b) Concealed bolts, top and bottom of first closing leaf.

(c) Double cylinder deadlock mortised into door style.

(d) Each lock shall be provided with three (3) keys.

(e) Each leaf of door to be fitted with 2 No. aluminium push/pull handles (of a design to be approved by the S.O.) of the same finish as the aluminium section.

C Fittings for sliding doors shall be as follows:

(a) Horizontal sliding leaves to run on adjustable steel rollers fitted with stainless steel ball base in the sill section.

(b) Nylon head guides to ensure easy and smooth mobility of the sliding leaves.

(c) Woven piles, dens ity-sil icone treated weather strip around perimeter of the leaves for weatherproofing and to ensure smooth operation.

(c) Doors to be fitted with approved pin lock or deadlock operated from inside.

(d) The styles of the sliding panels to have a continuous extruded finger pull incorporated and the sliding panels are fitted with cill bolts housing a stainless steel shoot, locking the sliding panels together both closed and partially opened positions.

ALUMINUM WORKS (Cont'd)

Fittings (Cont'd)

A Fittings for projected top hung and side hung window light shall be as follows:

(a) Each window/light is to be hung on extruded aluminium butt hinges and are to be provided with a set of interlocking friction stay (strong enough to withstand any wind action), 1 No. budget lock and 1 No. pull handle of brass of the same finish as the aluminium frames (capable of turning down to lock).

B All ironmongery and fittings shall be of approved brand and quality. Samples of each item of ironmongery or fittings used in the work shall be submitted to the S.O. for approval.

Structural Design for Aluminium Section

C All units shall be designed to withstand loads resulting from:

i) wind pressure 87 km/h.

ii) dead loads of infill panels, etc.

iii) live loads that may be imposed, and

iv) deflection factor 1/200

Guarantee

D The Contractor shall guarantee the whole of the completed aluminiurn woks, for a period of five (5) years in respect of the following:-

(a) Against colour fading in aluminium, and

(b) Against water leakages in the glazing and as a result of poor design and faulty workmanship and in the installation of frames (i.e. heads, mullions, transome, cill etc.)

E The guarantee shall be made in favour of the Employer and shall commence upon the practical completion of the whole building, as certified by the S.O.

F Within the specified Guarantee Period, the Contractor shall replace at his own expense all items of the works which are found to be defective or faulty, and shall be responsible for making good and reinstating any damage caused to the adjacent property of the Employer and tenants due to commissioning of the rectification to defective works.

PLASTERER AND WALL TILER

Cement

A The cement shall be as previously described in "Concretor". Where coloured Portland Cement is required, use "Snowcrete" or "Colorcrete" or other similar approved equivalent. The cement shall be delivered to site in manufacturer's sealed containers and used in the order of its delivery. The cement shall be stored on boarded platforms at least 75mm off the ground and under cover. Any cement which has deteriorated or become contaminated shall not be used and must be immediately removed from site.

Sand

B The sand for plastering shall comply with the requirements of B.S. 1199: 1976 and shall be clean, sharp, fresh water river sand free from clay and other impurities and shall be washed and/or screened if required by the S.O.. Sample shall be submitted for approval by the S.O. before plastering is commenced.

Mortars Plasticisers

C The mortar plasticiser shall be of approved type and conforming to the requirements of B.S.4887, and shall be used strictly in accordance with the manufacturer's instructions.

Plastering Generally

D All materials shall be stored, measured, mixed and used in accordance with recognised good practice, as set out in B.S. 5492: Internal Plastering and B.S. 5262: "External Rendered Finishes".

E All materials shall be obtained from approved manufacturers and must be used strictly in accordance with their instructions should these instructions or recommendations conflict with anything contained here in the S.O. shall be notified and his instructions obtained before work is commenced.

F Portland cement/sand mixes for plastering and screeds shall be used within one hour of mixing No retampering will be allowed. In particular, adequate time must be allowed for one coat to dry out before the next is applied.

G All surfaces shall be thoroughly cleaned down and the surfaces of brickwork, concrete or similar materials shall be well wetted before plastering is commenced. Concrete surfaces shall be well hacked for key and joints of brickwork shall be raked out to a depth of 12mm.

Plastering Generally (Cont'd)

A Chip off excess materials, laitance, etc. and make up faces of walls, columns and beams to true planes in the rendering or plaster specified for that area, including any dubbing out necessary to build up work to true faces or levels and to fill in excessive gaps in brickwork or concrete. Dubbing out to be in the same proportions as that specified for the rendering or plaster for that area and the maximum thickness of dubbing out at any one stage shall be not more than 20mm and the next coat to be applied after 24 hours have lapsed on a well wetted surface.

B Hack back all damaged, loose or contaminated rendering and plastering and cut out all large cracks. Undercut all edges and make good fine cracks with an approved filler trowelled smooth and perfectly level with adjoining surface.

C All plastering shall be executed in a proper and workmanlike manner, with true and even surfaces, and all arises and angles shall be left perfect.

D The Contractor is to take full responsibility and allow in his prices for providing an adequate key for plastering on concrete, brick and all other surfaces. Wire brushing of timber formwork will be permitted and when metal formwork is used, hacking concrete will be allowed. The use of a retarder on formwork will not be permitted under any circumstances.

Application

E Undercoats shall be ruled between screeds at centres not exceeding 3.0 metres and brought to an even plumb finish all external and internal angles shall be true and plumb and external angles slightly rounded. Scratch undercoat to form key. Undercoat shall be prevented from drying out too quickly by wet sacking or spraying.

F Finishing coats shall be applied only after undercoats have set. Wetting of the surface will be permitted if necessary to adjust suction. Allow drying strinkage to finish before applying another coat. Finish coat shall be brought to a smooth, flat egg shell surface that does not deviate more than 3mm from a 800mm straight edge.

Metal Lathing

G The expanded steel metal lathing shall be of plain expanded type galvanised and complying with B.S. 1369: 1947 and weighing not less than 1.6 kg/m2 for internal plastering and 1.9 kg/m2 for external rendering and shall be well lapped and fixed with galvanised tying wire, all in accordance with the manufacturer's instructions.

H Bonding fluid must only be used with the approval of the S.O. Where used, the bonding fluid shall be of an approved make, and applied strictly in accordance with the manufacturer's instructions.

Cement and Sand Plastering

I Cement and sand plastering shall be composed of one part of cement to six parts of sand (by volume) with the addition of an approved plasticiser.

J The plaster, unless otherwise described, shall be applied in two coats generally to a total thickness of 20mm to walls and columns and 13mm to soffits, beams, etc. The first coat for 20mm plain face shall be 10mm rough plastering and the second coat to be 10mm finishing coat trowelled with a steel trowel internally and a wood float externally. The first coat for 13mm plain face shall be 6.5mm rough plastering and the second coat to be 6.5mm finishing coat and trowelled as above described

PLASTERER AND WALL TILER (Cont'd)

Plastering on Plasterboard

A Plastering on plasterboard shall be a single coat to 5mm thickness.

B All joints shall be filled with neat board finish plaster Reinforce all angles with jute scrim not less than 90mm wide embedded in neat board plaster

C As soon as filling work has set, apply cement and sand plaster to the thickness required.

Plastering on Metal Lathing

D Plastering on expanded metal lathing shall be in three coats to overall thickness of 20mm (to walls and columns) and 13mm (to soffits, beams, etc.).

E Prior to plastering, ensure that the metal lathing is taut and fixed with key facing upwards. All tying wire ends are to be bent inwards, and cut edges, staples and nail heads are to be painted with bitumen before plaster is applied.

Plastering Across Different Backgrounds, Open Chases etc.

F Bridge junctions with paper and expanded metal lathing of required widths securely fixed on both sides. Then, plaster as specified herein.

Cement and Sand Renderings and Screeded Backings

G Cement and sand renderings and screeded backings shall consist of one part of cement and three parts of sand (by volume) and shall be applied in one coat to the required thickness.

H Screeds are to be properly finished to receive the finishing specified. Screeds to receive tiles shall be well scratched to form key for tiles

Textured Spray Tile

I Textured spray tile finish shall be of approved manufacture, and shall be to the colours, texture and finish described or shown on the Drawings.

J Texture and finish shall be selected and agreed with the S.O. prior to commencing on the Works.

K The textured spray tile finish shall be applied by trowelling or spraying on cement and sand plaster backings which have been allowed to dry out completely, with surface free from all dust, dirt and harmful materials.

L Application shall be carried out strictly in accordance to the manufacturer's specifications.

Thickness

M The thicknesses stated for in-situ finishings, beds and backings are nominal. The Contractor is to allow for the additional thicknesses required due to structural tolerances, keying, etc.

Glazed Ceramic Wall Tiles

A Glazed ceramic wall tiles shall be approved type, quality and size as described or shown on the Drawings. Tiles shall be true to shape, free from cracks, creases and blemishes.

B Tiles shall be fixed and jointed in cement and sand mortar (1:3) to screeded backings and pointed in a neat white or tinted cement.

C All internal and external angles shall be of rounded edge fittings to bond in with tiling on each side.

D On completion, clean off all dirt, stains, etc. replace all damaged and defective tiles and leave tiling perfect for handing over.

Homogeneous Ceramic Wall Tiles

E Homogeneous ceramic wall tiles shall be of the type, quality and size as described or shown on the Drawings. Tiles shall be of selected colours and patterns, and shall be obtained from approved manufacturers.

F Tiles shall be true to shape, free from cracks, creases and blemishes.

G Tiles shall be fixed and jointed in cement and sand mortar (1:3) to screeded backings and pointed in a neat white or tinted cement.

H All internal and external angles shall be of rounded edge fittings to bond in with tiling on each side.

I On completion, cleaned off all dirt, stains, etc. replace all damaged and defective tiles and leave tiling perfect for handing over.

Building in Fitments

J Build in all bathroom accessories as shown on the Drawings or specified including cutting and fitting wall tiles all around.

Sample Panels

K The Contractor shall install sample panels of tiling or finishes for the S.O.'s approval before commencing the Works. These sample panels shall be installed at locations to be selected by the S.O.

L The sample panels, once approved, shall set the minimum standard of material, workmanship and finish to be attained in the installation of the rest of the finishes.

Making Good

M All wall tiling and finishes are to be properly made good around all pipes, conduits and the like.

N Plaster is to be continued into grooves and rebates in timber frames and finished with slightly coved internal angles against metal windows.

Protection of Completed Works

O On completion of adjacent works or other trades, the Contractor shall thoroughly clean down the completed tiling work, and attend to any defects in the painting and plasterwork.

P Provide adequate protection to prevent damage to all completed wall and floor finishes.

PLUMBER AND SANITARY INSTALLATION

Codes of Practice

A The Plumbing Works shall comply with the requirements of B S 6700, B S 5572, B S 6465 and B S 6367, subject to any qualification given below

Generally

B The whole of the plumbing installation shall be executed by a Licensed Plumber, who shall be approved by the S.O.

C All works carried out shall conform in every respect to the latest relevant by-laws and regulations of the Local Municipality and any other authorities having jurisdiction over the installation and to the complete satisfaction of the S.O.

D The Contractor shall apply for and obtain all necessary certificates and approval for works done and shall submit same to the S.O.

Materials Generally

E All materials used shall be of the best quality available and shall be in accordance with the relevant British Standard and approved by the Local Municipality and any other Authorities having jurisdiction over the installation.

F The diameter of pipes given are clear internal diameter and in all cases, the definition will apply.

Piping Installation

G All pipework used shall comply with and be installed in accordance with the regulation of the Local Authority.

H All pipes and fittings shall be thoroughly cleaned before erection. All scales, fins and obstruction shall be removed prior to installation. Piping shall be carefully arrange to give true alignment with minimum number of crossovers. Cut piping shall be reamed to remove all burrs. A clear space of not less than 50mm between the pipe or lagging and the nearest building service shall be provided for thermal expansion and correction.

I Piping connection up to and including 50mm connections to equipment shall be made up with screwed unions to permit easy removal for maintenance. Screwed joints shall be made with unions made tight without the use of wicking. Assemble pipework in such manner that does not entail making joints in restricted locations

J Run all piping generally parallel to walls and arrange piping to conform to building requirements and to suit the necessities of clearance for other mechanical ducts, flues, conduits and work of other trades.

K Run all water piping as close to ceiling of other construction as possible, free of unnecessary traps or bends.

L Where pipes pass through the roof, a 150mm long sleeve shall be provided. The Contractor shall be required to provide a watertight flashing dressing to the pipe upstand

Piping Installation (Cont'd)

A All horizontal sanitary plumbing piping shall be installed to run at uniform grade and as indicated in the following schedules:

PIPE DIAMETER	GRADIENT
32mm	1 : 40
40mm	1 : 40
50mm	1 : 40
65mm	1 : 40
80mm	1 : 40
1 00mm	1 : 60
125mm	1 : 60
150mm	1 : 80

B All vent pipes shall have a minimum grade of 1 40 unless otherwise shown on the Drawings.

C Every section of branch supply piping shall be controlled by a stop valve where it is connected into the supply main.

F Each group of fixtures shall have separate control valves. The control valves shall be located at easily accessible points.

G Piping connections under 50mm to all pumps, tanks, automatic valves and to all other speciality equipment shall be made up with unions.

H Sufficient elbows and offsets shall be provided to the piping installation to permit free expansion and contraction

I Reducers shall be used where pipe sizes change along its horizontal or vertical run.

J All open ends of piping shall be properly closed with wood or metal plugs or caps during construction, to prevent damage to threads or flanges and prevent entry of foreign matter, rags, paper, or other unwanted materials.

K All exposed, finished, polished or enamelled connections to fixtures shall be put up with special care, showing no tool marks or threads at fittings and piping. No bowed or bent piping will be permitted.

L All piping through finished rooms and corridors shall be carried in partitions, in chases, or in recesses where same are provided in the walls.

Hangers and Brackets

M Provide sufficient hangers, clamps, clips, insets, mounting devices, etc. to support all piping installed to prevent sagging.

N Install all hangers straight and true and in perfect alignment. No hangers must be located near couplings, fittings or bends in piping with due provisions made for expansion

O For risers, stacks and other vertical piping, use "U"-bolts at each level. Copper-plated clamps shall be used for copper piping.

P Where piping runs along walls, provide suitable wall type and gang type hangers

PLUMBER AND SANITARY INSTALLATION (Cont'd)

Hangers and Brackets (Cont'd)

A Hanger rods shall be threaded and fabricated from hot rolled steel and shall be of the following minimum sizes:

Nominal Page Size	<50mm	65mm - 80mm	100mm - 125mm	>150mm
Diameter of Hanger Rod	lomm	12mm	16mm	20mm

B Where pipes run in common groups they shall be supported on a common mild steel hanger bar in compliance with the following spacings:

Pipe Size	Copper Pipe	Galvanised Mild Steel Pipe
Up to 25mm	1800mm (Max.)	2400mm (Max.)
32mm to 50mm	2400mm (Max.)	3000mm (Max.)

Sleeves, etc.

C Where required, form sleeves through brick or concrete walls and concrete floors made of similar tubing and of the minimum diameter to allow free movement. Alternatively sleeves may be fabricated from 18 gauge galvanised mild steel sheets. Properly build sleeves into wall and floor of equal length to total finished thickness of wall or floor.

D Sleeves shall give 3 - 5mm clearance around pipes and shall be filled with an inert compressible rot and fire resistant material.

Pipe Joints

E Joints shall be made in piping as follows:

(a) Copper Piping

Sanitary Work) Silver soldered
) 2% silver

Hot and Cold Water Service Pipe) 5% silver
Vent Pipe) 2% silver

(a) Cast Iron Piping

Soil and Vent Pipes) Joints shall be
) lead caulked

(b) Unplasticised P.V.C. Piping

Soil Pipes, Stacks, Vent Pipes) Joints shall be either
) by the non-heat application
) method or as per manufacturer's
) instructions

Jointing of Pipes to Fittings

A When making pipe joints, the following procedure shall be followed:

(a) Ensure pipes are clean internally and undamaged.

(b) Cut pipe square with sharp tools.

(c) File/ream cut ends and finish smooth.

(d) Re-round any deformed ends.

(e) Ensure pipe ends enter fittings and sockets to full depth of jointing area (Note:- Push fit joints shall be slightly withdrawn for approximately 5mm).

(f) Assemble pipework in a manner that does not entail making joints in restricted locations.

(g) Leave external vertical rainwater pipe socketed joints open unless otherwise specified. Centralised each metal pipe spigot with three lightly wedged pieces of hardwood or folded lead.

Capillary Joints

B Jointing of copper pipes to capillary fittings shall be as follows:

(a) Abrasively clean pipe with steel wool or sandpaper. Clean soldering area of fitting.

(b) Lightly flux and insert fully into fitting.

(c) Heat fitting evenly until complete capillary solder ring appears, using solder ring fitting or applying end-feed solder as appropriate.

(d) Leave undisturbed until cool and remove all flux.

Screwed Joints to Steel Pipes

C Make screwed joints to steel pipes with suitable sockets and fittings as follows:

(a) Cut threads using sharp dies producing clean cut tapered screw ends of adequate length.

(b) Remove any swarf and apply linseed oil based paste and hemp.

(c) Ensure that no jointing material enters the pipe. Tighten joints to obtain a watertight seal.

(d) Clean and prime any thread left exposed.

Flanged Joints

D Flanged joints shall be carried out as follows

(a) If pipes are not provided ready flanged, obtain approval from S.O. for brazing, welding or otherwise jointing pre-drilled mating flanges to pipes.

(b) Using specified gaskets or joint rings, tighten the flange bolt nuts progressively in opposing pairs until the jointing is sufficiently compressed to obtain a watertight seal.

PLUMBER AND SANITARY INSTALLATION (Cont'd)

Rigid Joints in Socketted Cast Iron Pipework

A Traditional caulked lead joints shall be made as follows:

(a) Form a gaskin of dry jute yarn and caulk into the bottom of the socket to centralise the spigot and seal the bore from lead/water contact.

(b) Fill the remainder of the joint space with molten lead or cold lead in fibrous form.

(c) Thoroughly caulk and consolidate the lead with a 1 5 kg (min.) hand hammer or powered hammer of equivalent force.

(d) Finish the joint 3mm inside the socket.

Joint in Plastic Pipes

B Comply with the following conditions when making joints in plastic pipes:

(a) Use the fitting and jointing methods recommended by the manufacturer of each type of plastic pipe.

(b) Use the recommended adaptors when jointing to pipes of different materials or to appliances.

(c) Make provision for thermal movement. At push-fit joints, push the pipe fully in and slightly withdraw (about 5mm). Use slide-fit pipe brackets at suitable spacings.

(d) Obtain approval before making any joint or using any fitting not included in the manufacturer's range.

Bends in Pipework

C Do not bend galvanised pipes. Do not bend other pipework unless such bends are specified by manufacturers as suitable for site bending.

D Site bends or offsets, if approved, shall be made on pipe-bending machines.

E Any pipe found with corrugated or flattened walls or other evidence of stress shall be rejected.

Pipe Cutting

F All pipe lengths shall be cut and threaded with standard pipe cutting and threading machine with both ends reamed and cleaned before assembly.

Cast Iron Soil and Ventilating Pipes

G The cast iron soil and ventilating pipes and fittings installed above ground shall comply with the requirements of B.S. 416. Pipes shall be coated with an approved tar-based composition. The pipes shall be of heavy grade fixed with stout cast iron holderbats built into the wall or with steel brackets where the pipes are suspended from concrete floor on beams. All joints shall be made with gaskin and molten lead well-caulked.

H All cast iron pipes and fittings installed underground shall conform to B.S. 437 or 1211 Class "B".

I Cast iron rainwater goods shall generally comply to the requirements of B.S. 460. Cast iron roof outlets and fittings shall be proprietary products complying to B.S. 416.

Galvanised Mild Steel Pipes

A Galvanised mild steel pipes and fittings shall be of the respective grades complying with there requirements of B.S. 1387 and shall be jointed with an approved proprietary jointing compound together with grummets or a few strands of fine hemp. Compound containing lead shall not used. Any thread exposed after jointing shall be painted to prevent corrosion.

B Galvanised mils steel waste pipes shall generally be medium grade quality.

Unplasticised P.V.C. Pipes

C Unplasticised P.V.C. pipes and fittings for water supply shall comply with the requirements of B.S. 3505 Class "D". All pipes shall be chased and concealed in brick wall where possible. All jointing and fixing shall be in accordance with the manufacturer's instructions.

Unplasticised P.V.C. Pipes (Cont'd)

D Unplasticised P.V.C. pipes, fittings and accessories for soil and ventilating pipes above ground shall generally conform to B.S. 4514. Underground pipes and fittings shall generally comply with the requirements of B.S. 4660. Jointing of pipes shall be by elastometric sealing rings or solvent welded.

E Unplasticised P.V.C. rainwater goods and gutters generally comply with the requirements of B.S. 4576 (for external pipes) and B.S. 4514 (for internal pipes).

Copper Pipes

F Hot water service pipes shall be light gauge copper pipes to B.S. 2871: Part 1, Table X, suitable for connection by means of compression fittings or capillary fittings. Compression and capillary fittings shall comply to the requirements of B.S. 864.

Stopcocks and Valves

G Provide and fix brass high pressure full-way screw down stopcock/valves of similar diameter to the pipe to be controlled. Stopcocks and valve shall comply with the requirements of B.S. 1010 and shall be positioned at the points:

(i) at the beginning of each branch from the rising main and at the inlet to each water storage tank

(ii) on each outlet pipe leaving water storage tanks

(iii) on branch piping to a fitting or group of fittings

(iv) on the rising main (at meter chamber) before it enters the building

(v) on supply pipe to cisterns.

H Float operated equilibrium ball shall comply to the requirements of B.S. 1212. Ball valves should be appropriately sized and provided at water storage tanks for control of the flow of water into the tank.

I Copper floats, where used, shall comply with the requirements of B.S. 1968.

Traps

J Traps to sinks, baths, etc. shall be anti-siphon type made of non-corrosive materials. Trap for basin shall be P.V.C. bottle trap complying with the requirements of B.S. 3943 unless otherwise stated.

PLUMBER AND SANITARY INSTALLATION (Cont'd)

Bib and Pillar Taps

A Provide and fix bib or pillar taps to basins, sinks as indicated. All fitments shall be in chromium plated brass with easy clean shield, crutch or capstan head complying to B.S 1010 with screwed tails for coupling.

B Bib taps shall be secured by means of back plate elbow screwed to walls or tees.

Water Tanks

C Provide and fix tanks of the type and required nominal capacities described shown on the Drawings. All water storage tank shall be supplied complete with covers and shall be treated internally and externally with non-toxic paint where required.

D Tanks shall be located and installed in such positions as shown; access for inspection and maintenance shall be provided.

E Tanks shall be rigidly supported to avoid any possible stress to the connected pipework.

F Provide tight fitting covers to tanks to exclude vermins.

Connection to Sanitary Appliances

G The Contractor shall perform all necessary cold and hot water pipe connections to all sanitary appliances, fixtures and equipment either supplied by him or by others

H All connections shall be made in such manner that as much pipework as possible is concealed. All portions of connections exposed to view shall be chrome-plated except those in the plant room areas.

Supply and Installation of Sanitary Fittings

I The Contractor shall supply and fix the sanitary fittings in accordance to the "Schedule of Sanitary Fittings" or as described or shown on the Drawings. Sanitary ware shall generally be brand, range and colour specified and obtained from approved sources

J Sanitary fittings shall be installed complete with all necessary plugs, screws, brackets and other fixing accessories necessary to adequately secure sanitary fittings to walls and floors and connecting to waste, vents and services as required. Attend upon all trades including cutting away and making good as required.

K Valves, waste fittings and shower arms, etc. are to be chromium plated unless otherwise described. Waste fittings are to be provided with plug and chain. Wash hand basins are to be chromium plated accessible traps with a 75mm seal.

L All flushing cisterns are to be with brackets for screwing to wall and with chain operated flush pull. Cisterns are to be supplied with ball valves, floats and overflow fittings. Cisterns shall bethoroughly cleaned before filling with water

M Take every precaution in protecting the various sanitary fittings and accessories once they have been installed and wrap every fitting with building paper, or protect using other approved method to ensure that fittings are not used during the progress of the work up till handing over

N Just before completion of the work, remove such protective wrapping and clean all surfaces for handing over.

Gully Traps, Floor Traps, etc

A Provide where shown on the Drawings approved gully traps of the type and size specified with side inlets and outlets complete with hinged cover grating. Make all necessary connections to pipework.

B Provide where shown on the Drawings cast iron floor traps of the specified diameters. Each outlet shall have a chromium plated removable cover and properly connected to the waste piping.

C Provide galvanised mild steel wire balloon grating to top of all soil and vent pipes and rainwater pipes.

Inspection and Cleaning Eyes

D Inspection and cleaning eyes shall be provided to soil, waste and vent pipes at branches and bends to provide access for proper inspection and cleaning of the system. Inspection and cleaning eyes shall also be provided at the foot of each stack just above the floor level.

Testing and Connection to Mains

E Test each installation in progressive stages, and before any plumbing work is concealed. Ensure that all pipes are unobstructed, and block pipes and outlets where necessary with expanding rubber or other suitable stoppers forming airtight seals.

F The plumbing and sanitary installation shall be completely tested after installation to the satisfaction of the S.O. and the Local Authorities. On completion of the plumbing installation, test all fittings and piping, make good all defects and leave everything in perfect working order.

G All tests shall be made in the presence of the S.O., or his representatives and the plumbing inspector of the Local Authority having jurisdiction. Prior notice should be given to parties concerned prior to testing.

H All tests shall be maintained for a length of time adequate for careful checking to be carried out and shall be in no event, less than three (3) hours. Test shall be repeated until all installations have been approved.

I All leaks and "sweating" located shall be corrected with new materials. On no account will caulking be accepted.

J After all fixtures have been completely set and connected, check and adjust the various supply valves, fittings, fixtures, etc., in order that proper delivery of water is obtained at all points

K Before handing over of the completed works, make such additional adjustments as may be necessary to deliver the complete installation in proper working condition.

L Allow for jointing and connecting to main water supply and sewer lines. Arrange for all Local Authorities inspection and tests, and pay for all fees in connection therewith.

GLAZIER

Glass Generally

A All glass shall be of the best quality conforming to the requirements of B.S. 952 or other equivalent and approved standard. Glass shall be clean cut, without edge faults and shall be free from bubbles, specks and other defects. Samples shall be submitted for the approval of the S.O. before the glass is fixed in place.

B All glass shall be delivered in proper containers with the maker's name, guarantee, type of glass and thickness or weight of glass attached to the outside of the containers.

C Glass on site should be stored in a dry, sheltered and ventilated location. It should be stored in racks in near vertical position, with means to secure the glass against wind loading. Ensure that glass is dry before stacking. On no account should glass be stored leaning or standing against materials which might damage the edges.

Preparation of Frames and Glass

D The following installation guide lines shall apply in respect of glazing:

(a) All glass rebates shall be square, plumb and true in plane, clean, dry and dust free.

(b) All frame adjustments shall be made prior to glazing.

(c) All glass edges shall be clean, cut to exact size, allowing expansion tolerances as recommended by the glass manufacturer.

(c) Glass having chipped or damaged edges of any sort shall be rejected and replaced.

(e) All sashes shall be glazed in a closed position and not opened until the compounds are set.

(f) Glass shall be pre-drilled for holes or shaped prior to installation.

(g) All materials shall be handled, stored and used in strict accordance with the manufacturer's instructions.

Clear Sheet Glass

E All clear sheet glass shall be of "Selected Glazing Quality" of the weights as required.

F Unless otherwise stated all clear sheet glass panels to doors or casement windows shall be 6mm thick.

G Glass louvres blades shall be 5mm thick cut to 150mm widths.

Obscured Glass

A Obscured glass shall be the narrow reeded and rough cathedral type and of a quality approved by the S.O.

Clear Float Glass

B All clear float glass shall be in either the monolithic or laminated form. The monolithic and laminated clear glass shall be installed in the partitions at the locations scheduled in the Drawings.

C The monolithic glass shall consist of one homogeneous sheet of clear glass of 6mm nominal thickness whilst the laminated glass shall be made up of 2 sheets of clear monolithic glass, each of approximately 3mm thickness, with a single piece of clear vinyl butyral interlayer sandwiched in between the sheets to give an overall nominal thickness of 6.5mm.

D Both the monolithic and laminated clear float glass shall possess optical and thermal properties no less inferior than those stipulated in the table below :

Type	Nominal Thickness	Light Transmission	Total Solar Heat Elimination	Shading Coefficient
Monolithic Clear	6mm	87%	16%	0.97
Laminated Clear	6.5mm	88%	18%	0.94

Tinted Float Glass

E Tinted glass shall be of two types, namely body-tinted and laminated-tinted, with the type for a particular application to be in accordance with the Drawings or as described.

F The body-tinted glass shall be a monolithic float glass that has been integrally tinted throughout the thickness of the glass. The lamination-tinted glass shall consist of 2 sheets of clear monolithic float glass, each of approximately 3mm thickness, with a single lamination of a neutral tinted vinyl butyral interlayer bonded between the sheets.

G The body tinted glass shall be of 6mm nominal thickness and the lamination tinted glass shall be of 6.5mm nominal thickness with both types possessing optical and thermal properties equal to or better than those stipulated in the following table.

Type	Nominal Thickness	Light Transmission	Total Solar Heat Elimination	Shading Coefficient
Body-Tinted	6mm	41%	40%	0.69
Lamination-Tinted	6.5mm	55%	31%	0.80

Wired Glass

H Wired glass shall be clear/transparent georgian wired glass with square 12mm mesh fabricated from steel wire, electrically welded at each intersection.

I Glass shall be supplied in the thicknesses described or shown on Drawings, and installed at the locations required.

GLAZIER (Cont'd)

Glazing Methods

A All glass shall be neatly cut to fit the rebate or channel of the frame in which it shall be housed Glazing shall be with putty fronting, bead glazing with putty or with an approved type of black P.V.C. rubber gasket or a combination of continuous setting and spacing blocks of black neoprene rubber which shall be capped with an approved type of silicone rubber sealant. Cut all glass and perform all edge and surface treatment at glass works.

B Putty fronting in glazing to wood and metal frames shall be an approved tropical putty and shall only be used where the frames and glass are subject to minimal movement. Bead glazing using putty shall only be applied in frames where frame and putty can be painted and where the frame is subject to minimal movement. If putty thicker than 1.5mm are used for glazing distance pieces shall be incorporated to accommodate wind loading during setting of the putty.

C Putty shall be allowed to set for at least 7 days prior to painting.

D Glazing to aluminium partitions and window units shall generally be with P.V.C rubber gasket or neoprene rubber setting and spacing blocks with a capping of silicone rubber sealant. The interface between the spacing block and the silicone rubber sealant shall be separated by a thin strip of an approved type of a non-staining closed-cell polyethylene foam or release paper to prevent adhesion of the sealant to the spacing block.

E The neoprene rubber for both the setting and spacing blocks shall have a durometer hardness of 800 - 900 and shall be formulated to conform with the provisions of B.S. 4255: Part 1 or other equal and approved standard.

F Where metal frames are used to house the glass, there shall be no glass to metal contact at any point around the glass panel.

G The glass shall be fixed to the frame in the manner recommended by the glass manufacturers, particularly in respect of glazing clearance, edge cover and condition, spacing and size of the setting and spacing blocks, and compatibility of the glazing sealant with the vinyl butyral interlayer in the case of laminated glass.

H Prior to installation, the Contractor shall verify all dimensions on site to ensure proper fit and shall assume full responsibility in regard to the correct sizes. Any improperly fitted glass shall be replaced or reset to the S.O 's satisfaction at the Contractor expense.

Wood and Metal Beads

I Glazing beads shall either be wood, metal or other suitable materials. Beads shall be attached to the frame by clips or screws.

J Solid timber beads must be bedded to the frame using gun grade sealant or other approved method when used for external glazing.

Exposed Glass Edges

K Where glass edges are exposed which are not specified to be polished i.e. louvre blades, these edges to be carefully rubbed down with carborundurn stone and finished smooth to the touch.

Sand Blasting

L Sand blasting to achieve desired surface texture and patterns on clear float or tinted float glass shall be carried out by approved methods, to the approval of the S.O.

Cleaning

A On completion, all glass shall be cleaned both sides and any broken, cracked or defective panes shall be immediately replaced.

B Regular cleaning of glass shall be carried out to prevent discolouration and deterioration of the glass surface.

C After installation, should glass become stained by plaster, mortar or concrete spillage, these materials should be removed when wet. If damage is caused to the glass, the glass shall be replaced at no extra cost.

D Provide protective sheeting to all installed glazing if necessary.

Glass Blocks

E Glass blocks shall be of approved manufacture and supplied in sizes and patterns described or shown on the Drawings.

F Samples of the glass blocks shall be submitted to the S.O. for approval prior to commencing on the Works.

G Glass blocks shall be laid butt-jointed in cement and sand mortar (1:4). Before laying the first course of glass blocks, apply two coats of bitumen emulsion or heavy coat of asphalt emulsion to the receiving base. Each panel of the glass blocks shall have a clearance of 13mm at sides and top with the surrounding structure. The clearance shall be filled with non-hardening compound and finished as detailed on Drawings or approved by the S.O.

H Provide all panel anchors, reinforcement, expansion bolts and other necessary accessories for proper completion of the Works in accordance with details shown on the Drawings.

I Approved expanded metal strip reinforcement shall be provided at every fourth course. All joints between blocks shall be pointed with white cement. Exposed areas of non-hardening compound shall be painted to match surrounding structures.

PAINTER

Codes of Practice

A Painting shall comply with the requirements of B.S. 6150 subject to any qualifications given herebelow.

Paints Generall

B All distempers, emulsion paints, primers, paints and protective coatings shall be type and brand described or shown on the Drawings

C The materials for painting shall be delivered to the site in the original sealed containers and shall be used strictly in accordance with the manufacturer's instructions. They shall be carefully stored to minimise exposure to extremes of temperature.

D Cement based paint shall be of approved type and mixed and applied strictly in accordance with the manufacturer's instructions.

E Knotting shall be in accordance to B.S. 1336.

F Varnishes, stains, wax polish for wood surfaces shall be an approved brand applied strictly in accordance with the manufacturer's instructions.

G Silicone based water repellents shall conform to B.S. 3826 Class "A" and shall be a brand approved by the S.O.

H The colours and tints of paints shall be selected by the S.O. and the priming, undercoats and finishing coats shall be differing tints as directed and shall be obtained from the same manufacturer.

I Each coat of paint shall be properly dry and be well rubbed down with glass paper before the next coat is applied

J All paints, varnishes, distemper and other surface coatings delivered to the site shall be labelled clearly by manufacturer; the label or decorated container stating:

(a) Type of product.

(b) Brand name, if any.

(c) Use for which it is intended, i.e. primer, undercoat or finishing coat.

(c) Manufacturer's batch number.

N.B.:- The label shall be a PRINTED label, type written labels will NOT be accepted.

Workmanship and Application

K All painting shall be carried out in accordance with the requirements stipulated under B.S.6150: 1982 - "Code of Practice for Painting of Buildings".

L None other than skilled workmen shall be employed. A properly qualified foreman shall be constantly on the job whilst the work is proceeding.

M Work is a sequence to insure that the finished work is not spoiled by dust and debris arising from subsequent preparatory work.

Dust Sheets

A An ample supply of clean dust sheets to provide adequate protection of floors, fixtures and surfaces not to be painted shall be provided by the Contractor at all times during the execution of the painting works.

Stoppers and Fillers

B Stopping for plasterwork shall be an approved water mixed powder type based plaster filler.

C Fillers for exterior woodwork shall be on approved white lead paste to fill wood grain or fine surface imperfections on wood to give a smooth base for finishing coats.

Priming Woodwork

D All bare woodwork surfaces shall be primed with primers conforming to B.S. 5082 or 5358.

E Woodwork which is to be painted shall be thoroughly cleaned to remove dirt, grease, etc.rubbed down and sanded smooth and dusted off. All cracks, crevices on wood surfaces shall be made good with approved fillers and rubbed down to an even, smooth surface. All knots in woodwork shall be treated with a solution of shellac to prevent bleeding. Large or loose knots shall be cut out and replaced with sound wood or cut back and the surface made good with fillers.

F Dry, unprimed timbers arriving on site must be primed as soon as possible with the end grain given a double coat. On-site priming is to be carried with the use of a brush.

G Woodwork shall not be left longer than 6 months without being given a further primer or undercoat and gloss.

H All joinery timbers shall be primed before assembly and fixing.

Priming Metalwork

I All metalwork before fixing shall be thoroughly cleaned down to remove all dirt, grease, scale and rust by wire brushing, scraping, grit abrasion, and pickling or other means, and the surface shall then be primed immediately with an approved metallic primer. Primed steelwork shall be given a further primer or a protective coat as soon as signs of rusting appears.

J Galvanised metal surfaces to be painted must be etched by chemical treatment or primed with a special primer, like zinc-chromate or other approved, applied strictly in accordance with the manufacturer's instructions.

Application

K All paints shall be thoroughly mixed in accordance with the manufacturer's instructions before applying, unless there are specific instructions to the contrary.

L All primers shall be applied by brush. Subsequent coats may be applied by brush, spray gun or roller, as directed by the S.O. Surfaces must be free from condensation, and dusted or wiped to ensure freedom from dust or dirt.

M The recommendations of the manufacturer shall be strictly adhered to, even in cases where such directions may be at variance with this Specification.

N The Contractor shall ensure that any guarantee of quality given or implied by the manufacturer shall not be rendered void through the incorrect use of his product.

PAINTER (Cont'd)

Application (Cont'd)

A Painting shall not be started until preparatory work has been completed to the satisfaction of the S O., or his authorised representative. No paint shall be applied to materials (wood, plaster, concrete, etc.) having excessive moisture content.

B No subsequent coats of paint shall be applied until the previous coat have dried or hardened, and been similarly approved, except insofar as is necessary to comply with the manufacturer's specific recommendations as to the correct interval between coats.

C No exterior or exposed painting shall be carried out under adverse weather conditions such a extremes of temperature, rain and fog.

Colours and Trial Areas

D All colours and finishes are to be selected or approved by the S.O. The Contractor shall provide for preparing patterns or trial areas on the site for the S.O.'s choice and selection.

Painting Internal and External Plastered Surfaces

E Surfaces of painting shall be clean and dry. Any efflorescence shall be removed by first wiping with a dry coarse cloth and then with a damp cloth. The surfaces shall then be left for 48 hours to ascertain if further efflorescence has ceased.

F The surfaces shall be cleaned to remove dust, dirt and plaster splashes.

G Cracks and other imperfections shall be stopped or cut out and made good with a suitable sand/cement mixture. Such patching work shall be allowed to dry out thoroughly before painting.

H When the surfaces are thoroughly dry, and having been inspected and approved by the S.O. as being ready for painting, apply by brush direct to all internal and external plastered surfaces one coat of a plaster sealer. This shall be followed by two coats of an approved type of first quality emulsion paint on internal plastered surfaces and two coats of an approved type of cement paint on all external plastered surfaces. Such applications shall be in accordance with the manufacturer's instructions.

I Allow at least 4 hours interval between completion of the first coat and application of the second coat.

Painting Metal Surfaces

J All metalwork before fixing shall be thoroughly cleaned down to remove all dirt, grease, scale and rust by wire-brushing, scraping or other means. the surfaces shall then be rubbed down and the primer as specified shall be applied immediately. When the primer has thoroughly dried and has been inspected and approved, apply two undercoats and one finishing coat of high gloss enamel paint. Allow at least 24 hours drying time under normal weather conditions between application of each of the coats.

Painting Galvanised Metal Surfaces

K All galvanised metal surfaces before fixing shall be thoroughly cleaned down to remove all dirt, grease, scale and rust by wire brushing, scraping or other mean. the surfaces shall then be etched by chemical treatment and then primed with an approved primer such as zinc chromate. When the primer has thoroughly dried, apply one undercoat and one finishing coat of high gloss enamel paint. Allow at least 24 hours drying time under normal weather conditions between application of the coats.

Painting Coated Cast Iron Pipes

L All exposed coated cast iron pipes such as rainwater pipes, ventilating pipes, soil and waste stacks shall have one coat of metallic primer, one undercoat and one finishing coat of high gloss enamel paint. Time between the coats shall be as specified above.

PAINTER (Cont'd)

Prime Backs of Frames

A All backs of door and window frames in contact with brickwork or concrete shall be treated with one coat of aluminium wood primer before fixing.

Painting Wood Surfaces

B Where indicated in the Drawings or scheduled, wood surfaces to be painted shall first be primed as described in the preceding Clauses. The primed surfaces shall then be painted with two undercoats and one finishing coats of high gloss enamel paint. Each undercoat shall be rubbed down with fine glass paper when thoroughly dry before applying the next coat.

Stain and Varnish to Wood Surfaces

C Where indicated in the Drawings or scheduled, unpainted wood surfaces shall be stopped with an approved filler and tinted to match the timber colour. it shall then be rubbed down with fine glass paper to an eggshell finish and applied with two coats of approved stain and coated with flat varnish.

Marine Varnish to Ramin Boarding

D The ramin Boarding shall be stopped with an approved filler and rubbed down with fine glass paper to an eggshell finish. Thereafter three coats of marine varnish shall be applied directly to the Boarding with a break of 12 hours between application of the first and second coats. The Boarding shall not be stained.

Maintenance and Renovation of existing Painted Surfaces

E All paint in good condition shall be washed with soap or detergent, rubbed down with wet abrasive paper, rinsed and allowed to dry

F Loose or defective paint shall be removed by sanding, scraping and abrasion or other appropriate means. Burning off by blowlamps shall only be used where safe and skilled workmen. No burning shall be carried out near glass or fine furnishings. paint removers to B.S. 3761 shall be used and all residues carefully removed by white spirit or water as appropriate.

Maintenance and Renovation of Existing Painted Surfaces (Cont'd)

G All base timber surfaces shall be primed as before stipulated. Decayed timber shall be cut out and replaced by preservative treated compatible wood. Small area may be repaired using an approved hard stopper. If decay of old woodwork is considered likely, a paintable preservative solution shall be applied liberally and left to dry for at least 48 hours prior to applying the primer. All cracks, splits and defects shall be made good by and approved hard stopping. On no account shall powder fillers be used on exterior surfaces. The hard stopping shall then be rubbed down to a smooth level surface.

H All old loose and defective putty shall be hacked out, the rebate cleaned, primed and refilled with linseed oil putty or metal casement putty as appropriate.

I All sound paintwork on steel surfaces shall be cleaned with white spirit if greasy and water if dirty. Corroded area shall be cleaned to bare metal by wire brushing and/or abrasion and wiped clean with white spirit, followed quickly by the application of the primer coat. The first protective coat shall be applied as soon as the primer is dry.

J Loose and defective paint on plastered surfaces, efflorescence, fungi, lichen and moss shall be removed by water jet blasting where practicable. Wire brushing may be carried out if necessary. All defective plaster shall be cut out and made good with plaster of similar type. All repaired work shall be allowed at least two weeks to dry out prior to application of emulsion or cement paint.

EXTERNAL AND INFRASTRUCTURE WORKS

Generally

A The relevant clauses under the sections for "Excavator", "Concretor", "Bricklayer", etc in this Specification shall equally apply here.

Primary Stormwater Drainacie a d Culverts

Drainage Generally

B The whole of the drainage works shall be carried out in accordance with the relevant Bye-Laws and tested to the satisfaction of the S.O. and Local Authority

Excavation for Trenches, etc.

C Excavation for trenches shall be to straight lines and gradients required for the pipes and beds as specified. The trench shall be of minimum width to allow adequate working space for the proper construction of joints and compaction of backfill around the pipe.

D In all pipelines the Contractor will be expected to reduce the width of the trench at formation level to the width of the cross section specified.

E Before any excavation commences and throughout the period of construction, each drainage sump centre shall be set out and marked by a centre peg and three triangular peg markers situated outside the working area.

F The levels are to be set out and inverts referred to protected level pegs near each drainage sump and change of grade or line. Properly painted black and white slight rails, 2.50m long, are to be fixed and maintained at the changes of grade or line and not more than 60 metres apart.

G Strongly constructed, clearly painted boning rods shall be provided at each length where work is in progress. Such boning rods shall be designed to show the pipeline invert level below the sight rails.

H When excavation is completed and before any further work commences, wooden pegs are to be driven into the formation at not more than 3.65m centres, the level of each peg being adjusted to the proposed pipe invert by the use of the sight rails and boning rods.

I Excavation for structures and culverts shall be to the line and levels in accordance with the Drawings, and all excavated spoil shall be deposited in approved dumps. Backfilling shall only be carried out after the drains or structures have been correctly constructed and approved by the S.O.

J When the formation consists of both soft and hard materials, the foundation shall be so prepared as to make it as uniform as possible, without abrupt changes from hard to soft materials. Hard materials shall either be excavated below grade and replaced with suitable fill material or the entire foundation excavated at lest 300mm below formation and replaced with suitable uniform material or concrete as directed

K Where rock is encountered in drains or drainage structures, these shall be removed to the required depth and widths

L The sides of pits and trenches shall be adequately supported at all times Alternatively except where the Contract expressly requires otherwise they may be suitably battened. Trenches and pits shall be kept free of water

M All excavated materials from such excavations not required for refilling shall be disposed as directed by the S O

Primary Stormwater Drainage and Culverts (Cont'd)

Excavation for Trenches, etc. (Cont'd)

A The bottom of all excavations shall be levelled carefully and stepped or benched horizontally as shown on the Drawings or as required by the S.O. Any pocket of soft material or loose rock in the bottoms of pits and trenches shall be removed and the resulting cavities and any large fissures filled with concrete grade C1 5P, sand or other approved fill material. After the placing of any blinding concrete required by the contract, no trimming of the side faces shall be carried out for 24 hours.

B The Contractor shall at his own expenses make good with concrete any over-excavation at or below the bottom of foundations or any additional excavation to remove foundation material which the Contractor allows or causes to become disturbed.

C Unless otherwise shown on the Drawings or directed by the S.O., all filling for this purpose shall consist of selected excavated material deposited and compacted in required layers and by approved plant as specified.

D Timber sheeting, piles and other excavation supports shall be carefully removed as the filling proceeds except where they are required by the S.O. to be left on position but the removal of such supports will not relieve the Contractor of his responsibilities for the stability of the works.

Setting Out Drainage Works

E The Contractor shall be responsible for the proper setting out of all primary stormwater drainage and culverts to the satisfaction of the S.O., on completion of the embankments and platforms.

F Unless otherwise directed by the S.O., the setting out works shall include the following

(a) Demarcation of the reserve with boundary pegs at not more than 30 metres intervals and at turning points.

(b) Setting up of permanent bench marks at suitable sites to the requirements of the S.O.

(c) Setting out clearly the lines and levels of the cut including sight rails and boning rods.

G The Contractor shall give the S.O. at least 24 hours prior notice in writing when he intends to set out or fix levels for, any part of the drainage works, to enable the S.O. to arrange for checking the same. Execution of work shall be suspended during the checking and the Contractor shall carefully preserve any marks made by the S.O. The setting out of the drainage works shall be completed at least 2 weeks in advance of the commencement of the relevant portion of the works. This requirement is to be strictly observed so as to afford sufficient notice for inspection by the Authorities concerned.

Bakau Piles/Temporary Works

H Where directed by the S.O., bakau piles or hardwood sheet piles or shoring shall be driven along the toes and or slopes of embankments where these are unable to stand without support.

I Bakau piles shall be as described under "Piling" section of this Specification.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Primary Stormwater Drainage and Culverts (Cont'd)

Existing Drainage Paths and Water Courses

A The Contractor shall execute the works by such method or in such order to ensure that existing drainage paths or other water courses shall not be obstructed before the construction and completion of such permanent or temporary diversion works as are provided for in the Drawings and this Specification or as the S.O. may order as the works proceed

B The Contractor shall ensure that the natural water course is not obstructed during execution of the Works and shall be required to provide silt traps where necessary to prevent loss of earth from exposed cuts or fills during rainfall. Silt traps shall be built to the lines and levels to suit each site and these may be required to be raised at the instruction of the S.O.

C All trenches and excavations shall be backfilled within a reasonable time after the pipes, drains are installed and approval is given by the S.O. to backfill, unless other protection of the works is directed.

D The backfill material around the pipes shall be either sand obtained from an approved source or selected material free from large rocks, hard lumps, sods, cinders, tree stumps or other organic matter.

E Where material excavated from the trench is not considered suitable by the S.O., selected material from other source shall be used for backfilling.

F The Contractor shall provide an earth cover of at least 1200mm over the crown of the pipe before heavy equipment is allowed to be driven over it.

G Backfilling shall be carried out in layers not exceeding 150mm in thickness with approved soil and rammed with mechanical hammers uniformly from both sides and to the satisfaction of the S.O.

H After the backfilling is completed the Contractor shall remove all excess spoil to suitable areas or as directed by the S.O

Stormwater Drains

I Stormwater drains shall be constructed of precast concrete half-round inverts or "V"- shaped channels to the sizes and depths as shown on the Drawings

J Plain and reinforced precast units shall be in concrete grade C20P as shown on the Drawings unless otherwise elsewhere stipulated. The drain channels shall be reinforced with fabric reinforcement as required.

K Precast units shall be handled at the prescribed points and bedded or otherwise fixed in their final positions as instructed

L Drain channels shall be laid, bedded and jointed in cement mortar (1:3) with all joints grouted to a smooth flush surface

M A layer of concrete grade C15P bed of the thickness shown in the Drawings shall be laid before the unit is placed in position. Any precast unit deviating more than 3mm from line and level at either end shall be made good by lifting and relaying at no extra cost

N All joints and voids shall be filled with lean concrete or cement grout

Primary Stormwater Drainage and Culverts (Cont'd)

Stormwater Drains (Cont'd)

A No immediate loading or backfilling will be permitted around the precast units until the S.O.'s approval is obtained.

B All precast units shall conform to the shapes and dimensions shown on the Drawings. All edges shall be clean and sharp and the wearing surfaces shall be true and free from any winding. On being fractured the interior shall present a clean and homogeneous appearance.

C Precast units shall not be removed from the moulds or erected until sufficiently matured to ensure that no damage shall be done to the unit. The S.O. may require the Contractor to mark or stamp the date of casting on the precast units before delivery to the Site.

D Any precast unit found cracked or damaged during, before or after erection shall be removed from the site and immediately replaced at the Contractor's expense.

E The stormwater drains shall be raised to the required plot levels on one/both sides with common brickwork or limestone rubble revetment walls to the thicknesses as scheduled on the Drawings.

F The limestone rubble revetment walls shall be constructed of random sized limestone aggregate laid jointed and pointed in cement mortar (1:3). sample panel shall be constructed for the approval of the S.O. prior to commencement of works on drain walls.

G Weepholes constructed of 75mm diameter P.V.C. pipe sections, or other approved material, shall be provided to all rubble or brick revetment walls at 1800mm (minimum) centres, as shown on the Drawings or as directed.

Drain Covers and Gratings

H Provide precast reinforced concrete grade C20P drain cover slabs of the size and thickness described or shown on the Drawings. Drain cover slabs shall be reinforced with mild steel rod reinforcements and bedded over drains at areas where shown.

I Where gratings are required, these shall be heavy duty type constructed of mild steel to the details and dimensions shown on the Drawings and painted with two coats of approved rust resistant paint.

Culverts

J All precast pipes and culverts shall be "Hume" or other equal and approved spun reinforced concrete pipes of the grades stated Pipe diameters shall be as described or shown on the Drawings.

K Cutting of pipes shall be carried out by approved type of wheel cutter except for small diameter concrete pipes, the S.O. may approve the cutting of pipes with a hammer and chisel provided a competent operator capable of making a neat true cut is employed.

L All pipes and specials shall be sufficiently protected by approved means to prevent damage occurring during transit or storage.

M Each batch of pipes supplied shall be accompanied by the manufacturer's test certificates for compliance with tests specified in the relevant British Standard In the absence of such certificates the Contractor will be required to arrange and carry out at his own expense all the appropriate tests on samples from each batch as required to the satisfaction of the S O

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Primary Stormwater Drainage and Culverts (Cont'd)

Culverts (Cont'd)

A Loading or unloading, pipes or castings must be handled by approved lifting tackle. Unloading by rolling down planks or any other form of inclined ramp will not be allowed. Pipes are to be carefully stacked on site with timber packings under and between the pipes.

B No pipes may be used in the work without the approval of the S.O. based on either a test certificate of actual tests made. Should the selected pipes fail the tests, the Contractor shall mark and remove from the site the whole batch of pipes from which the pipes were selected and replace them with sound pipes at no extra costs.

C All pipes, specials, etc. shall be carefully examined for damage prior to fixing or laying and prior to concreting or backfilling.

D If any pipe, special, etc. is found to be damaged in any way, the Contractor shall notify the S.O. The damaged item shall be clearly marked and set aside for repair, cutting, or should such damage, in the opinion of the S.O., be caused through negligence on the part of the Contractor the expense of repairing, cutting and or replacement shall be borne by the Contractor. The Contractor shall be responsible for any delays caused thereby. Only pipes, etc which on inspection are found to be sound in every respect shall be fixed or laid.

E The interior of all pipes shall be carefully cleaned with brushes and shall be tested for soundness before being laid. The pipes shall be laid to true inverts, straight lines and falls, each pipe being separately boned between sight rails and bearing evenly upon the concrete for its full length.

F The laying of pipes in the finished trench shall be started at the lowest point and laid upgrade.

G Where pipes are laid on earth formation, the trench shall be widened and deepened sufficiently at the joints to allow the joints to be properly laid and such that the barrel or the pipe bears evenly over its full length on solid ground.

H Where pipes are laid on rock formation, the trench shall be excavated 150mm deeper and made up to required bed level with 150mm of properly consolidated selected material or with 150mm of concrete grade C15P as directed by the S.O.; care being taken that the pipe does not rest on any projecting pieces of rock

Concrete Beds, Haunchings, etc.

I Concrete for bedding, haunching and surround to pipes shall be grade C15P or otherwise shown on the Drawings. The concrete shall be well rammed or vibrated and worked under and around the pipes. No concreting shall be carried out until the pipe joints have been inspected and approved. Permanent vertical joints shall be formed at every four pipe lengths or 6100mm whichever is less using 25mm thick fibreboard shuttering or other approved material left in place. Concrete shall be placed right up against the trench excavation. Where the excavation has been carried out to a greater width than the required section or approved width, the Contractor shall provide the additional concrete at his own expense.

Sumps

J Sump shall be brick or concrete type constructed to the sizes as shown on the Drawings. All internal surfaces of sumps shall be rendered with high aluminium cement (1:2) and finished smooth.

K Sumps shall be pumped dry and cleared of all mud and debris upon completion and prior to handing over of the Works.

L Where required, sump cover slabs comprising precast concrete units or mild steel gratings shall be provided to details as shown on the Drawings.

Primary Stormwater Drainage and Culverts (Cont'd)

Testing and Approval of Culverts

A Testing of culverts shall be performed in the presence of the S.O. The Contractor shall provide all equipment and plant including portable hydraulic pumps, blank flanges, caps, plugs, pressure gauges, all pipe connections, cocks and strong rubber hoses and shall provide all struts, thrust blocks, etc., which are necessary for effectively testing the pipelines to the required pressure and he shall keep the said equipment and plant in good order during the continuance, all at his own expense, of the tests.

B Any pipe or length of pipes found to be defective shall be immediately removed and replaced at the Contractor's expense and leaking joints shall be remade; the test shall then be repeated as often as necessary until the whole length of pipe tested is approved.

C No work shall be covered up without the prior inspection and approval of the Local Authorities, the S.O. or his representative. The Contractor shall give due notice as required by the Local Authorities' Bye-Laws to the Local Authorities' representative whenever such works are ready for inspection. the Contractor shall afford full opportunity for the Local Authorities' representative to carry out the inspection of works, and shall be deemed to have allowed in his rates for such inspection, any fees payable, any phasing, any temporary suspension of works and other costs resulting thereby.

D Should any woks be covered without prior inspection and approval, the Contractor shall uncover any part or parts of the works or make openings in or through the same, as the Local Authorities' representative may direct, for inspection. the Contractor shall, at his own expense, reinstate and make good such part or parts to the satisfaction of the Local Authorities and the S.O.

E On completion, the culverts and sumps must be pumped dry and cleared of all debris, mud, dirt, etc to the satisfaction of the S.O.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Primary Soil Drainage

Generally

A The whole of the primary soil drainage system and manholes shall be executed by specialist firms in accordance to the latest requirements of the relevant bye-laws and tested to the satisfaction of the S.O. and Local Authorities.

B The Contractor shall supply, lay, join and test all concrete, cast iron, vitrified clay pipes and stoneware glazed (SWG) pipes as indicated on the Drawings including excavation and backfilling of trenches for the pipelines and supply of all necessary specials, joints and everything else necessary for completing the sewer pipeline and manhole.

Pipework Generally

C All pipework castings shall be truly cylindrical in shape, concentric with the bores free from all blemishes and blow holes and shall have a first class smooth finish.

D All pipework and fittings shall be supplied complete with the necessary nuts, bolts plain and spring washers, gaskets, etc. for all connection and jointing.

Pipe Diameters

E All diameters of pipes described or shown on the Drawings are nominal internal diameters in accordance with the manufacturer's specifications.

F Where diameters described are not available, the nearest equivalent available from manufacturers and suppliers shall be used.

Cast Iron Pipes

G Cast iron pipes and fittings shall comply with B.S. 437 and B.S. 78 for soil drains laid underground. Cast iron pipes shall be of the spigot and socket type and jointed by lead wool or tarred gaskin and molten lead, well caulked.

H All pipes and fittings are to be coated inside out in accordance with the relevant B.S. Standards. Any damaged coating shall be made good by painting with two coats of bituminous paint.

Cast Iron Spun Pipes and Specials

I Cast iron spun pipes and specials shall comply with the requirements of B.S. 1211 and shall be of Class "B" quality of the spigot and socket type. Jointing shall be similar to cast iron. Alternatively, patent flexible jointing may be used with spun iron pipes as described later in this Specification

J Cast iron flanged pipes and fittings shall conform to the requirements of B.S. 2035.

Primary Soil Drainage (Cont'd)

Vitrified Clayware Pipes

A All vitrified clayware pipes, bends and fittings shall be "GBH" VCP pipes of approved manufacture and shall comply in all respects with B.S. 65 : 1981 - specification for vitrified clay pipes, fittings and joints The pipes shall be in approved standard lengths and strictly within the tolerances allowed for deviation from straightness. Joints shall be by flexible joints as approved by the S.O.

B Flexible joints shall be of the rubber ring or rubber ring polyester type and jointing as described later in this Specification.

C The pipe shall be tested for crushing strength, barrel impermeability, hydraulic proof and acid and alkali resistance in accordance with Clauses 10 to 14 of B.S. 65.

D The S.O. may require that these tests be carried out in the presence of his representative, or alternatively demand properly substantiated test certificates for each batch or consignment of pipes.

E Pipes shall not be used in the works without the approval of the S.O. based on either test certificates or actual tests made.

Stoneware Glazed Pipes

F All stoneware glazed pipes, bends and fittings shall be of approved manufacture and comply in all respects with B.S. 65. The pipes shall be of approved standard lengths and strictly within the tolerances allowed for deviation from straightness.

Concrete Pipes

G The pipes shall be of "Hume" or other equal and approved reinforced concrete sewage pipes manufactured to meet all the requirements of B.S. 556 : 1972 or to Australian Standard No. AS 1342-1973 or approved equivalent, lined internally with 13mm thick layer of high alumina cement fondu.

H Unless otherwise instructed or shown on the Drawings, concrete pipes shall be of the spigot and socket type suitable for fixing with gasket, cement and sand or flexible rubber ring joint.

Asbestos Cement Pipes

I Asbestos cement sewer pipes and fittings shall be of the required class/strength as shown on the Drawings and shall conform in terms of manufacture to the requirements of B.S. 3656 : 1981 - Specification for Asbestos Cement Pipes, Joints and Fittings for Sewerage and Drainage.

J The pipe shall be suitable for gravity flow installations at normal atmospheric pressure.

K Jointing shall be with standard collars and rubber rings.

Handling of Pipes

L All pipes and specials shall be sufficiently protected by approved means to prevent any damage occurring during transit or storage and shall be handled by approved methods to avoid damage during lowering of pipes into pipe trenches. Pipes shall be carefully stacked on site with timber packings under and between the pipes.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Primary Soil Drainage (Cont'd)

Test Certificates

A Each batch of pipes supplied shall be accompanied by the manufacturer's test certificate certifying compliance with the tests specified in the relevant British Standards. In the absence of such certificates, the Contractor shall whenever required by the S.O. arrange for and carry out at his own expense all the appropriate tests on samples from each batch to confirm that the pipes supplied comply with this Specification. Should the test results show that the samples do not comply with this Specification then the whole batch of pipes shall be rejected and the replacement made at no extra cost.

B No pipes shall be used in the Works without the written approval of the S.O. Approval shall be based on either a test certificate or actual tests made.

Despatch of Pipes to Site.

C Pipes shall not be despatched from the place of manufacture until the approval of the S.O. has been given following whatever tests or inspection the S.O. may have called for. Notwithstanding the approval of the S.O. of pipes at the place of manufacture, the Contractor will remain responsible for any fault found in the pipes on site.

Excavations

D Excavation for trenches shall be to straight lines and to the correct depths and gradients required for the pipes and beds as indicated on the Drawings. The trench bottom shall be of sufficient width to allow adequate working space for the pipe layer.

E The Contractor shall be responsible for securing the sides trenches by planking and strutting, etc. to ensure the proper and speedy execution of the Works.

F Before any excavation commences and throughout the period of construction, each manhole centre shall be set out and marked by a centre peg and three reference pegs situated outside the working area.

G The levels shall be set out and inverts referred to protect level pegs near each manhole and change of grade or line. Sight rails shall be fixed and maintained at the changes of grade or line and not more than 60 metres apart. Properly constructed boning rods shall be used to check invert levels at each length of pipe trench.

H When excavation is completed and before any further work commences, wooden pegs are to be driven into the formation at not more than 3660mm centres, the level of each peg being adjusted to the proposed sewer or pipe invert by the use of the sight rails and boning rods.

I In the event of excavations being made deeper than necessary, they shall be filled to the proper level with concrete grade C15P at the Contractor's expense

J All excavations shall be kept stable and free from water by pumping, baling or other suitable methods

Primary Soil Drainage (Cont'd)

Deviations from Straight Lines

A Should any obstructions be encountered during the progress of trench excavations which will require alteration to the design the Contractor shall immediately notify the S.O. who will then issue whatever instructions deemed necessary. The Contractor shall not make any deviation from the specified line and/or grade without the prior approval of the S.O.

B Should any deviation from the line and/or grade of trench is permitted by the S.O. to reduce the amount of rock met with in excavation or to avoid other pipe crossings, the Contractor shall allow for all additional concrete anchor or thrust blocks, valves, air and vacuum assemblies, blow-off assemblies, extra pipe footage, manholes and other appurtenances required. All such additional work necessitated, upon confirmation and approval by the S.O., will be treated as "extras" and valued and paid for in accordance with the provisions of the Contract.

C Any other deviations carried out for the convenience of the Contractor's operations will be to the Contractor's expense.

Backfilling of Pipe Trenches

D The backfilling of the pipe trenches shall follow the installation and testing of the pipes as closely as possible. Before the pipes have been tested, only sufficient backfilling of the trenches to prevent snaking of the pipes during tests shall be permitted and all joints shall be left exposed to provide inspection for leakage.

E The greatest care shall be taken during backfilling to ensure:

(a) a good bed for the pipe by tamping selected material to at least 300mm thick over the crown of the pipe where no concrete bedding or surround is provided.

(b) through compaction of backfill. The selected backfill shall be good earth, free from stones or other hard materials, at or about optimum moisture content.

G The initial backfilling shall be carefully spread along the trench bottom between the pipes and the trench walls to a loose depth of about 150mm and shall be hand tamped. Similar 150mm layers shall be spread and tamped until a height of 300mm is reached over the top of the pipe.

H The material for the remainder of the backfilling need not be as carefully selected as the initial backfilling material but it shall be reasonably free from stones or hard materials and shall not be too wet or too dry. It shall be placed in 300mm layers and be thoroughly compacted, employing approved mechanical tampers.

Buried Services

I All pipes, ducts, cables, mains and other services exposed by the excavations shall be effectively supported and protected by timber or other means instructed by the S.O.

Cutting Pipes

J All cutting of pipes required for chamfers, bends, junctions, etc. shall be by an approved type of wheel cutter such that a true straight edge is obtained. Cutting of small diameter concrete or stoneware pipe with a hammer and chisel shall only be carried out by a competent pipelayer to the approval of the S.O.

Granular Bedding for Sewer Pipes

K Granular materials for sewer pipe bedding shall consist of well graded crushed stone or gravel and shall be able to pass 9mm - 30mm sieve and shall be retained by a 5mm sieve. Other similar material, i.e. crushed brick or crushed concrete may only be used with the prior approval of the S.O.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Primary Soil Drainage (Cont'd)

Concrete for Pipe Bedding, Haunching and Surround

A Concrete for bedding, haunching and surrounds shall be of grade C15P, unless otherwise shown on the Drawings.

B Cement, sand and coarse aggregate for the concrete shall be of the respective types and quality as specified for these materials under the relevant section of this Specification.

C Concrete for the bedding, haunching and surround to the pipes shall be well rammed or vibrated and worked under and around the pipes.

D The pipes shall be laid evenly on the barrel at the required level. There shall be no hollows, voids or foreign material under the pipe. No concrete blocks or wedges shall be used. The bedding shall be completed to the correct profile as shown on the Drawings and concrete for the bedding shall be cast in one continuous operation with no horizontal joint along the bedding. Care shall be taken to ensure proper bedding at and on either side of the pipe joints after completion of testing.

E No concrete shall be placed around the pipes until the pipe joints have been inspected and approved by the S.O./Local Authority. Permanent vertical joints shall be formed at every four pipe lengths or 6100mm, whichever is the lesser, using 25mm thick fibreboard shuttering or other approved material left in place.

F Concrete shall be placed right up against the trench excavation. Where the excavation has been carried out to a greater width than the required section or approved width, the Contractor shall provide the additional concrete at his own expense.

Pipelaying

G All pipes, specials, etc. shall be carefully examined for damage prior to fixing or laying and prior to concreting or backfilling.

H If any pipe, special, etc. is found to be damaged in anyway the Contractor shall notify the S.O. The damaged item shall be clearly marked and set aside for repair, cutting or should such damage, in the opinion of the S.O., be caused through negligence on the part of the contractor the expense or repairing, cutting and or replacement shall be borne by the Contractor. The Contractor shall be responsible for any additional costs or delay arising therefrom. Only pipes, etc. which, on inspection, are found to be sound in every respect shall be fixed or laid.

I The interior of all pipes shall be carefully cleaned and brushed and shall be tested for soundness before being laid. The pipes shall be laid true to inverts, to straight lines and falls, each pipe being separately boned between sight rails and bearing evenly upon the concrete bedding for its full length

J Where pipes are laid on earth formation, the trench shall be widened and deepened sufficiently at the joints to allow the joints to be properly laid and such that the barrel of the pipe bears evenly over its full length on solid ground

K Where pipes are laid on rock formation, the trench shall be excavated 150mm deeper and made up to required bed level with 150mm of properly consolidated selected material or with 150mm of concrete grade C15P as directed by the S.O., care being taken that the pipe does not rest on any projecting pieces of rock.

L Certain portions of sewer pipes may not be heavy enough to resist the possible uplift due to water pressure until the structure and pipelines, soil cover and backfilling have been completed. The Contractor shall make adequate arrangements to keep the excavation dry until the structure and filling are complete or shall adopt other approved means of ensuring the stability of the temporary or permanent works

Primary Soil Drainage (Cont'd)

Jointing Stoneware Glazed Pipes with Cement Mortar Joints

A The spigot and socket of each pipe shall be thoroughly brushed clean before laying. The pipes shall then be laid to true lines and level and secured in position with the spigot ends wound with one complete ring of tarred gaskin and pushed firmly into the next pipe socket. After laying, the gaskin shall be caulked with a wooden caulking tool firmly to the back of the socket, care being taken to ensure that the gaskin does not protrude through the joint into the pipe. Each joint shall be made with high alumina cement mortar in the proportion of 1 part of cement to 2 parts of sand by weight, caulked firmly into the socket and trowelled off to make an acute angle fillet to the outside of he socket.

B The high alumina cement mortar used for specials shall be mixed in small quantities sufficient only for 30 minutes work. Mortar which has settled and hardened shall not be remixed and used but it shall be removed and disposed from the works.

Flexible Joints to Vitrified Clayware Pipes

C Flexible joints to vitrified clayware pipes shall be of the rubber ring or polyester type and of a design and form approved by the S.O. Manufacturer's instructions for making such joints shall be strictly adhered to. The joints shall be of a type which can remain completely watertight while accommodating a deflection of 5 degrees in any direction. Where polyester joints or polyester/rubber ring joints are supplied, the formed polyester must be securely bonded to the clayware. Pipes with damaged or loose polyester rings or socket packings shall be rejected.

D The spigot and socket of each pipe shall be thoroughly brushed clean to ensure that it is free from grit or dirt before the rubber ring is placed in the groove. An approved soap lubricant shall be applied to the rubber ring and the inside faces of the socket. Grease and oil shall not be used as a lubricant. The spigot is then inserted into the socket, lead in and pushed straight home. Only a reasonable amount of pressure is required to make the joint if the socket is adequately lubricated.

E Flexible jointed pipes will be required to be handled and stacked carefully. Any damage to the joints caused in handling, stacking and laying shall be made good at the Contractor's expenses.

Bolted and Screwed Gland Joint

F The bolted gland joint comprises a rubber ring in the socket secured by a pressure ring held in position by bolts.

G The screwed gland joint comprises a lead tipped rubber joint ring which is compressed and held in position by an internal gland screwed into position in the socket.

H Bolted gland or similar types of flexible patent joint shall be made in accordance with the manufacturer's recommended material, and accurately positioned. All types of pipe joints, joint and jointing ring or material shall be thoroughly cleaned of dirt, grease and grit before any jointing commences. The pipes shall be properly supported, bedded and lined up before the joint is set up and made.

I The joint shall be firmly pushed or jacked home and where screwed or bolted glands are involved the glands shall be steadily and evenly tightened all around.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Primary Soil Drainage (Cont'd)

Jointing Cast Iron and Steel Pipes

A Patent pipe joints may be required for use to join cast iron and steel pipes Any special instructions issued by the manufacturers of proprietary pipe joints regarding the laying of pipes shall be strictly adhered to.

B The pipe joint and jointing shall be thoroughly cleaned of dirt, grit or grease before jointing commences. The pipes shall be properly supported, bedded and lined up before the joint is made.

C Spigot and socket joints shall be made by caulking with two rounds of white yarn of approved type and size and then filling the joint with lead run with proper steel caulking tools. The lead shall be run and caulked to fill the socket to within 3mm of face of the socket. In certain circumstances the S.O. may permit the use of lead wool in place of run lead.

D The flexible couplings required shall be of a type capable of withstanding not less than 5 degrees deflection (for pipe diameters up to 900mm) some transfer of load, and the draw or compression due to expansion, contraction or movement up to 19mm combined with the maximum deflection all without leakage. The joints shall be "Gibault", "Viking Johnson" or similar approved flexible mechanical coupling.

E Where flanged joints are used, the flanges shall be faced drilled to type PN 16 as described in IS02531.

F Flanged joints shall be carefully and properly laid true to line and level before bolting and on no account shall drifts or podgers be used in the bolt holes. Flange bolts shall be carefully tightened in rotation to ensure even pressure on the joint ring. The joint ring shall conform to B.S. 2494 and shall be in the form of a strip ring lying within the bolt circle.

G Puddle flanges shall be provided on all pipework built into water retaining walls or where required for thrust resistance purposes.

External Protection of Cast Iron/Steel Pipe Joints

H All flanged joints or mechanical couplings shall be encased in bitumen jointing compound after the pipelines have been tested and found satisfactory.

I The bitumen jointing compound shall comprise 50% pure bitumen and 50% slate flour or limestone powder and shall have the following properties:

(i)	Specific gravity	:	1.4 to 1.5
(ii)	Weight per 100 cu. ins	:	5 to 5.5 lbs.
(iii)	Softening Point (R & B)	:	1960 F to 2210 F
(iv)	Open Flash Point	:	450 0 F
(v)	Penetration at 250 C	:	15 to 25
(vi)	Ductility at 250 C	:	not less than 1 0 cm

Primary Soil Drainage (Cont'd)

External Protection of Cast Iron/Steel Pipe Joints (Cont'd)

A The surfaces of the joint shall be wire brushed clear of all dirt. A mould box of suitable shape to ensure a minimum compound cover of 6mm over any part of the joint including bolts and nuts shall be fixed around the joint to receive the bitumen compound. Before being fixed in position, the inside of the mould box shall be given a thick coat of "French" chalk to prevent adhesion of the bitumen compound to the mould box. The bitumen compound shall be heated in a pot to a temperature of 1600C. The heated bitumen compound shall be poured into the mould box and allowed to harden.

B After the bitumen compound has hardened, the mould box shall be carefully removed to ensure that no damage is caused to the bitumen protective coating.

Testing of Pipelines

C All sewer pipelines must be tested for watertightness by means of water pressure as specified under C.P. 2005: 1968 (Sewerage).

D Testing of pipes shall be carried out in the presence of the Local Authority and S.O. The Contractor shall provide at his own expense all suitable plant, including portable hydraulic pumps, blank flanges, caps, plugs, pressure gauges, pipe connections, cocks, hoses, struts, thrust blocks and everything else necessary for effectively testing the pipelines to the required pressure.

E All gravity pipelines and sewers of 525mm or lesser diameter, before being surrounded and covered by backfill material, shall be tested by filling with water in a manner specified in C.P. 2005 in the presence of the S.O. or their representatives.

F For this test, a pressure head of 1200mm of water above the crown of the pipe is maintained at the high end of the pipeline under test, but not more than 61 00mm at the low end. The test should be carried out by inserting suitably strutted plugs in the low end of the sewer and in connections if necessary and by filling the system with water. The loss of water from a measuring vessel at regular intervals of 10 minutes and noting the quantity required to maintain the original water-level. The average quantity added for pipes up to 450mm diameter should not exceed 1 litre per linear metre of a nominal internal diameter.

G Alternatively, air tests may be carried out, for testing of all sewers up to 525mm diameter or less before being surrounded or covered and before backfilling.

H The length of pipe under air test should be effectively plugged as before described and air pumped in by suitable means (e.g. a hand pump) until pressure of 100mm of water is indicated in a glass U-tube connected to the system. The air pressure should not fall to less than 75mm during the period, after allowing a suitable time for stabilisation of the air temperature.

I Before each test, the S.O. or their representatives shall inspect each section of the pipeline by rolling a ball through the pipe and should the ball fail to roll through without being pushed, the faulty section of the pipe shall be taken out and relaid. Where possible, testing should be carried out from manhole to manhole and short branches to a main drain between manholes included in the test for the main drain.

J Gravity pipelines exceeding 525mm in diameter shall not be hydraulically tested but the joints will be inspected and shall be made to the satisfaction of the S.O.

K Pumping or pressure mains shall be tested to the pressures corresponding to the grade or class of the pipes as specified in the relevant British Standard or approved equivalent governing the use and installation of such pipes.

L Any length of pipe found defective shall be removed and replaced at the Contractor's own expense and leaking joints shall be remade. The test shall then be repeated as often as necessary until the whole length under test satisfied the test requirements and is approved by the S.O./Local Authority.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Primary Soil Drainage (Cont'd)

Testing of Manholes

A Manholes should be tested for watertightness by filling them with water and observing any subsidence. It will also be necessary to fill the downstream length of drain in order that the drain plug may be removed upon completion of the test

Painting

B Upon completion of the Works, all pipework, fittings, etc. in chambers or exposed positions shall, unless otherwise specified, be wire brushed clean, primed and painted with three coats of an approved bituminous paint.

Sewer Manholes and Chambers

C Manholes and chambers shall be constructed to the dimensions, depths and details as shown on the Drawings or as directed by the S.O.

D All manholes shall unless otherwise specified be constructed of brickwork bonded in 1:3 cement (Ordinary Portland) mortar and rendered internally with a 20mm thick layer of 1:2 high alumina cement-sand rendering.

E All concrete surfaces in chambers in contact with sewage unless specified otherwise shall be finished with a 20mm thick layer of 1:2 high alumina cement-sand mortar

F The high alumina cement shall comply with B.S. 915.

G All bricks shall comply with B.S. 3921 and shall be hard, well-burnt, machine-made, pressed bricks from an approved kiln and to the satisfaction of the S.O.

H Half brick (1 15mm) thick walls or less shall be in stretcher bond with every fourth course reinforced with "Exmet" or other approved brick reinforcement.

I All bricks shall be thoroughly soaked in water before use and the tops of walls left off shall be wetted before commencing work. All joints shall be raked out to provide key for rendering as specified

J Concrete base slab where indicated in the Drawings shall be made of concrete grade C20P using ordinary Portland Cement complying with the requirements of B S 12

K Channels shall be benched up to the soffit levels of sewers with similar concrete and the top of the benching finished smooth to slope upwards from the edge of the channel to the chamber walls at a gradient of approximately 25mm to 300mm, the benching being floated to a smooth, hard surface with a 20mm thick coat of 1:2 high alumina cement-sand rendering

L Manhole covers and frames shall be cast iron (coated or galvanised) flat covers and frames complying with the requirements of B.S. 497. They shall be either heavy duty or medium duty quality and shall be installed at the locations shown on the Drawings

M Unless otherwise specified, heavy duty covers and frames shall be used in carriageways carrying relatively fast-moving commercial vehicles and shall incorporate a permanent non rock design feature. Medium duty covers and frames shall be installed in carriageways carrying relatively slow-moving commercial vehicles

N To facilitate removal of he covers, the seating of all covers shall be liberally greased after casting of the frames in the concrete manholes

Primary Soil Drainage (Cont'd)

Sewer Manholes and Chambers (Cont'd)

A Ventilating or recessed covers shall only be used where specifically shown on the Drawings or instructed by the S.O.

B Step irons to chambers shall be galvanised iron. Manhole step irons shall be malleable cast iron. Unless otherwise shown on the Drawings, general purpose pattern step irons with 127mm tails shall be used in the brick walls and rounded bar pattern step irons shall be used in concrete walls.

C Unless otherwise directed or shown on the Drawings, all benchings and concrete surround shall be constructed of concrete grade C1 5P using Ordinary Portland Cement complying with B.S. 12.

D Precast concrete cover slabs shall be constructed with grade C20P using Ordinary Portland Cement.

E Sulphate-resisting Portland Cement shall be used where shown on Drawings.

F Main channels, branch channels, bends, etc. shall be of stoneware glazed pipes and shall be obtained from approved manufacturer. All channels shall be properly bedded and jointed in with 1:2 high alumina cement mortar.

G Where required, channels, bends, benchings, etc., in manholes shall be formed and shaped to details as shown on Drawings using concrete grade C15P.

Commissioning of Sewer Pipelines and Manholes

H On completion of the works, the Contractor shall thoroughly clean and wash out all the pipelines, manholes, chambers, etc. of sand, silt and other debris.

I After cleaning, the pipelines and other parts of the sewerage system shall be tested and inspected by the S.O. Only after the whole works have been certified satisfactory by the S.O. following the inspection shall the sewers be put into use. Any defects found during the inspection shall be rectified and made good by the Contractor at no additional cost, all to the satisfaction of the S.O.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Water Reticulation and Fire Hydrants

Excavation Generall

A All excavations shall be carried out to the required lengths, widths, depths, inclinations and curvatures as may be necessary for the proper construction of the Works. All excavations shall be sufficient to provide for the necessary working spaces shuttering and any other temporary structures required during construction.

B Where so directed by the S.O. the turf and top-soil shall be stacked aside for re-use in reinstatement.

C Unless otherwise stated, the excavations, whether in open cut or in trench, shall be proceeded with in such portions and at such times as the S.O. may direct and shall not in the first instance be carried down to a depth nearer than 150mm above formation level; the last 150mm depth to formation level shall be carried out by manual labour immediately in advance of placing concrete screed, concrete or pipe-laying. The bottom of all excavations shall be carefully trimmed and levelled, well rammed and consolidated to ensure good solid foundations. The Contractor shall take such steps as are necessary to prevent damage to the formation due to exposure to the weather.

D Excavations made deeper than necessary shall be filled to proper levels with concrete grade C 1 5P at the Contractor's expense.

E No concrete shall be placed in excavations until the S.O. has inspected and approved it and no pipes shall be laid upon the surfaces prepared by excavation. Any works built upon foundations which have not been approved by the S.O. shall on the order of the S.O. be uncovered or removed by the Contractor and the foundations reinstated all at the Contractor's own expense.

F All excavations shall be measured nett and no payment shall be made for the extra lengths, widths and depths to provide for working space, timbering, etc. or for any additional excavation which the Contractor may be permitted to carry out for his own convenience; and no "overbreak" will be paid for.

G The Contractor shall allow for the re-handling of all excavated material as often as may be necessary, whether it be used for re-filling excavations, for the construction of embankments, slopes, verges, tips, etc. or for covering trenches.

Pipe Trench Excavations

H Before commencing the excavation of pipe trenches, the routes of the pipelines shall be pegged out accurately. Strong sight rails shall be fixed and maintained at each change of gradient, and at intermediate points not exceeding 60 metres apart. On these rails shall be marked the centre line and the level to which the pipes are to be laid, and such rails shall be maintained in position and at correct level from the time excavation commences until backfilling is completed.

I The trench shall excavated to such width as will ensure that a working space of 150mm will be available on either side of the outside of every pipe when properly aligned. Where pipes are to be laid on a concrete bed the width of the excavation at the bottom of the trench shall be the width of the underside of the concrete bed. At all joints the trench shall be excavated to give a working space of not less than 300mm all round the joint. Where bends are made by deflecting pipes at joints the trench shall be widened to permit this operation. The sides of the trench shall be cut vertical, and where necessary shall be protected against caving in by timbering to the satisfaction of the S.O.

J The trench shall be excavated to the gradients and depths intended or shown in the Drawings and shall be finished and trimmed accurately to level and grade. Where no invert levels are shown or indicated, the bottom of the trench shall be graded so that the pipe invert slopes evenly between the adjacent invert levels.

Water Reticulation and Fire Hydrants (Cont'd)

Pipe Trench Excavations(Cont'd)

A Should the ground be so wet or soft that it does not form a firm base for the pipe, or should rock be encountered at the bottom of the trench, the trench shall be excavated 225mm below the level intended or shown in the Drawings and then brought back to the correct level with good selected earth or sand well rammed into place. Should the bottom of the trench be inadvertently excavated below the specified level, it shall be brought back at the Contractor's expense to the correct level with concrete grade C 1 5P.

B When excavating pipe trenches under carriageways or other paved surfaces, the Contractor shall first remove all metal, slabs or bricks forming the existing paving to the width of the trenches and deposit these materials clear of the trenches for re-use in reinstatement, where possible. Upon completion of the works, all existing surfaces shall be reinstated to original condition.

C Excavations for thrust blocks, piers, culverts, wing walls, valve chambers and other ancillary woks shall be taken down to the levels shown on the Drawings or such other levels as may be directed on site. Excavations shall be kept free from water and where necessary, timbering shall be provided to sides of excavations. Excavations shall be finished to an even surface and shall be inspected by the S.O. before concrete foundations are laid

Excavation in Rock

D The definition for "rock" shall be as stipulated in the "Excavator" section of this Specification.

E The S.O.'s decision as to whether or not the material to be excavated is classified as rock shall be final.

F Where rock is encountered in the excavations it shall be removed at the direction of the S.O. Voids formed by the removal of rock in the base of excavations shall be refilled with concrete of approved grade or suitable material approved by the S.O., well rammed and consolidated to the required levels. The Contractor shall not use any explosives without the permission of the S.O. in writing.

G The volume of rock excavated shall be taken as its volume in-situ before it is broken up. The volume of rock on which extra is payable shall be measured and agreed upon weekly between the Contractor and the S.O., or his authorised representatives.

Unauthorised Excessive Excavation

H In the event of any excavation including rock excavation being carried out beyond the limits on or against which permanent work is to be supported in accordance with the Drawings, unless otherwise directed or authorised the Contractor shall at his own expense, be required to fill the excess excavation with concrete as specified for foundations or other suitable materials as directed by, and to the satisfaction of the S.O.

Additional Excavation Required

I Any part of the formation found unsuitable to provide a satisfactory foundation, such portions shall be further excavated to such depths as the S.O. may direct and refilled to correct formation level with concrete or approved grade or selected material.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Water Reticulation and Fire Hydrants (Cont'd)

Stability of Excavation

A The Contractor shall be responsible for the stability of excavations at all times and shall where necessary slope the sides of the excavations and/or provide and fix strong and sufficient timbering to support the sides and/or bottom of the excavations to prevent against collapse and shall maintain the same until, in the opinion of the S.O., the construction work is sufficiently advanced to permit the timbering to be withdrawn. Timbering shall be removed only under the personal supervision of a competent foremen

B The S.O. may order close timbering wherever it may appear to him to be necessary at the Contractor's expense.

C The Contractor shall be responsible for any injury to the work or consequential damages caused by or arising out of the removal of timbering and any advice, permission or approval given by the S.O. relating to the removal of timbering shall not relieve the Contractor from his responsibility under the Contract.

Keeping Excavations free from Water

D The Contractor shall be responsible for keeping dry all excavations, whether in open cut or in trench, so as not to interfere with the work in progress. He shall, without extra cost, provide, form, fix, maintain and work as and where directed by the S.O. such pumps, wells, drains, dams and other things necessary to effectively deal with all water which may collect or find its way into the excavations from any cause whatsoever. Nevertheless all methods employed for dealing with water shall be to the approval of the S.O. Such approval shall however not relieve the Contractor from his liability for any damage to the Works or adjoining land and property or water courses due to his operations

E The Contractor shall carry out any diversion and subsequent restoration of such existing rivers, water courses, land springs, ditches, etc wherever encountered during the execution of the Works, whether, shown on the Drawings or not.

Backfilling

F Backfilling of all excavations shall not be carried out until the Works therein have been approved by the S.O.

G In backfilling excavations other than pipe trench excavations, the best and most suitable portions of the excavated material shall be employed. The material shall be deposited and spread in layers of not more than 300mm deep; each layer shall be thoroughly rammed and watered if required.

H If so directed by the S.O., the backfilling shall be finished off slightly proud of the surrounding ground to allow for settlement. The Contractor shall make good any settlement which may occur during the construction of the Works and during the Defects Liability Period of the Contract at his own expense

I After the pipe laying has been approved by the S.O. and before the pipelines have been satisfactorily tested, only sufficient backfilling of the trench to prevent "snaking" and to maintain the pipes in position will be permitted, but all joints shall be left exposed. In low lying ground or any other locality where the trench may be filled with water and cause flotation of the pipes, or elsewhere as may be decided by the S O the backfilling shall follow the pipe laying as closely as possible.

J In backfilling pipe trenches, selected materials free from stones or rocks or other hard materials shall be carefully spread along the trench bottom between the pipes and the trench walls to depth of about 150mm thick and the same materials shall then be spread and rammed in the same manner up to the top of the pipes.

Water Reticulation and Fire Hydrants (Cont'd)

Backfilling (Cont'd)

A The remainder of the backfilling may consist of coarse material including broken rock free from boulders and large earth clods. It shall be placed in layers and hand or mechanically rammed until the backfill is 300mm above the top of the pipe. The rest of the trench backfill shall be in layers and compacted to finish off slightly proud of the surrounding ground. The Contractor shall make good any settlement during the Defects Liability Period under the Contract.

B If the quantity of selected fill is not available from the excavated material, the Contractor shall, with the approval of the S.O., use imported fill or fill from adjoining areas.

Removel Surplus Soil

C All surplus excavated material, earth, rubbish and waste matter shall be disposed off to a dump to be found by the Contractor unless otherwise directed by the S.O.

D When removing surplus soil, the Contractor shall dispatch, clear up all carriageways, footways, verges, etc. affected by his work, and leave the site of the Works clean and tidy. If surplus soil shall be executed with the approval of, and with the least possible amount of inconvenience to the owner and occupier of the same.

E The Contractor will not be permitted to use sand, gravel , puddle clay or other material arising out of the excavations for incorporated in the permanent works, except with the special permission in writing of the S.O.

Concrete

F Concrete shall generally comply with the requirements of B.S. 8110.

Sand

G Sand for cement mortar shall conform to B.S. 1200 and shall be clean, fresh water river sand free from clay and other impurities

Cement

H Cement shall, unless otherwise described, be Ordinary Setting or Sulphate Resisting Portland Cement of approved manufacture and shall comply with the requirements of B.S. 12 : 1978.

Brickwork

I Brickwork shall generally be clay bricks to B.S. 3921 set and jointed in cement and sand (1:3) mortar.

Handling, Laying and Testing Pipeline

J All pipes, specials, etc. shall be carefully examined for damage prior to fixing or laying and prior to connecting or backfilling.

K If any pipe, specials, etc. is found to be damaged in any way, the damaged item shall be clearly marked and set aside for repair, cutting to a shorter length or removal from site as the S.O. may direct. All expense of repairing, cutting and or replacement shall be borne by the Contractor. Only pipes, etc. which on inspection are found to be sound in every respect shall be fixed or laid.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Water Reticulation and Fire Hydrants (Cont'd)

Handling, Laying and Testing Pipeline(Cont'd)

A Before steel pipes and specials are laid, all damaged covering and lining shall be cut out and replaced with new materials compatible with the sheathing material as directed by the S.O. Cracks in the internal mortar lining of steel pipes and specials may be caulked with an epoxy resin filler, but only with the prior approval of the S.O

B All pipes, valves and specials shall be examined for rust and loss of paint prior to installing in position. The exposed surfaces of valves affected by rust shall be wire-brushed and painted with two coats of approved bituminous paint. The ends of pipes and specials shall be wire brushed and cleaned, primed and painted with two coats of solution compatible with the factory applied sheathing material

C No pipe shall be laid until the trench has been inspected and approved by the S.O. or his representative on the site. The trench shall be kept sufficiently dry for making joints.

D The pipes shall be gently lowered into the trench by means of a crane, or suitable shear legs and chain blocks with rope slings. No pipe shall be rolled and dropped into the trench.

E Before any pipe, special and valve is laid in position ready for jointing, its internal surfaces shall be thoroughly wiped clean and free of all dirt, stones, etc. to ensure that no debris, sticks, stones, rags or other foreign matter is left in the pipeline. The pipes shall be laid true to alignment and gradient, each pipe being bonded between sight rails. In no case shall the pipelines be laid to a gradient less than 1 in 500. care shall be exercised to ensure that the barrel of every pipe is evenly bedded throughout the whole length. The interior and exterior of each pipe at the joint shall be thoroughly cleaned before the joint is made.

F To prevent the entry of foul water, earth and other foreign matter into pipelines, the Contractor shall provide and fix suitable caps for sufficiently closing all open ends of the pipelines in the trench at all times when works is not actually being carried out at such open ends.

G Air valves, tees and washout tees may be installed at the pipe joints nearest to the specified positions provided that the approach gradients are amended to ensure that the air valve tees and washout tees are installed at the highest and lowest points respectively of the sections of the pipelines concerned.

Depth and Protection

J Except where otherwise shown on the Drawings or directed by the S.O the top of the pipes shall not be less than:

(i) 1.0 metre below the surfaces of the ground: or

(ii) 1.25 metre below the haunches of the road where the pipelines cross or are adjacent to, any road

Closure Units

K The use of closure units shall be avoided as far as possible by laying each pipeline in a continuous length. However, where this proves impossible at any point, the Contractor shall form closure units by cutting pipes to the exact lengths required. No pipe shall be cut any closure without the prior consent of the S.O.

Water Reticulation and Fire Hydrants (Cont'd)

Torque Spanners

A For tightening of all bolts in pipe joints, the Contractor shall provide "all use" torque spanners of the "break back" types set to give a torque of 1050 kg/m or other value to be determined by the S.O.

Concrete Surround, Haunching and Bedding

B Where it is specified or shown in the Drawings that concrete shall be placed around or under a pipe, the pipe when laid shall first be supported on not less than two concrete supporting blocks and the remaining concrete shall first be placed on one side of the pipe only and carefully pinned or vibrated until it has spread under the pipe to the opposite side of the pipe to the full length of the surround haunching or bedding. Concrete may then be added on both sides of the pipe until the top of the surrounding haunching or bedding has reached the level specified. Such concrete surround or bedding shall not be placed until the joints at both ends of the pipe have been made. Except where otherwise specified, concrete shall be omitted on either side of a flexible mechanical coupling for a distance of 300mm from the centre of the joint.

Thrusts and Anchor Blocks

C The Contractor shall construct all necessary thrust and anchor blocks where required. Plain concrete blocks shall be in concrete grade C 1 5P.

D The bearing faces of all thrust and anchor blocks shall be cast against the bearing sides of the excavation. Where timbering has to be used in the bearing side of the excavation, such timber shall be withdrawn as the concrete is placed so that the concrete will be in direct contact with undisturbed bearing side. If through negligence the Contractor has excavated beyond the bearing sides the voids so formed shall be filled in with concrete grade C1 5P at his own expense.

Pipes Passing through Masonry and Brickwork

E Where it is necessary for any pipe to pass through masonry or brickwork, the masonry or brickwork shall be arched over the pipe. The diameter of the hole thus formed shall be 25mm larger than the external diameter of the pipe; and the space between the masonry or brickwork and the pipe at the hole shall then be filled with bituminous felt to provide a cushion to the perimeter of the pipe.

Testing of Pipelines

F The Contractor shall provide all water required for filling, testing and retesting the mains (pipelines), and any pumps, pipework fittings and pressure gauges required for the purpose.

G Whenever a section, not exceeding 600m metres long, of any main has been laid, jointed and part backfilled as specified, it shall be prepared for testing by sealing the open ends temporarily with stop ends. The stop ends shall be of cast iron or steel. The stop end at the lower end of the section of the main shall be fitted with a valved inlet pipe for use to fill the section of the main with water and the stop end at the higher end of the section of the main shall be fitted with a valve air release vent pipe. A pressure gauge shall be connected to the valved inlet pipe. The pressure gauge shall have a dial of not less than 150mm diameter and graduated to read up to 150 metres of width at 3 metres graduations. All pressure gauges tested by the S.O. before use, and provisions shall be made for connecting the S.O.'s pressure gauge, if he so elects to the valved inlet pipe.

H The stop ends shall be braced to the satisfaction of the S.O. to withstand the end thrust which develops from water pressure. All weight, thrust and anchor blocks intended to prevent the vertical and lateral displacement of the pipes and specials must be properly completed and shall have attained an adequate strength before the tests are carried out. When gentle curves are affected by deflection pipes these pipes shall be securely packed with backfill to prevent movement.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Water Reticulation and Fire Hydrants (Cont'd)

Testing of Pipelines (Cont'd)

A The section of the main to be tested shall be filled with water or fair quality free from sediment and from a source approved by the S.O. The water shall be introduced into the section of the main through the valved inlet in the stop end at the lower end of the section. During filling provisions shall be made for the air to escape from all high-spots in the section by properly installing all air valves and from the air release vent pipe in the stop end at the higher end of the section.

B The pressure/strength test shall be carried out first. Each section of the main shall be tested to a pressure of 150% of the working pressure of steel pipes.

C After the section of the main has been filled with water for a period of not less than one day, more water shall be pumped into the section to raise the pressure slowly in increments of 10 metres head of water with pause of one minute between each increment. Should any appreciable drop in pressure be noted during one of these pauses, the test shall be stopped until the caused of the pressure drop has been investigated and rectified. An engine driven pump may be used until 60 metres head pressure is attained, and thereafter only a hand operated pump shall be used.

D The pressure/strength test shall be considered to have passed when the pressure gauge shows no reduction in pressure during the specified one minute pause and also during the period of 10 minutes after full test pressure has been attained. If these conditions are not satisfied, a thorough inspection of the section of the main shall be made. All defects shall be repaired and the test shall be repeated until the desired results are attained to the satisfaction of the S.O.

E The leakage test shall then follow. The pressure shall be reduced to wor king pressure for steel pipes, and shall be maintained as constant as possible for a period of 24 hours. Make up water shall be pumped into the section of the main from time to time to maintain this pressure. The leakage test shall be considered to have been passed if the make-up water pumped into the section of the main does not exceed the allowable leakage calculated as one gallon per inch of diameter per mile of pipe per 24 hours per 30 metres head of water pressure. If this specified rate of leakage is exceeded, a thorough inspection of the section of the section of the main shall be made. All leaks discovered shall be repaired and the section shall be tested again.

F Every section of every main shall be tested as described above in the presence of the S.O. or his representative. Testing may be carried out between sluice valves but not against the gates of the sluice valves.

Record of Articles and Materials Buried by Backfilling

G Before any excavation is backfilled, the Contractor or his representative and the S.O. shall make joint inspection and compile a record of the number of pipes, specials, fittings, valves, joints, etc. which will be buried under the backfill. All such records shall be signed by both parties and shall be binding.

Asbestos Cement Pipes, Joints and Fittings

H Asbestos cement pressure pipes shall comply with the requirements of B.S. 486 : 1981 -"Specification for asbestos Cement Pressure Pipes and Joints".

I Pipes shall be of the class or quality indicated on the Drawings and shall be supplied in straight lengths with spigot ends grooved internally for jointing with rubber sealing rings, using joint sleeves of the same material as the pipe. The rubber shall comply with the requirements of B.S. 2494, unless otherwise specified by the manufacturer. The internal surface of the pipes shall be regular and smooth. Pipe diameters where specified are nominal outside diameters (o.d.). the manufacturing outside diameter shall be as stated in the manufacturer's literature.

Water Reticulation and Fire Hydrants (Cont'd)

Ductile Iron Pipes, Specials and Joints

A Ductile iron pipes and fittings shall comply with the requirements of B.S. 4772 (metric).

B Standard pipes shall be provided with socket and spigot ends suitable for making "Tyton" or other flexible, push-on type joints or equal. Fittings shall be provided with socket ends unless otherwise specified.

C Where the ends of pipes are described as plain ended, they shall be suitable for jointing with an approved flexible mechanical coupling.

D Pipe sizes are generally specified by their nominal size (DN), fabricated in accordance with the manufacturer's specification.

E Standard pipes shall comply with Class K9. Standard fittings without branches shall be to Class K1 2 and fittings with branches shall comply with Class K1 4.

F Pipes shall be manufactured by one of the following processes:

(i) Centrifugal casting in metal moulds.

(ii) Centrifugal casting in sand moulds.

G Pipes and fittings shall be protected internally with a cement mortar lining and externally with an approved non-toxic tar epoxy coating.

H All flanges shall conform to table 10 B.S. 4772 and shall be Type PN10 unless otherwise specified.

Steel Pipes, Specials and Joints

I Steel pipes and specials shall be of approved manufacture and shall comply with the requirements of the current editions including all amendments of B.S. 534 and B.S. 3501. Pipes and specials meeting any other internationally accepted standard ensuring a quality equal to or higher than the standard mentioned above will also be accepted.

J Pipes and specials shall generally be concrete lined internally and covered externally with coal tar enamel wrapping specified hereinafter. All steel pipes and specials shall be of the pressure type and of quality suitable for the purpose intended.

K Every consignment of pipes and specials delivered under this Contract shall bear the supplier's a certificate, worded as follows:-

"This is to certify that the quality of the pipes and specials delivered in this consignment is not inferior to the sample provided or to the quality laid down in the Specification, whichever is applicable".

L All pipes and specials supplied shall bear the following marking on the outside of the pipe or special:

(a) Manufacturer's distinguishing mark.

(b) Outside diameter.

(c) Length of the pipe.

(d) Approximate weight of the pipe or special

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Water Reticulation and Fire Hydrants (Cont'd)

Steel Pipes, Specials and Joints (Cont'd)

A The thicknesses of the steel plates and diameter of the pipes, shall be as shown below, except otherwise specified. Pipes, fitting and specials sizes are generally specified by their finished outside diameter (o.d.)

Pipe Diameter		Thickness of Shell Plate (mm)	Thickness of Concrete Lining (mm)	Tolerance for Concrete Lining (plus only) (mm)
Nominal Diameter (mm)	o.d. (mm)			
250	273	4.0	12	3
150	168.3	3.6	6	3
100	114.3	3.6	6	3
50	60.3	2.9	6	3

B The thicknesses stipulated above are minimum manufacturing thicknesses considered suitable for use under pressure. Thicker pipes may be required on the instruction of the S.O.

C The Contractor shall supply straight pipes in standard length of about 6m unless otherwise shown on the Drawings and to standard manufactured lengths.

D Specials shall conform to the appropriate dimensions given on the Drawings. The flanged duckfoot bends shall be cast iron flanged fittings in accordance with B.S. 2035 : 1966 and shall be of Class "C" quality or as indicated on the Drawings or elsewhere otherwise described.

E Pipes shall be supplied truly circular throughout their length for cutting to provide closing lengths. The tolerances on the outside diameters of such pipes shall be ± 1.5mm.

F The welded metal on the external surfaces of the ends of all plain ended pipes and specials shall be machined flush with the external surfaces of the pipe for a sufficient distance to facilitate jointing with couplings or steel collars.

G The concrete lining and the external coating of pipes and specials to be joined by welded shall be omitted for a sufficient distance from the ends to prevent damage to the protection during site welding. The external coating of pipes and specials to be jointed by mechanical couplings or flange adaptors shall be omitted for a sufficient distance from the ends to permit assembly of the joints but the concrete lining shall extend to the end of the pipes or specials. The unlined surfaces shall be protected with a suitable approved rust inhibitor during manufacture so that extensive cleaning of the surface is not required after jointing on site.

Water Reticulation and Fire Hydrants (Cont'd)

Cast Iron Pipes, Specials and Joints

A Cast iron pipes and specials shall generally comply with the requirements of B.S. 2035 - "Cast iron flanged pipes and flanged fittings" with detachable joints.

Mechanical Flexible Couplings (Gibault or V.J. Couplings)

B Flexible mechanical couplings shall be of mild steel and shall be "Gibault" or "Viking-Johnson" couplings or other similar approved type suitable for making watertight flexible connection between plain-ended pipes.

C Unless otherwise specified, the external surfaces of couplings shall be cleaned down to metallic finish and primed and painted with two coats of red lead oxide paint. The internal surfaces shall be similarly treated and protected with two coats of non-toxic approved epoxy bituminous paint.

D All mechanical couplings shall be capable of withstanding the maximum test pressure specified for the pipes they are to connect.

E All mechanical couplings shall be supplied completed with all necessary coupling rings, nuts, bolts, washers and rubber rings. Wedge joint rings shall comply with B.S. 2494. Bolts and nuts shall be hexagonal and shall be in accordance with B.S. 916.

Flanged Joints

F All flanges shall be of steel, welded to the pipe by the electric arc process or other approved method. Flanges shall be square to the longitudinal axis of the pipe and truly faced over their whole width. The bolt holes, which shall be drilled off-centre, shall be true to line and to end with longitudinal axis of the pipe.

G Flanges shall be in accordance with B.S. 10 : 1962 Table "E" or B.S. 4505 (metric).

H Each set of flange jointing materials shall be complete with nuts, bolts, washers and joint rings. Joint rings shall be of flat section 4.6mm thick, medium rubber reinforced with two-ply flax fabric and shall extend to the inner edge of the bolt-holes. Bolts and nuts shall be hexagonal and shall be in accordance with B.S. 916.

Collars

I Short sleeve collars suitable for making externally and internally welded connection between plain-ended pipes and specials shall conform to the dimensions given below.

J Each collar shall have two suitable tapped holes provided with matching plugs to permit air pressure tests of the joints to be carried out on completion of welding.

Nominal Pipe Diameter	Minimum Sleeve Length
250mm	150mm

K The external surfaces of collars, except where otherwise specified, shall be protected with two coats of primer compatible with the pipe coating. The internal surfaces shall be unlined but suitable protected with an approved rust inhibitor.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Water Reticulation and Fire Hydrants (Cont'd)

Collar Welded Joints

A The plain ends of the pipes to be jointed shall be cleaned of all rust, loose scale or other foreign matter adhering to the surface over the full width of the collar. Immediately after the surface at each end has been cleaned, it shall be painted with one coat of coal-tar primer as previously described The primer coat shall be followed with two finishing coats of coal-tar enamel paint, with sufficient time allowed for each coat to dry in between painting

B The metal surface shall be thoroughly dry before either the primer coat or finishing coat is applied

C A mild steel collar 150mm wide by 6mm thick (or at least 1.5mm thicker than the thickness of the adjoining pipe barrel, whichever is greater) shall be used as a backing strap over the butt joints of the steel pipes. The internal diameter of the collar shall be such that it can snugly fit over the plain ends of the pipes to be jointed.

D Prior to slipping the collar over the ends of the pipes, the internal surfaces of the collar shall be removed of rust, loose scale and other foreign matter and painted with coal-tar primer and finishing coat in the same manner as the plain ends of the pipes described above.

E The collar shall then be centrally aligned over the abutting ends of the pipes to be jointed and the pipes shall be secured in position and the line and level checked before welding commences. Each end of the collar shall then be fillet welded to the pipe throughout its circumstance, after which the collar and exposed portion of the pipe shall be externally protected with a wrapping of asbestos coal-tar saturated felt as previously described.

Special Joints

F Where a joint occurs between a steel pipe or special and a valve, the internal diameter of the steel pipe or special shall be finished to match the bore of the valve by gradually decreasing or increasing the thickness of the concrete lining in the steel pipe or special. Any increase or decrease in the thickness of the concrete lining along the length of such a pipe or special shall be gradual and smooth

Work Test

G The Contractor shall carry out the following tests on all pipes and specials before they are lined or coated:

(i) Hydraulic pressure test on every pipe and special shall be 200m head. All pipes and specials which pass this test shall be stamped with the Contractor's test stamp

(ii) As a control weld quality, the Contractor is also required to submit radiographs of 2% of all welds for the S.O.'s approval. The minimum lengths of welds to be radiographed at any one location shall be 300mm

Defects and Method of Reffiection

H Materials which show injurious defects at the place of manufacture, at site, or which proves to be defective when properly applied in service shall, only where permitted by the S.O., be completely repaired

I Injurious defects shall include cracks, leaks, lamination, lack of complete penetration, lack of complete fusion, dents, exceeding one eighth of the specified wall thickness and undercutting or reduction in pipe wall thickness adjacent to a weld exceeding 1 mm in depth.

J Every pipe or special which fails to pass the Hydraulic Pressure Test shall be rejected.

Water Reticulation and Fire Hydrants (Cont'd)

Defects and Method of Reffiection

A Any pipe or special which has been rejected shall be marked in a distinctive manner which will preclude any possibility of their use in the Works. Such pipes and specials may be submitted for retest following the correction of any defects, where such correction is permitted.

Cleaning

B After satisfactory hydraulic testing of each item, pipes and specials shall be thoroughly descaled by acid pickling or grit blasting in order to remove all mill scale, rust, paint, grease and loose dirt. After cleaning, the pipes and specials shall be protected from and maintained free of all oil, grease and dirt from whatever source until it has received its external coating and concrete lining.

Internal Lining

C All steel pipes and specials shall be lined internally to the thickness specified with concrete made from ordinary Portland Cement and fine aggregate. The materials used for lining, the method of lining and curing of the finished lining shall comply with the requirements of B.S. 534 : 1981 and shall be carried out to the satisfaction of the S.O. The manufacture and testing of test cubes shall comply with the specific requirements of B.S. 534.

External Coating for Buried Pipes

D All steel pipes and specials shall be protected against external corrosion by coating and wrapping in a neat and workmanlike manner.

E Immediately and not later than 15 minutes after each pipe or special has been cleaned to bare metal a uniform thin coat of primer compatible with the coating materials to be used shall be cold applied by final coating, spraying or brushing. The primer shall be allowed to dry properly before the coating material is applied, but if more than 96 hours elapses before coating or if the primer becomes dead or powdery it shall be cleaned off and the pipe or special shall be re-primed.

F The coating material shall conform with the following requirements:

(i) The pipes and specials shall be coated with two layers of plasticised coal tar pitch base enamel suitable for use in tropical climate. The coating shall be applied to a total minimum thickness of 3mm and shall be reinforced with an inner wrapping and an outer wrapping.

(ii) The wrapping materials shall be spirally wound onto the pipes and specials simultaneously with the coating material. Each wrap shall be formed 300 - 450mm wide and the edges shall overlap by 12 - 25mm. Care should be taken to ensure that the inner wrap does not come in contact with the pipe metal or with the outer wrap and the minimum coating layer between wrapping and metal being 1 mm.

(iii) The inner wrap shall be a glass fibre resin bonded tissue reinforced in longitudinal direction with parallel glass threads spaced 10mm apart. The nominal thickness shall be 0.5mm and the minimum weight shall be 0.5 kg per 10m2.

(iv) The outer wrap shall be a glass fibre resin bonded tissue in the longitudinal direction with parallel glass threads spaced 10 - 25mm apart. It shall be impregnated with material fully compatible with the coating material to give a finished thickness of 0.8mm.

(v) Coated pipes and specials shall be given one coat of water resistant white wash immediately following final inspection.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Water Reticulation and Fire Hydrants (Cont'd)

Exposed Pipework (Pipework above Ground)

A Steel pipes and specials required for installation above ground at stream or river crossings shall be internally concrete lined unless otherwise specified and protected externally with two coats of approved zinc chromate after cleaning as specified.

Coating, Inspection and Repairs

B All coated pipes and specials shall be rigidly inspected for defects. Thickness shall be determined by a pit gauge and for continuity with a holiday detector and coating quality by cutting out 80 x 80mm samples.

C The whole coated surface area of all pipes and specials shall be tested for pinholes or other visible defects in the coating using an approved holiday detector at a potential of 14,000 volts.

D Any lengths on which the coating is, in the opinion of the S.O., poorly applied shall be cleaned to bare metal and re-coated. Minor defects may be repaired by touching up. All repairs shall be checked for thickness and continuity.

Handling

E Pipes and specials shall be lifted and moved only by wide non-abrasive slings or by other means acceptable to the S.O. Wire ropes, chain and hooks shall not be permitted to come in contact with external wrapping.

F Pipes shall be kept clear of the ground and rested on padded sleepers or support

Site Welding

G All site welded joints shall be made by the electric arc process. The Contractor shall submit for the S.O.'s approval full details of the size, type and make of the electrodes and the arc length, polarity, voltage and current to be used in the work

H Fillet welds shall be 450 equal leg with an effective throat thickness of not less than 0.707 times the nominal leg size of the weld.

I The maximum size of fillet weld to be made in one pass shall be 8mm and a single layer of weld metal deposited in one pass shall not exceed 3mm thickness

J Before welding is started, the surface to be welded shall be dry and clean. Each time the arc is started it shall be manipulated to obtain complete fusion of the deposited weld metal with the base metal and with any previously deposited weld metal before any progression is made along the joint

K During welding, electrode manipulation shall ensure that complete fusion is obtained and the method base metal is replaced by weld metal, so that no overlap or undercut remains along the edges of the weld; and also so that all slag, oxide and gases are floated to the surface behind the advancing arc

L At the completion of a pass or weld, the arc crater shall be filled with sound metal

M Before welding over previously deposited weld metal, all slag shall be removed and the old and adjacent base metal shall be brushed clean. This requirement shall apply not only to successive layers but also to the successive beads and to the crater area when welding is resumed after any interruption

N Defective or unsound welds shall be corrected by strengthening or removing and replacing the defective weld as the S.O. may direct. A cracked weld shall be removed and replaced throughout its entire length

Welders Qualification

A The Contractor shall employ qualified welders approved by the S.O. for the carrying out of the Works.

Completion of Sheathing at Welded Joints

B After the S.O. has advised the Contractor in writing that a welded joint has been tested in accordance to B.S. 709 and approved, the external sheathing shall be completed to ensure continuity of protection along the pipeline.

C The bare metal shall be thoroughly cleaned to a bright metallic finish and it shall be immediately coated with a primer solution. The primer shall be applied cold by brush.

D As soon as the primer has set, the sheathing shall be completed by running hot bitumen into an aluminium mould placed over the joint and overlapping the sheathing by 75mm on either side of the joint. The thickness of the sheathing completed by the Contractor shall not be less than 10mm. The Contractor shall test the sheathing at each joint for defects by using a Holiday detector.

E Priming and sheathing material shall be provided by the Contractor including all the necessary mould boxes and funnels required to form the protective mould and whiting for use in lining the mould boxes prior to each pour. The Contractor shall also supply all necessary boilders complete with thermometers to heat the compound to the temperature recommended by the manufacturer.

Sluice Valves

F Sluice valves shall be of approved manufacture and sizes and shall be suitable for its intended use.

G The sluice valves shall have non-rising spindles and shall be suitable for the conveyance of raw or drinking water in the tropics under the maximum working pressure of 100m head of water when fixed in pipelines or in unsupported terminal positions.

H Sluice valves shall have cast iron bodies, high tensile forged bronze spindles, gun metal nuts, wedge gates with gun metal faces and seats and bonnets fitted with soft packing glands. The glands shall be fitted with a bronze bush.

I All valves shall be suitable for operation by one man under the maximum working pressure.

J Each sluice valve shall be provided with a cast iron cap top.

K Sluice valves shall be arranged for clockwise closing.

L Where sluice valves are in an accessible position or too large for easy operation, they shall be fitted with extension spindles, chain mechanisms; steel keys or headstocks appropriate for its use. Headstocks shall be clearly and indelibly marked to indicate the "CLOSED" and "OPEN" positions of the valve.

M Sluice valves larger than 375mm diameter shall be fitted with a studded cast iron cover at the bottom of the valve body for inspection, cleaning and flushing purpose.

N Both ends of the sluice valves shall be flanged. The flanges of valves shall be machined and drilled to B.S. 10 : 1962, Table "E".

O Smooth and clear internal surfaces are particularly required on any sluice valve. Sluice valves having on the inside rough surfaces or projections which cannot be removed satisfactorily shall be rejected.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Water Reticulation and Fire Hydrants (Cont'd)

Sluice Valves(Cont'd)

A All sluice valves of 200mm diameter and under shall be "open end" tested as required and shall show no signs of leakage under these tests.

B All sluice valves of 250mm diameter and above shall be "closed end" tested as required and shall show no signs of leakage under these tests

Scour or Washouts

C Washouts shall be installed at locations shown on the Drawings or as may be directed by the S.O. The washout branches shall be connected to the pipeline by special washout tees and sluice valves. From the scour or sluice valve, 100mm diameter Class "C" galvanised mild steel drain pipes shall be laid to the nearest drain or stream and shall point downstream.

Air Valves

D Cast iron single or double air valves shall be of the diameters required and shall be located at positions shown on the Drawings. All air valves shall be suitable for operating at a maximum working pressure of 100m head of water and their bodies and covers when assembled shall be capable of withstanding a hydrostatic tests pressure of 200m head of water without any sign of leakage

Single Orifice Air Valves

E Single orifice air valves shall be suitable for automatically releasing air that may accumulate in pipelines under pressure and shall be supplied with air release nipples of bronze screwed into brass plugs.

F The ball which forms the valve element shall be either rubber or vulcanite, or covered with rubber or vulcanite and shall be of a diameter suitable for operating at maximum working pressure of 1 00m head of water.

G Each air valve shall be fitted with a gun metal isolating cock of the screw down pattern at the inlet. The inlet and outlet of each isolating cock shall be threaded with British Standard Mal Pipe Threads.

Fire Hydrants

H All fire hydrants shall be the screw down type complying with the requirements of B.S. 750 including subsequent additions and amendments thereof and subject to the deviations and additions specified herein.

I Fire hydrants shall be fixed by the Contractor in the general positions shown on the Drawings. The exact position of each hydrant will be decided on site by the S.O.

J For hydrants with sluice valves the duckfoot bend at the base of the hydrant shall be firmly embedded in concrete grade C20P surrounds. Provide concrete apron around the hydrant standpost to details shown on the Drawings. A sluice valve chamber shall be constructed for each hydrant sluice valve.

Water Reticulation and Fire Hydrants (Cont'd)

Coating of valves, Air Valves and Fire Hydrants

A Immediately after casting and before machining, all cast iron parts of sluice valves, air valves and underground hydrants shall be coated by dipping in a bath containing a composition having a tar base and maintained at a temperature between 2900 F and 3300 F. The proportions of the ingredients of the composition shall be regulated so as to produce a coating having the properties hereinafter specified.

B The castings shall be re-heated before dipping either by immersion in hot water or by heating in an oven or shall be held in the dipping bath sufficiently long to reach an equivalent temperature, the method used being at the maker's option. Care shall be taken to see that the castings are perfectly dry immediately before dipping. On removal from the bath, casting shall be sufficiently drained.

C The coating shall be such that it shall not impart taste or smell to the water and shall be smooth, glossy and tenacious, sufficiently hard so as not to flow when exposed to a temperature of 1700 F and not so brittle at a temperature of 320 F (00 C) as to chip off when scraped lightly with the point of a penknife.

D All machined surfaces shall be thoroughly cleaned of the coating and before they become affected by rust shall be treated with an approved protective composition.

Valves, Hydrants and Scour Chambers

E Valves, hydrants and air valves chambers shall be constructed to the details shown on the Drawings. Pipes and valves shall be centrally placed in chambers unless otherwise directed by the S.O. Floors shall be formed in Grade C20P Portland Cement concrete of 100mm minimum thickness or such other thickness as shown in the Drawings. The walls shall be 230mm brickwork in 1:3 cement mortar and shall be built in English bond with a fair inside face and struck joints. Brickwork shall be arched over all pipes. Alternatively chambers may be constructed of precast concrete grade C20P chamber rings of standard depths and sizes to details as shown on the Drawings. Every part of the pipe and valve in a chamber shall sit on concrete blocks suitably benched to prevent movement. The covers to chambers shall be mild steel chequered plate hanged covers. Chambers in carriageways shall have the brickwork corbelled to support cast iron or precast concrete covers as directed. The finished level of any chambers shall be such that no obstruction shall be offered to any vehicle, animal or pedestrian.

Mild Steel

F All mild steel shall be of approved manufacture and shall be free from grease, rust and scale.

Step Irons

G All step irons shall be heavily galvanised malleable iron castings complying with B.S. 1247 1955. Unless otherwise shown on the Drawings, general purpose pattern step irons with 11 5mm tails shall be used in walls 230mm or more in thickness, and rounded bar pattern step irons shall be used in 115mm walls.

Wall Plastering

H All internal faces of brick walls in chambers shall be rendered in 1:3 cement and mortar Unless otherwise shown in the Drawings the rendered shall be 12mm thick.

Painting of Pipework, Valves and Hydrants

I After installation, the exposed surface of all pipework, valves and fittings in chambers and at washouts shall be properly cleaned and painted with two coats of approved bituminous paint.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Water Reticulation and Fire Hydrants (Cont'd)

Maintenance

A The Contractor shall maintain the whole of the works for a period of twelve (12) months after completion and acceptance by the S.O.

B The Contractor shall during the progress of the work and during the maintenance period repair all leaks and other defects, make good any subsidence which may have occurred along the trenches and shall continuously make good all trenches, and particularly all road crossings.

Sterilisation and Flushing of Pipelines

C When the final connection have been made and the pipeline has been tested to the satisfaction of the S.O. the pipe should be scoured until the water runs clear and then disinfected. The Contractor shall thoroughly sterilise and flush the pipeline in sections or as directed by the S.O.

D The section of the main to be sterilised shall first be emptied and then filled with a solution of chloride of lime containing at least 20 parts per million of chlorine. After being filled with chlorinated water, the section of the man shall be closed and left overnight. The main shall be deemed to have been sterilised if the samples of water taken from various tappings on the main show a chlorine residual. The main after sterilising shall be flushed with clear water.

Preparation of Subgrade to Receive Road Pavement

E The preparation of subgrade shall be carried out only after completion of all subgrade drainage, piped drains, services and ducts or any other drainage work that might affect the works, unless otherwise agreed by the S.O., and such preparation shall be carried out immediately prior to the laying of the base course.

F The surface of the subgrade shall be substantially uniform in density throughout its entire width and shall conform to the density requirements for compaction. Compaction shall be carried out by approved rollers until the subgrade is uniformly compacted to a density not less than 95% of the maximum dry density obtained by testing in accordance with Test No.13 of B.S. 1377 (modified ASSHTO). It shall be trimmed to conform to the lines, camber, grades and typical cross sections shown on the Drawings, or as directed by the S.O. Where ruts or other objectionable irregularities occur as a result of construction traffic or other causes, the Contractor shall re-shape and re-compact the subgrade to the required density.

Earth Formation

G Where soft spots and unsuitable material occur, they shall be removed and backfilled with approved stable material and compacted by not less than 4 passes of a smooth-wheeled roller weighing not less than 10 tonnes or an equivalent vibrating roller.

H The subgrade shall then be checked and the final trimmed surface shall be rolled by one pass of a smooth-wheeled roller of not less than 5 tonnes or an equivalent vibratory roller prior to the laying of the base.

I The subgrade shall be so constructed to drain surface water to the side ditches or other drainage system. If the Contactor allows the moisture content of the completed formation to reach a value above the permitted maximum for the compacted material, the Contractor shall allow the material to revert to an acceptable moisture content and, if directed by the S.O , make good at his own expense the surface by re-compacting before laying the base.

Pavement Thickness

J The thickness of the various layers of the pavement shall be as shown on the Drawing

Roads (Cont'd)

Sub-base Material

A The crusher run sub-base to be placed on top of the subgrade shall be dry bound macadam consisting of crusher run metal laid in layers as specified to give the specified total compacted thicknesses and to the width, correct line and levels shown on the Drawing or as directed by the S.O.

B The material shall be crushed rock of hard durable particles of fragments of rock crushed to the correct size, well graded and lie within the following grading limits shown in Table 1. The grading of crushed rock shall be approved by the S.O.

TABLE 1

GRADING LIMITS FOR CRUSHER RUN

B.S. Sieve Size	Percentage by Weight Passing
76mm	100
38mm	85 - 100
9mm	40 - 70
5mm	25 - 45
No. 25	8 - 22
No. 200	0 - 10

Notes :-

1. The particle size shall be determined in accordance with the requirements of B.S. 1377.

2. The material passing the No. 36 B.S. Sieve when tested in accordance with B.S. 1377 shall be non-plastic.

Laying and Compaction of Crusher Run

C All work on the portion of the subgrade on which the sub-base is to be laid shall be properly shaped and compacted in accordance with the requirements of this Specification before the placing of the sub-base material on the portion. The preparation of the subgrade shall be completed at least 200 metres ahead of the placing of the sub-base material. the sub-base shall be constructed to the full compacted thickness as shown on the Drawing.

D Prior to laying the crusher run sub-base, a layer of sand blanket to the full width of the pavement shall be placed on the subgrade to the thickness described or shown on the Drawings.

E Crusher run material shall be placed and spread evenly to the full width of the road bed.The maximum compacted thickness of any one layer shall not exceed 150mm. When the specified compacted thickness of sub-base exceeds 150mm, the base shall be constructed in two or more layers of approximately equal thickness. Each layer shall be compacted to the required density before the next layer is placed. Care shall be taken to prevent segregation of material into the coarse and fine fractions. Segregated surface areas of a base material contaminated to such an extent that it no longer complies with this Specification shall be removed and replaced with well graded and satisfactory material at the expense of the Contractor.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Roads (Cont'd)

Laying and Compaction of Crusher Run (Cont'd)

A The material shall be spread by a motor grader or any other approved mechanical plant.

B When a sub-base is spread adjacent to concrete kerbs or roadside drains, extreme care shall be exercised so as not to damage the kerbs or drain. Any damaged kerbs or drains shall be removed and reinstated to proper condition at the Contractor's own expense.

C Compaction shall be completed as soon as possible after each layer has been spread and shaped satisfactorily. Each layer shall be thoroughly compacted with suitable compaction equipment to the requirement specified in Table 2 - Compaction Requirements for Granular Sub-base Materials.

D Rolling operations shall begin along the edges and progress towards the centre gradually in a longitudinal direction. On super-elevated curves, the rolling shall begin at the low side and progress towards the high side. he rolling operation for each layer shall continue until all rolling marks, ridges or cracks are eliminated. Any irregularities, segregation or loose material which may develop in the surface during or after construction shall be corrected or removed and the defective areas made good to the full thickness of layer and recompacted.

E Before the laying of each layer of crusher run metal a partial width of the shoulder, not less than 300mm wide shall be constructed to the top of each uncompacted layer of the base to act as a haunch to support the edges of the crusher run base during rolling.

F Sub-base material shall be maintained at the correct moisture content necessary for proper compaction by sprinkling with water or drying as required. All these shall be carried out at the Contractor's own expense.

Roads (Cont'd)

Laying and Compaction of Crusher Run (Cont'd)

A The surface of the aggregate sub-base shall be well drained at all times.

TABLE 2

Compaction Requirements for Granular Materials				
Type of Compaction Plant	Category	Number of Passes of		
		Not greater than 115mm layer	Not greater than 150mm layer	Not greater than 230mm layer
Smooth-wheeled roller	Load per inch width 70 - 140 kg more than 140 kg	16 8	Unsuitable 16	Unsuitable Unsuitable
Pneumatic tyred roller	Wheel Load Tonne 4-6 6-8 8-12 more than 12	12 12 10 8	Unsuitable Unsuitable 16 12	Unsuitable Unsuitable Unsuitable Unsuitable
Vibratory roller	Static Load per inch width of vibratory roller kg 20-35 35-50 50-65 65-80 80-100 100-120 120-140	16 6 4 3 3 2 2	Unsuitable 16 6 5 5 4 4	Unsuitable Unsuitable 10 9 8 7 6
Vibrotamper	Weigh kg 50-65 65-75 more than 75	4 3 3	8 6 4	Unsuitable 10 8
Power rammer of dropping weight compactor	Weight kg 100-500 more than 500	5 5	8 8	Unsuitable 12

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Roads (Cont'd)

Finished Sub-base Surface

A The finished sub-base surface shall be even, free from hungry patches, irregularities, loose material or fines and true to cross-section, line and level. Any irregularities on the finished sub-base surface of more than 13mm when measured with a straight edge 3.0 metres long laid either parallel to the centre line of the road or laid transversely, shall be corrected by loosening, adding or removing material, reshaping and recompacting.

Bituminous Tack Coat

B A bituminous tack coat shall be applied to the top of the completed crusher run base before the laying of the bituminous macadam binder course. The bituminous material for the tack coat shall be either a rapid curing cut back given in B.S. 3690 Part 1: 1982 - "Specification for Bitumens for Road Purposes" or a rapid breaking emulsion. Bitumen emulsion shall be of the anionic type unless the cationic type is explicitly required.

C The grade and use of other anionic emulsified bitumen or cationic emulsified bitumen shall conform to the requirements for the appropriate grade given in B.S. 434 Parts 1 & 2: 1984 in respect of general properties.

D The Contractor shall apply the tack coat on the completed portion of the granular base as soon as practical. However, he shall not apply the prime coat if the moisture content in the top 50mm of the aggregate sub-base exceeds the higher of either:

(i) The average of the optimum moisture content as determined by the standard compaction test, and the absorption of the B.S. 5mm sieve fraction, or

(ii) Two-thirds of the optimum moisture content as determined by the standard compaction test.

E A further coat of bituminous tack coat shall be applied to partially completed areas of crusher run sub-base course before laying of new crusher run.

F The surface shall be cleaned immediately prior to the application of the tack coat. The bituminous material shall be applied by means of a distributor at the rates directed by the S.O., but not to be less than 0.40 litres per sq. metre and at the ambient temperatures as necessary for uniform spraying and satisfactory penetration.

Bituminous Macadam Road Pavement

G The bituminous macadam road pavement shall be laid to the overall finished thickness shown on the Drawings and in compliance with the requirements of B.S. 1621.

Coarse Aggregate

H The coarse aggregate shall be natural aggregate substantially free from the material passing an 3mm B.S. sieve in accordance to B.S. 410 - Test Sieves. It shall be hard, clean, durable crushed rock of granite or limestone group or of any other rock group as may be approved by the S.O. Only granite shall be used for the wearing course.

Roads (Cont'd)

Fine Aggregate

A (i) The fine aggregate shall consist of crushed rock or of clean sand, substantially all of which shall pass an 3mm B.S. sieve. If sand is used, the content of silt, loam and clay shall not exceed 3 percent by weight of the fine aggregate, determined in accordance with B.S. 812, method A or B. In the event of dispute, method A (sedimentation method) shall be used.

(ii) If added filler is used in the bitumen macadam, it shall consist of crushed rock, hydrated lime, Portland Cement, or other material approved by the S.O. At least 75 percent of it shall pass a No. 200 B.S. sieve.

Binder

B The binder shall be either cut-back or straight run bitumen, which shall have a penetration of between 80 and 100 at 250C.

Composition of Mixtures

C The bituminous macadam road pavement shall generally be laid in two layers comprising the base course and the wearing course. Each layer shall be to the thickness shown on the Drawings to make up the finished thickness of the pavement.

D The composition of freshly mixed material for the bitumen macadam shall comply on analysis with the following requirements:

BASE COURSE

Passing B.S. Sieve	38mm Nominal Size Aggregate
mm	% by Weight
65	-
50	100
38	90 – 100
25	50 – 80
13	10 – 30
19	0 – 10
Binder Content as found by Analysis	3.0-3.8

WEARING COURSE

Passing B.S. Sieve	20mm Nominal Size AggregatE
mm	% by Weight
25	100
19	95 – 100
13	70 – 90
10	55 – 75
6	40 – 60
3	25 – 40
No 14	14 – 30
No. 200	3 – 6
Binder Content as found by Analysis	4.4 - 5.4

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Roads (Cont'd)

Mixing

A The aggregate shall be surface dry, and the aggregate and binder separately heated to the following temperatures on entering the mixer:-

Aggregate	65.60 C - 148.90 C
Binder	93 30 C - 162 80 C

B It is particularly important to avoid excessive heating of the binder, and excessively high temperature of the aggregate at the time of mixing, as these will adversely affect the quality of the resultant macadam

C The materials, including any added filler, shall be weighted or measured into a mechanical mixer and thoroughly mixed in such a manner that all particles of the aggregates are completely and uniformly coated.

Transport

D The bitumen macadam shall be transported from the manufacturing plant to the site of the work in clean vehicles and shall be protected against adverse weather conditions by means of tarpaulin. The use of dust, coated dust, oil or water on the interior of vehicles to facilitate discharge of the bitumen macadam is permissible , but the amount shall be kept to a minimum and any excess shall be removed by tipping or brushing.

E It is particularly important that bitumen macadam which is to be laid warm shall be protected to minimise loss of heat during transit so that all material is delivered in a condition suitable for spreading and compacting.

Sampling and Testing

F Sampling and testing of the aggregates and mixed materials carried out shall be in accordance with the following British Standards as appropriate:-

B.S 812	"Testing of Aggregates"
B.S 598	"Sampling and examination of bituminous mixtures for roads and other paved areas"

Laying of Bitumen Macadam

G The base course and wearing course shall be laid by machine in single course each and the average compacted thickness of the individual courses should be within the limits specified below:

Base course	:	45mm to 65mm
Wearing course	:	30mm to 40mm

H The accuracy of finish in the longitudinal direction shall be determined by measuring the gap under a 3 0 metres straight edge, placed in any position on the road surface parallel to the centre line; the gap at any place between the points at which the straight edge is in contact with the road should not exceed the following limits

Base course	:	13mm
Wearing course	:	6 5mm

I The transverse profile should conform to a similar standard of accuracy, using a correctly shaped templates instead of a straight edge

Roads (Cont'd)

Laying of Bitumen Macadam

A The bitumen macadam shall be laid by machine. Work shall not proceed under unsuitable weather condition. The machine shall be of a type preferably self-propelled and capable of laying bitumen macadam continuously so as to produce automatically an even, smooth and compact surface to the required widths, thickness and cross-falls without segregation of the bitumen macadam.

B A fully trained and experienced operator shall be in direct charge of the machine.

C The bitumen macadam shall be supplied continuously to the machine. Material supplied to the machine shall be laid as soon as possible after delivery.

D The machine shall be used only when it is in a serviceable condition. Bituminous material remaining in the hoppers, conveying and spreading mechanisms, tampers and screeds, shall be cleaned off at the end of each working day. On no account shall cleaning solvent be allowed to come into contact with any road surfacing material. Accumulation of material not of the specified quality shall not be deposited on the sites. The machine shall be operated to avoid, as far as possible, dragging of the bitumen macadam.

E On carriageways, narrow strips remaining alongside machine work shall be, as far as possible, hand laid and rolled at the same time as the machine laid work and allowance should be made for extra compaction of hand laid strips.

F Continuous inspection of the finished surface as it is laid shall be carried out and any defects immediately rectified before and rolling takes place.

Joints

G When a transverse construction joint is to be made, the material shall be cut back to a vertical face of the full depth of the course being laid and painted with bitumen or bitumen emulsion before any new material is laid.

H On longitudinal joints a complete bond of the two strips, after compaction should be ensured. If this is not possible, the edge shall be cut back and painted as above.

Laying Around Manhole Covers

I When laying around manhole covers and similar fittings, those parts against which the bitumen macadam is to abut should be cleaned and painted with bitumen or emulsion prior to laying operations. The bitumen emulsion macadam shall be tamped, so that, after final compaction, the finished surface is level with, or slightly proud of, such fittings.

Compaction

J As soon as rolling can be effected without causing undue displacement, the bitumen macadam shall be uniformly compacted by rolling. Compaction should be carried out with a roller or rollers of weight not less than 6 tonnes nor shall it exceed 10 tonnes, and the width of a roll shall not be less than 450mm. The bitumen macadam shall be rolled in a longitudinal direction, working from the sides to the centre of the carriageway, overlapping on successive passes by at least one half of the width of the rear roll. The roller should be fitted with a quick reverse and smooth acting clutch.

K Rollers should not be allowed to stand on newly laid bitumen macadam while there is a risk that the surface will be deformed thereby.

L Traffic shall not be allowed to pass over the surface until the bitumen macadam has been compacted and is adequately set.

EXTERNAL AND INFRASTRUCTURE WORKS (Cont'd)

Turfing

Surface Preparation

A The areas to be turfed are to be completely cleared off all builder's debris, stones or other obstructions and brought to the lines and grades as required. The ground shall then be forked or otherwise loosened to a depth of 1 00mm - 150mm. A top dressing of Rock Phosphate or similar approved fertilizer shall be spread over the prepared area at the rate of 136 to 203 grams per metre super and the fertiliser dressing shall then be well raked in prior to laying of the turf.

Vegetable Soil

B The top soil is to be selected black vegetable soil, free of roots, weeds and clods and large stones. All soil shall pass a 10mm sieve but a few stones retained therein but passing a 25mm over areas to be turfed to form an even layer of 50mm (consolidated) thickness

Turf

C Turves shall consist mainly of healthy, dense, indigenous cow grass. samples of turf shall be submitted to the S.O. for approval before delivery to the site or alternatively the S.O. will inspect the turf on site of origin before stripping.

D Before stripping, the grass shall be cut not to exceed 19mm length. Turves shall be cut in panels at least 300 x 300mm square and lifted with proper turf cutting tools The shall be flat, of even thickness not less than 38mm and of rectangular shape with square edges.

E Turves intended for building compounds and landscape works shall be free from mimosa, lallang and any other objectionable plants. They will be inspected for weeds before laying and any weeds discovered shall be grubbed out complete with roots and be destroyed.

F Turves shall be laid within 24 hours of being cut. They shall be stacked on site roots to roots and grass to grass and shall be kept moist by spraying with water and covering with wet sacking. Turves which dry out shall be rejected.

Spot Turfing

G Spot turfing shall comprise of squares of turves not less than 200mm square and laid at 380mm centres both ways. The turves shall be approved quality cow grass rooted into at least 50mm of topsoil. The turf shall be firmly rolled or tamped into the soil until the surface of the turf is level with or slightly below the surrounding soil.

Close Turfing

H Close turfing to all newly formed banks or exposed earth up to the edges of the Authorities road-side drains shall be with approved quality cow grass deeply rooted in 50mm layer of top soil

I Close turfing shall consist of turves laid edge with staggered joints to cover the whole area without any space between. After laying, the turf shall be rolled or tamped into the soil to provide an even surface. Tamping or rolling shall be carried out by methods or equipment approved by the S.O On slopes with gradients 2 : 1 or steeper, and in channels the turf shall be pegged after tamping. The peg shall be driven in flush with the turf bed surface

Watering, Tending and Caring

J The Contractor shall be responsible for the proper nursing and tending of the newly laid turf until it is firmly established. This shall include regular watering as necessary during the dry periods. Any turfed areas which fail to flourish shall be replaced at the Contractor's expense to the satisfaction of the S O

Turfing (Cont'd)

Watering, Tending and Caring (Cont'd)

A The maintenance of earth banks includes the repair of any slips as directed by the S.O. Such repair shall include the replacement of turf as required.

Protection of Turfed Areas

B The Contractor shall take all necessary measures to protect newly turfed areas to prevent the destruction of turfing by pedestrians, traffic or grass eating animals.

C Put up warning signs, temporary fencing, barricades at vulnerable points or as instructed by the S.O. The temporary fence, barricades, etc. shall be maintained by the Contractor and when the grass is well established, shall be removed and cleared away and the ground reinstated. Any damage to grass shall be made good until all turfed areas are handed over.

Surface Finish

D All turfing shall be finished to give a smooth, compact surface. Where spot turfing is planted, the turf shall not stand out above the level of the surrounding soil. When turf has been firmly established to the satisfaction of the S.O., the whole of the turfed areas shall be thoroughly rolled with an approved roller, to give the required surface finish.

Maintenance

E After three months growth, the turf shall be cut once a month for all succeeding months and this shall be carried on for the full duration of the Defects Liability Period.

F The Contractor shall also allow for watering the turves as often as shall be necessary to ensure knitting.

(End of Standard Specification of Materials and Workmanship)

SCHEDULE OF RATE

SCHEDULE OF RATES

1. This Schedule of Rates shall form part of this contract and shall be read in conjunction with the General Specification and any addenda or appendices thereto.

2. The Rates shall be firm and shall not be subjected to any adjustment after the signing of the Contract. The rates shall be used as the basis for computing progress payments and calculating the cost of any variations which may be ordered in accordance with the Terms of the Contract.

3. Where no such rates exist in these Schedule of Rates, the works shall be valued on pro-rata basis on similar existing rates. Where no such similar rates exist, then the works shall be at the actual Prime Cost to the Contractor all in accordance with Clause 11 (C) (ii) of the Conditions of Contract.

4. This Schedule of Rates duly filled in and signed must be returned together with the Tender Form.

5. All rates herein shall be held to include for waste on materials, carriage and cartage, carrying in and return of empties, hoisting, setting, fitting and fixing in position, making and all other labours and everything else necessary (including any customs duty, etc) for the proper completion of each item and for establishment charges and profit.

6. Rates for excavation (including excavation for drainage) are to include for keeping all excavations free from water, mud, etc. by pumping or bailing, if required and for planking and strutting, leveling, ramming or preparing bottoms, any double handling required and for additional excavation for planking and strutting and formwork.

7. Rates for concrete shall be held to include for forming, leaving or cutting grooves, chases, mortices, holes and making good and any sundry items and removal.

8. Rates for formwork shall be held to include for erection, raking and circular cutting, splayed edges, notching, allowance for overlaps and passing at angles, battens, strutting, bolting, wedging, easing, striking and removal.

9. Rates for brickwork and blockwork shall be held to include for all rough and fair cuttings, over-sailing and receding courses, rough relieving and discharging arches, wedging and pinning, raking out joints for the pointing flashings, bedding plates, bedding and pointing frames, paring and coring flues, labour caves filling, plumbing angles, forming square and rebated reveals, cut squints or bird-mouths, notches, forming, leaving or cutting chases, holes and mortices and cutting and pinning and making good any other sundry items of a like nature.

10. Rates for each item of paving shall be held to include for all rounded angles, arises and making good any other sundry items of a like nature.

11. Rates for each item of skirting, risers, channels and the like shall be held to include for all short lengths, formed cut and purposes made angles, junctions ends etc. and making good any other sundry items of a like nature.

12. Rates for all carpentry timber are to include for all labour to notching, halving, morticing, tenoning and wedging, scarfing, dovetailing, sinking for heads of bolts and nuts and trimming for openings.

13. Rates for each item of joinery shall be held to include for all cuttings, notching, holes housing ends, mitering ends and shaped ends, angles, junction, heading joints, short length and any other sundry items of a like nature.

14. Rates for plastering, rendering, etc shall include for raking out joints of brickwork, and masonry or hacking concrete as key.

15. Overall rates of each item of plastering, etc. shall be held to include for narrow widths and small quantities, temporary rules, joints between different types of plastering, internal angles, arises, quirks, rounded coves and external angles not exceeding 25 mm radius, and mitres stops, etc. on cornices, mouldings, enrichments, coves, skirtings, gutters and strings, all making good and any other sundry items of a like nature.

16. Rates for mild steel tubing are to include all short running lengths, sockets, backnuts, elbows and bends,.

17. Rates for driving of Bakau and pressure-treated timber piles shall include for the provision of all necessary mechanical plant, rig, temporary works, timber etc. transporting to site, erecting, dismantling removal on completion and also for traveling of pile frame about the site.

18. Rates for driving of precast concrete piles and reinforced concrete lengthened piles shall include for traveling of pile frame about the site.

19. Unit of Measurement

The units of measurement are generally according to Metric System and Measures unless otherwise stated.

Metric Measures

Cubic Metre	-	Cu.M
Square Metre	-	Sq.M
Linear Metre	-	M
Kilogram	-	Kg
Pairs	-	PR

ITEM	DESCRIPTION	UNIT	RATE
	EXCAVATOR		
1.	Excavate oversite average 150mm deep to level off formation or reduce level.	Sq.M	1.20
2.	Excavate oversite to obtain formation level and remove spoil and deposit on site to make up levels including trimming or forming as specified (By hand).	Cu.M	7.00
3.	Ditto (By Mechanical Equipment)	Cu.M	2.50
4.	Excavate, for foundation trenches, pier holes manholes, septic tanks, filter bed, etc. not exceeding 1.5m deep, backfill and remove surplus spoil and deposit, spread and level on site as specified (By hand).	Cu.M	7.00
5.	Ditto exceeding 1.5m but not exceeding 3.0m deep ditto.	Cu.M	5.00
6.	Ditto exceeding 3.0m but not exceeding 4.5m deep ditto.	Cu.M	8.00
7.	Ditto irrespective of depth (By Mechanical Equipment)	Cu.M	3.00
8.	Extra over for excavating in rock or other hard materials which in the opinion of the Architect requires the use of wedges, level or compression drills.	Cu.M	60.00
9.	Ditto which in the opinion of the Architect requires the use of mechanical plant (e.g. ripper).	Cu.M	48.00
10.	Ditto in the opinion of the Architect requires the use of explosives (Allow for all necessary precautions).	Cu.M	25.00
11.	Load and cart away excess/surplus soil from site to Contractor's own surface.	Cu.M	3.00
12.	Ditto to areas outside the site and designated by the Architect within 1.7km lead from the site.	Cu.M	3.00
13.	Haulage or transport only of excess/surplus soil through each subsequent kilometer lead or part thereof.	Cu.M	1.20
14.	50mm (compacted) thick sand binding, spread and leveled on hardcore measured separately to receive concrete bed.	Cu.M	0.50

ITEM	DESCRIPTION	UNIT	RATE
	EXCAVATOR – (Cont'd)		
15.	50mm ditto laid to slope.	Sq.M	0.55
16.	Approved imported earth filling to be obtained from the Contractor's own source to make up levels where directed, deposit spread leveled, well rolled and consolidated in 150 mm layers. Hardcore as described spread, leveled, well rammed and consolidated, watered and blinded with sand, well rolled and finished to receive concrete.	Cu.M	7.50
17.	150mm bed.	Sq.M	4.20
18.	150mm ditto but laid to slope.	Sq.M	4.50
	+ N.B. i) Item 11 – if it comes to the knowledge of the Architect that the Contractor is selling the surplus excavated material, then the Contractor is not entitled to any payment in respect of this items. ii) In the measurement of quantities of earth either carting away of filling, the Architect shall ensure that these are the compacted or consolidated quantity. For guidance the following are the average increases in bulk of various types of ground after excavation:- Type — Per Cent Gravel — 10 Sand — 12 ½ Ordinary Earth — 25 Clay — 33 1/3 Chalk — 33 1/3		

ITEM	DESCRIPTION	UNIT	RATE
	CONCRETOR		
1.	Mass concrete (1:3:6 – 37.5 mm) as specified for 50mm binding screed spread and leveled on hardcore (measure separately) to receive concrete bed, floors, aprons, cubes and steps etc.	Sq.M	6.50
2.	Ditto 25mm ditto under ground floor slab.	Sq.M	3.50
3.	Ditto 50mm ditto under pile cap.	Sq.M	7.00
4.	Ditto 50mm ditto under ground beam.	Sq.M	7.00
	Reinforced concrete (1:2:4 – 19mm) as specified excluding reinforcement and formwork to :-		
5.	Beams (ground, suspended roof, upstand and fascia).	Cu.M	180.00
6.	Suspended floor slab.	Cu.M	180.00
7.	Staircases.	Cu.M	180.00
	Reinforced concrete (1:1 ½:3 – 25mm as specified, excluding reinforcement and formwork to :-		
8.	Pile Caps	Cu.M	190.00
9.	Columns & column stumps	Cu.M	190.00
10.	Walls.	Cu.M	190.00
11.	Reinforced concrete (minimum compressive strength of 0.035 kg/mm2 at 28 days) as described to prestressed beam of various sectional areas.	Cu.M	190.00
12.	Reinforced concrete (minimum compressive strength of 0.035 kg/mm2 p.s.i at 28 days as described with approved waterproofing additives used strictly in accordance with the manufacturer's instructions to prestressed roof beam of various sectional area.	Cu.M	200.00
	Mild steel bars reinforcement to concrete work generally, including all cutting, bending and placing in position :-		

ITEM	DESCRIPTION	UNIT	RATE
	CONCRETOR – (Cont'd)		
13.	6mm diameter.	Kg.	1.85
14.	10mm diameter.	Kg.	1.85
15.	12mm diameter.	Kg.	1.85
16.	16mm – 25mm diameter.	Kg.	1.85
17.	Exceeding 25mm diameter.	Kg.	1.85
	High tensile steel bars reinforcement to concrete work generally, including all cutting bending and placing in position :		
18.	10mm diameter.	Kg.	1.85
19.	12 mm diameter.	Kg.	1.85
20.	16mm – 25mm diameter.	Kg.	1.85
21.	Exceeding 25mm diameter.	Kg.	1.85
22.	Welded steel fabric reinforcement of 75mm x 300mm mesh weighing 2.34 kg/m3 and embedded in concrete.	Sq.M	7.10
23.	Ditto 150mm x 150mm mesh weighing 2.56 kg/m3 ditto.	Sq.M	7.60
24.	Ditto 150mm x 150mm mesh weighing 3.07 kg/m3 ditto.	Sq.M	8.90
25.	Ditto 75mm x 400mm mesh weighing 3.90 kg/m3 kg/m3.	Sq.M	12.35
26.	Expanded metal reinforcement of 75mm weighing 2.27 kg/m3.	Sq.M	7.10
27.	Ditto weighing 4.53 kg/m2.	Sq.M	13.00
	Sawn formwork as specified.		
28.	To sides of pile cap.	Sq.M	22.00

ITEM	DESCRIPTION	UNIT	RATE
	CONCRETOR – (Cont'd)		
29.	To sides of columns and column stumps, lintels, staircase etc.	Sq.M	22.00
30.	To sides of foundation and ground beam.	Sq.M	22.00
31.	To sides of wall.	Sq.M	22.00
32.	To sides and soffit of beam.	Sq.M	22.00
33.	Extra over last four items for sloping surfaces.	Sq.M	2.00
34.	To soffit of suspended floor slab, roof slabs, landing slab, etc.	Sq.M	22.00
35.	Ditto for strutting up to a height exceeding 3.5m but not exceeding 4.0m.	Sq.M	24.00
36.	Extra over for strutting to soffits of beams exceeding 3.5mm but not exceeding 4.0mm.	Sq.M	2.00
37.	To string of steps including cutting formwork to profile of treads and riser.	Sq.M	24.00
38.	12mm bitumen impregnated fibreboard 150mm wide as expansion joint filter to reinforced concrete structure including filling 12mm x 12mm recess with non-shrinkable mastic glouting.	M	25.00
39.	12mm cane fibre 150mm wide as expansion joint filler ditto.	M	25.50
	Precast concrete as specified.		
40.	Precast concrete (1:2:4 – 19 mm agg.) in half round surface water drains 225mm wide including excavations, bends, junctions etc and bending as specified.	M	16.00
41.	Ditto 300mm wide ditto	M	18.00
42.	Ditto 375mm wide ditto	M	20.00
43.	Ditto 480mm wide ditto	M	35.00
44.	Ditto 600mm wide ditto	M	60.00

ITEM	DESCRIPTION	UNIT	RATE
	CONCRETOR – (Cont'd) CONCRETOR – (Cont'd)		
45.	112mm x 150mm precast concrete (1:2:4 – 19mm agg.) lintel including formwork but excluding reinforcement.	M	12.00
46.	50mm thick precst concrete cover slab 300mm wide and 600mm long notched at ends and reinforced with and including one layer of 150mm (6 G) x 150mm (6 G) steel fabric reinforcement and placing in position.	M	15.50
	BRICKLAYER		
	Common brickwork in cement mortar (1:6) with an approved plasticizer to :-		
1.	Reduced brickwork 300 mm thick in retaining wall.	Sq.M	80.00
2.	Reduced brickwork 225mm thick in walls.	Sq.M	60.00
3.	Half brickwall 112mm thick reinforced with and including course reinforcement as described as every fourth course well lapped.	Sq.M	30.00
4.	Extra over for standard brickwork for fairface on one side, including pointing.	Sq.M	8.00
5.	Ditto both sides ditto.	Sq.M	14.50
6.	Half brick walls in facing bricks in gauged mortar struck pointed both sides.	Sq.M	55.00
7.	One brick wall ditto.	Sq.M	110.00
	Damp proof courses as specified (measured nett with no allowance for laps) to		
8.	112mm wide brickwall.	M	1.50
9.	225mm wide brickwall.	M	2.50
10.	Precast cement and sand hollow blocks to 75mm thick walling as specified.	Sq.M	18.00
11.	Ditto 112mm thick ditto.	Sq.M	20.80
12.	Ditto 225mm thick ditto.	Sq.M	40.50
13.	Random rubble walling	Cu.M	300.00

ITEM	DESCRIPTION	UNIT	RATE
	DRAINLAYER		
1.	Excavate trench for 100mm diameter drains not exceeding 1.5m deep and average 0.9m deep and refill trench including removing surplus spoil, deposit, spread and level on site as specified.	M	4.30
2.	Ditto for 1.5m deep but not exceeding 3m deep average 1.8m deep ditto.	M	8.20
3.	Ditto for 150mm diameter drains not exceeding 1.5m deep and average 0.9m deep ditto.	M	4.60
4.	Ditto exceeding 1.5m deep but not exceeding 3m deep average 1.8m deep ditto.	M	7.80
5.	100mm diameter salt glazed stoneware drains (1st quality) laid and jointed with tarred gaskin and cement mortar (1:1) as specified.	M	12.80
6.	150mm diameter ditto.	M	18.60
	150mm diameter ditto.	M	18.60
7.	100mm diameter (medium duty) cast iron drains laid complete as specified.	M	32.00
8.	150mm diameter ditto.	M	54.00
9.	150mm concrete (1:3:6 – 38mm) bed under 100mm diameter drain pipe and haunch as specified.	M	12.80
10.	150mm concrete ditto under 150mm diameter ditto.	M	16.00
11.	Ditto under 100mm diameter drain pipe and completely surround as specified.	M	18.30
12.	Ditto under 150mm diameter drain pipe and ditto.	M	28.00
13.	Concrete (1:2:4 – 19mm) in benching average 150mm thk to bottom of reinforced concrete though finished to steep falls towards high alumina channels and rendered in 50mm cement and sand (1:3) trowelled hard and smooth.	Sq.M	35.00
14.	20mm cement and sand (1:3) water-proofed rendering as specified to internal sides of imhoff tank.	Sq.M	12.00

ITEM	DESCRIPTION	UNIT	RATE
	DRAINLAYER (Cont'd)		
15.	100mm diameter salt glazed stoneware half round straight main channel and jointing in cement and sand (1:3).	M	8.50
16.	100mm diameter salt glazed stoneware half round section main channel bend and ditto.	No	15.60
17.	150mm diameter salt glazed stoneware half round straight main channel and jointing in cement and sand (1:3).	M	16.00
18.	150mm diameter salt glazed stoneware half round section main channel bend and ditto.	No	28.50
19.	100mm diameter salt glazed stoneware three quarter section curved branch channel bend and jointing in cement and sand (1:2).	No	24.00
20.	150mm diameter ditto.	No	36.00
21.	20mm diameter mild steel rod 750mm girth, bent as required and with ends split, caulked and built in to brickwork as step iron.	No	5.50
22.	600mm x 450mm coated cast iron light duty single seal flat type manhole cover and frame to B.S. 497 'C' weighing not less than 25kg including setting from in cement and sand (1:3) and sealing cover in grease and fine sand.	No	83.60
23.	600mm x 450mm coated cast iron light duty single seal flat type manhole cover and frame to B.S 497 grade 'C' weighing not less than 37kg including setting frame in cement and sand (1:3) and sealing cover in grease and fine sand.	No	109.20
24.	600mm x 600mm coated cast iron heavy duty manhole cover and frame weighing not less than 182kg including ditto.	No	348.00
25.	Manhole cover (heavy duty : 242kg) 500 mm diameter as specified.	No	430.00
26.	50mm x 100mm gauge graded limestone in filter bed as filter media.	Cu.M	60.00
27.	37mm to 50mm gauge ditto.	Cu.M	60.00

ITEM	DESCRIPTION	UNIT	RATE
	DRAINLAYER (Cont'd)		
28.	100mm diameter perforated salt glazed stoneware pipe as described embedded in graded limestone filter media.	M	18.50
29.	150mm ditto.	M	22.50
30.	75mm diameter coated cast iron disluging pipe to B.S. 437 as described and fixing to concrete wall with approved bracket.	M	28.00
31.	150mm diameter T-shaped coated cast iron inlet dip pipe 450mm long with 225mm arm built into concrete wall & fixed with approved holderbats.	No	26.00

ITEM	DESCRIPTION	UNIT	RATE
	ROOFER		
1.	"Atlaskote" insulating patent roof water proofing including leveling screed as described on roof surface and finished to fall and cross falls.	Sq.M	26.50
2.	Approved C.I. rainwater outlet unit comprising of steel grating and sleeve for PVC downpipe and cast in between concrete roof slab and screed.	No	30.00
3.	0.66mm zincalume 'klip-lok' or equivalent fixed to steel channel purlins including with bracket, fastener and accessories in accordance with manufacturer's instruction (measured nett – no allowance for laps).	Sq.M	47.00
4.	Standard ridge capping to 'klip-lok' metal deck.	M	18.00
5.	Approved double sided aluminium building paper laid on 25mm thick fibre glass insulation sheet (measured separately) all in accordance with manufacturer's instruction (measured nett - no allowance for laps).	Sq.M	15.50
6.	25mm thick fiberglass insulation sheet (8kg/m3) laid on chicken wire mesh (measured separately) securely fastened to steel channel purlin.	Sq.M	16.00
7.	Galvanised chicken wire netting 50mm mesh fixed with typing wire to steel channel purlins including 150mm laps (measured nett – no allowance made for laps).	Sq.M	6.00
8.	6mm thick prefabricated asbestos cement fascia panel, glued and screwed to steel back up frame (measured separately) properly set out, joint filled with epoxy and sand smooth.	Sq.M	20.00
9.	20 gauge G.T. gutter on timber boarding support including brackets, bends, short length and step ends.	Sq.M	30.00
10.	0.78m thick galvanized steel flashings as specified.	Sq.M	26.20
	Approved PVC rainwater downpipes and fittings jointed in accordance with manufacturer's instruction.		
11.	100mm diameter.	M	18.00
12.	150mm diameter.	M	25.00
ITEM	DESCRIPTION	UNIT	RATE

	ROOFER – (Cont'd)		
13.	Extra for bend.	No	15.00
14.	Extra for shoe.	No	18.00
15.	Approved PVC dome shaped grating and frame to top of 150mm diameter PVC rainwater downpipe.	No	14.50
16.	50mm diameter approved PVC drainage outlet connected into rainwater downpipe inclusive of grating frame.	No	14.80
17.	40mm diameter G.I. outlet spout pipe of 150mm in length.	No	17.00
18.	Standard pattern clay roofing tiles laid to 300mm gauge on and including battens as specified.	Sq.M	80.00
19.	Hip of ridge tile to match Marseille pattern tiles as specified.	M	18.00
20.	Standard interlocking concrete roofing tiles laid to 300mm gauge on and including battens as specified.	Sq.M	35.00
21.	Low pitch ditto laid to 275mm gauge on and including battens as specified.	Sq.M	40.00
22.	Hip or ridge tile to match interlocking concrete roof tile as specified.	M	10.50
23.	"Humesix" or other approved corrugated asbestos cement roof sheeting as specified.	Square	220.00
24.	Two-piece close-fitting adjustable ridge peace to match "Humesix" as specified.	M	16.50
25.	"Humethree" of other approved corrugated asbestos cement roof sheeting as specified.	Square	160.00
26.	Light weight corrugated asbestos roof sheeting (Grey) as specified.	Square	150.00
27.	Two-piece close-fitting fluted and adjustable ridge capping to match light weight corrugated asbestos roof sheeting as specified.	M	18.00
28.	Corrugated aluminium sheet roofing 26 gauge as specified including cutting and fixing, etc.	Square	235.00
ITEM	**DESCRIPTION**	**UNIT**	**RATE**

	ROOFER – (Cont'd)		
29.	No. 26 S.W.G. aluminium plain ridge on hip 450mm girth and fixing.	No	12.00
30.	Approved interlocking galvanized steel roofing sheets (500mm thick) as decking secured to steel purlins as per manufacturer's instruction including 150mm end laps (measured nett – no allowance made for laps).	Sq.M	45.00

ITEM	DESCRIPTION	UNIT	RATE
	JOINER AND CARPENTER		
	Wrot Grade 'A' timber as specified :-		
1.	37mm thick flush door comprising 100mm x 25mm top rail, stile and bottom rail, 150mm x 25mm intermediate rail covered both sides with 6mm thick plywood as described and with 10mm timber lapping/edging all round, mitre at angle and hanging on hinges (measured separately).	Sq.M	43.00
2.	Ditto but with marine ply internally (ditto)	Sq.M	47.00
3.	44mm louvre door comprising 100mm x 44mm top rail and stile, 125mm x 44mm intermediate rail, 150mm x 44mm bottom rail into two panels, each filled with 12mm x 20mm timber louvre at 20 apart at 60 deg. Slope with end housed into stiles covered one side with approved antivermin netting fixed with 13mm x 13mm beading (measured separately).	Sq.M	75.00
4.	Pair ditto in two equal leave ditto rebated at meeting stile (ditto).	Sq.M	80.00
	Supply and fix fire rating door to the approval of director general of fire service, Malaysia.		
5.	44mm thick one hour fire rated door with Meranti plywood lining on both sides over all size 1090mm wide x 2045 high approximately hanging on hinges (measured separately).	No	350.00
6.	Ditto overall size 790mm wide x 2045mm high approximately (ditto).	No	300.00
7.	Pair ditto overall size 1390mm wide x 2045mm high approximately ditto including rebated side.	No	660.00
8.	Wrot Grade 'A' timber generally.'	Cu.M	1950.00
9.	Sawn ditto.	Cu.M	1850.00
10.	Wrot pressure treated Grade 'B' timber generally.	Cu.M	1650.00
11.	Sawn ditto.	Cu.M	1590.00
12.	Wrot pressure treated Grade 'C' timber generally.	Cu.M	1450.00

ITEM	DESCRIPTION	UNIT	RATE
	JOINER AND CARPENTER – (Cont'd)		
13.	Sawn ditto.	Cu.M	1400.00
14.	Aluminium suspended ceiling grid system consisting of 35mm x 25mm extruded mill finished 'T' and 'L' section and galvanized iron having wire for 1200mm x 600mm ceiling board (the rate shall include for extra material for odd panel at border of rooms).	Sq.M	16.00
15.	Mineral fibreboard in 1200mm x 600mm panel fix to suspended gird ceiling system (ditto).	Sq.M	38.00
16.	Extra over forming account outlet including additional frame.	No	20.00
17.	6mm thick flat asbestos free cement sheet ceiling lining in panel size 1200 mm x 600mm including timber space framing.	Sq.M	25.00
18.	Ditto striated asbestos free cement sheet ditto.	Sq.M	28.00
19.	Flat asbestos free cement sheet ceiling lining in panel size 1200mm x 600mm fixed to racking surface including timber space framing.	Sq.M	25.50
20.	Ditto striated asbestos free cement sheet lining.	Sq.M	28.00
21.	Gypsum board as specified including timber space framing.	Sq.M	23.00
22.	Ditto but racking surface ditto.	Sq.M	24.00
23.	50mm thick fiberglass insulation board as specified.	Sq.M	12.00
24.	6mm plywood panel in partition including framing and fixing.	Sq.M	20.00
25.	9mm ditto.	Sq.M	33.40
26.	13mm ditto.	Sq.M	48.30
27.	1.5mm 'Formica' or equivalent laminated plastic sheeting and fixing.	Sq.M	31.50
28.	50mm 'insulite' or equivalent woodwool slabs including fixing.	Sq.M	38.00
29.	13mm perforated acoustic board fixed to walls as specified.	Sq.M	60.00

ITEM	DESCRIPTION	UNIT	RATE
	IRONMONGERY		
	Supply and fix the following ironmongeries		
1.	75mm steel butt hinges.	PR	6.50
2.	100mm ditto.	PR	8.40
3.	75mm brass butt hinges.	PR	7.00
4.	100mm ditto.	PR	8.90
5.	75mm counter flap brass hinges.	PR	9.00
6.	50mm brass cabin hook and eye.	No	5.40
7.	100mm cabinet 'D handle equal to Union 4800-04 AS.	No	6.80
8.	150mm ditto Union 4800-06 AS.	No	7.40
9.	Set 300mm standard galvanized steel adjustable friction stays and fixing as specified.	No	25.60
10.	Set 300mm standard brass ditto.	No	42.00
11.	Window spring catch and fixing as specified.	No	10.50
12.	Window fastener and fixing ditto.	No	12.10
13.	Window handle and fixing.	No	11.10
14.	Extruded aluminium hat and coat hook with rubber buffer.	No	10.20
15.	200mm brass barrel bolt.	No	11.00
16.	250mm ditto.	No	13.50
17.	150mm x 19mm aluminium lever action flush bolt.	No	16.50
18.	200mm x 19mm ditto.	No	17.90
19.	150mm x 25mm stainless steel flush bolt Yank or equivalent.	No	22.50
20.	300mm x 25mm ditto (ditto).	No	26.20
21.	100mm x 50mm flush pull (Union 1370 AS or equivalent).	No	16.60

ITEM	DESCRIPTION	UNIT	RATE
	IRONMONGERY – (Cont'd)		
22.	Brass cylinder padlock 37mm (Union 3102 or equivalent).	No	15.40
23.	Ditto 50mm (ditto).	No	21.00
24.	Ditto 62mm (ditto).	No	30.00
25.	Approved single action central door closer equal to 'New Star' (Medium duty).	No	120.00
26.	Single action floor spring (Hold open at 90 deg.) equal to Union 524-1355 & 546 SC.	No	198.00
27.	Double action floor spring 44mm shoe (ditto) equal to Union 512-122 BA.	No	335.00
28.	25mm diameter rubber door stop.	No	2.50
29.	Bathroom indicating bolt (Union 8094 CH or equivalent).	No	12.00
30.	2 – lever rebated lockset (Union or equivalent).	No	25.00
31.	2 – lever rebated lockset (ditto).	No	36.00
32.	3 – lever mortice lockset (ditto).	No	35.00
33.	2 – lever rebated mortice lockset (ditto).	No	38.00
34.	2 – lever mortice deadlock with escatheons (ditto).	No	45.00
35.	3 – lever ditto.	No	60.00
36.	63mm single cylindrical lockset (Union CZ 682-13-41 SC or equivalent).	No	44.00
37.	63mm rebated ditto (Union CS 682-13-45 SC or equivalent).	No	55.00
38.	63mm double cylinder lockset (Union CZ 682-13-45 SC or equivalent).	No	90.00
39.	63mm rebated ditto (Union CZ 682-13-245- or equivalent.	No	92.00

ITEM	DESCRIPTION	UNIT	RATE
	STEEL AND IRONWORKER		
1.	Mild rolled steel in roof trusses, braces, gusset plates, bearing plates, etc. including riveting, welding, bolding, hoisting and fixing.	Kg	3.20
2.	Mild rolled steel in angles, joists, channels, plates, etc. including cutting, drilling, assembling, welding, riveting, bolting.	Kg	3.50
3.	Wrot iron straps, hangers, etc. complete with all bolts, washers, etc. fixed complete.	Kg	3.65
4.	Wrot iron in railings, doors, balustrades, ladders and grilles.	Kg	3.75
5.	Mild steel hollow sections including cutting, drilling, assembling, welding, etc.	Kg	4.10
	Supply and fix the following complete with nuts and washers :-		
6.	19mm – 25mm diameter bolts.	Kg	6.60
7.	12mm and 16mm ditto.	Kg	6.80
8.	6mm – 9mm ditto.	Kg	7.50
9.	Collapsible gates consisting or vertical channel pickets with low friction lattice bars 16mm x 6mm complete pivoting on steel pins with and including roller top hangers bottom rollers, top and bottom guides, tracks and fixing frames to concrete or brickwork and casting bottom track in concrete floor.	Sq.M	160.00
10.	Ditto with shutters in 1.0mm galvanized iron sheet.	Sq.M	180.00
11.	Aluminium roller shutter to suite the opening size and complete with removable mullions, side guides and all necessary ironmongery to manufacturer's instruction.	Sq.M	230.00
12.	Aluminium door and window including transome, mullions, approved PVC gasket, fixing screws, ironmongery (glazing measured separately) to manufacturer's instruction.	Sq.M	185.00

ITEM	DESCRIPTION	UNIT	RATE
	STEEL AND IRONWORKER – (Cont'd)		
13.	Pair of approved zinc annealed or baked enamel pressed steel adjustable louver style 450mm for three blades and fixing (single control).	No	16.50
14.	Add for each additional louvre blade.	No	2.50
15.	12mm x 12mm mild steel burglar bars and fixing.	M	4.30
16.	Pair of approved zinc annealed or baked enamel pressed steel adjustable louver style 990mm for 7 nos. blades and fixing (dual control).	No	16.00
17.	Add for each additional louvre blade.	No	2.50
18.	9mm diameter dowel of 100mm long fish tailed and cast in concrete and other end mortise into timber frame.	No	2.50
19.	3mm x 38mm holdfast, 300mm girth one bent, twice drilled and screwed to timber and other end fishtailed and built into joints of brickwork including priming before fixing.	No	2.50
20.	Heavy duty mild steel cover grating overall size 450mm x 275mm comprising 25mm x 25mm x 16mm angle framing and infilled with 25mm x 16mm flats at 38mm centres including 2 nos 16mm diameter bar welded to frame and painting surfaces with two coats of bituminous paint.	No	45.00
21.	Heavy duty mild steel cover grating overall size 750mm x 500mm ditto.	No	130.00

ITEM	DESCRIPTION	UNIT	RATE
	PAVIOUR, PLASTERER AND TILER		
1.	19mm thick cement and sand (1:2) waterproofed rendering as specified on concrete roof slab.	Sq.M	10.00
2.	31mm thick ditto.	Sq.M	16.00
3.	19mm ditto skirting 150mm high with rounded top edge and cove at bottom.	M	2.50
4.	19mm thick cement and sand (1:3) rendering to floor as specified.	Sq.M	10.00
5.	25mm thick ditto.	Sq.M	12.00
6.	38mm thick ditto.	Sq.M	16.00
7.	19mm ditto skirting 150mm high as specified.	M	2.50
8.	19mm thick cement and sand (1:3) rendering with anti-slip groove lines as specified.	Sq.M	12.00
9.	Ditto water proof rendering to floor as specified.	Sq.M	15.50
10.	19mm thick cement and sand (1:3) rendering to floor in coloured cement as specified.	Sq.M	11.00
11.	25mm thick ditto.	Sq.M	13.00
12.	38mm thick ditto.	Sq.M	17.00
13.	19mm thick ditto skirting 150mm high as specified.	M	3.00
	Cement and sand (1:6) mixed with an approved plasticizer as specified to :		
14.	12mm thick to walls, columns, ceiling, soffit, etc.	Sq.M	8.00
15.	19mm thick ditto.	Sq.M	9.50
16.	Unglazed mosaic flooring as specified including screed.	Sq.M	36.00
17.	Unglazed mosaic skirting 150mm high as specified.	M	10.20
18.	Semi-glazed mosaic flooring (square pattern) as specified including screed.	Sq.M	38.00

ITEM	DESCRIPTION	UNIT	RATE
	PAVIOUR, PLASTERER AND TILER		
19.	Semiglazed mosaic skirting 150mm high as specified ditto.	M	19.00
20.	Semi-glazed mosaic flooring (random pattern) as specified including screed.	M	36.00
21.	25mm thick granolithic screed flooring as specified.	Sq.M	22.00
22.	Wash concrete paving of a min thickness of 10mm spread uniformly to concrete bed.	Sq.M	30.00
23.	2.0m thick vinyl tiles as specified bedded and jointed with adhesive materials to floor.	Sq.M	22.50
24.	Approved black sheet vinyl cut to width to skirting 150mm high and jointed with adhesive as specified.	M	6.00
25.	200mm x 200mm heavy duty non-slip ceramic tiles, flooring as specified including screed.	Sq.M	68.00
26.	Approved three (3) coats bituminous paint tanking to planting boxes externally as specified.	Sq.M	4.50
27.	106mm x 106mm x 5.5mm first quality white glazed wall tiles, crusher edge, bedded and jointed in cement mortar (1:3) as described and pointed in white cement including screed and all internal and external angles cored and round edged tiles and all cutting and fittings as specified.	Sq.M	50.00
28.	Ditto but coloured tiles.	Sq.M	55.00
29.	106mm x 106mm ceramic wall tiles fixed including screed and all internal and external angles coved and round edged tiles and all cutting and fitting as specified.	Sq.M	65.00
30.	200mm x 200mm ceramic wall tiles ditto.	Sq.M	68.00
31.	25mm x 3mm aluminium dividing strips cut to length and set and bedded on edge at junction of different floor finishes including filling smooth flush and level with paving.	M	7.00
32.	20mm (minimum thickness) of vermiculite gypsum plaster to brickwall as specified.	Sq.M	28.00

ITEM	DESCRIPTION	UNIT	RATE
	PAVIOUR, PLASTERER AND TILER – (Cont'd)		
33.	25mm cement and sand (1:3) paving to ramps including forming 12mm x 12mm grooves at 75mm centres.	Sq.M	16.00
34.	Decorative acrylic spray tile finish (Bontile or equivalent) to external brickwall as specified.	Sq.M	19.50
35.	Heavy duty paving block (unipave or equivalent) to floor as specified.	Sq.M	43.00
36.	Terrazo tile flooring as specified including screed.	Sq.M	33.00
37.	Ditto skirting 100 mm high as specified.	M	9.00
38.	19mm thick in-situ terrazzo flooring including 16mm (1:3) mortar screed as specified.	Sq.M	37.00
39.	19mm thick ditto skirting 100mm high with rouned top edge and cove at bottom.	M	7.00
40.	9mm thick parquet flooring including screed as specified.	Sq.M	50.00
41	16mm thick parquet flooring including screed as specified.	Sq.M	70.00
42.	14mm x 75mm high timber skirting to match parquet flooring.	M	15.90
43.	19mm thick granolithic flooring as specified.	Sq.M	22.00
44.	Ditto skirting 100mm with rounded top edge and cove at bottom.	M	6.00

ITEM	DESCRIPTION	UNIT	RATE
	PLUMBER		
1.	Galvanized iron 1.6mm in flashing, collars, etc. including jointing and cutting, fixed as described.	Sq.M	32.00
2.	Ditto in gutters and valley lining including jointing and cutting fixed as specified.	Sq.M	49.00
3.	Galvanised iron 22 gauge 100mm diameter half round eaves gutters including brackets, bends, short lengths and stop ends.	M	21.00
4.	Ditto rainwater pipes 100mm diameter including bends, holderbats, shoes and short lengths.	M	28.00
5.	Asbestos cement 100 mm diameter half round eaves gutters including brackets, bends, short lengths and stop ends.	M	26.00
6.	Ditto rainwater pipes 100mm diameter including bends, holderbats, shoes and short lengths.	M	24.00
7.	100mm diameter PVC rainwater downpipe including bends, shoes, etc and fixing to walls with holderbats. (Type 'S-Lon G150 DP' or equivalent.	M	15.20
8.	150mm half round PVC rainwater gutter including fittings and fixing with brackets.	M	18.80
9.	22 gauge galvanized iron rainwater box gutter 600mm girth including fixing to timber and cutting hole for downpipe.	M	26.50
10.	100mm x 75mm x 22 gauge galvanized iron rain water downpipe and fixing to wall with approved holderbats and including bends.	M	23.20
11.	Approved galvanized wire ballon grating and fixing to end of 100mm diameter pipe.	No	7.00
12.	50mm diameter medium duty coated cast iron soil, waste or ventilating pipes with lead spigot and socketted joints fixed to walls concrete soffits with and including hangers and holderbats.	M	22.50
13.	Extra for bend.	No	12.50

ITEM	DESCRIPTION	UNIT	RATE
	PLUMBER – (Cont'd)		
14.	Extra for bend with enlarged sockets to receive w.c outgo including extra joints.	No	31.20
15.	Extra for 50mm x 50mm x 31mm tee.	No	20.80
16.	Extra for 50mm x 50mm x 50mm tee.	No	21.30
17.	Ditto single branch with 50mm arm and inspection eye.	No	22.50
18.	100mm diameter medium duty coated cast iron soil, waste or ventilating pipes with lead spigot and socketted joints fixed to walls, concrete soffits with and including hangers and holderbats.	M	26.00
19.	Extra for bend.	No	16.00
20.	Extra for bend with enlarged socket to receive w.c outgo including extra joints.	No	27.80
21.	150mm diameter medium duty coated cast iron soil, waste or ventilating pipe as specified.	M	70.40
22.	Extra for bend.	No	34.00
23.	Ditto single branch with 150mm arm and inspection eye.	No	36.00
24.	Galvanised mild steel water supply or waste pipes 'Class B' including couplings, connectors, bends, elbows and tees fixed complete as specified :-		
	a) 13mm diameter.	M	8.30
	b) 19mm diameter.	M	9.80
	c) 25mm diameter.	M	13.00
	d) 31mm diameter.	M	15.30
	e) 38mm diameter.	M	16.60
	f) 44mm diameter.	M	18.00
	g) 50mm diameter.	M	19.00
	h) 56mm diameter.	M	22.50
	i) 63mm diameter.	M	25.50
	j) 75mm diameter.	M	32.00

ITEM	DESCRIPTION	UNIT	RATE
	PLUMBER – (Cont'd)		
	Pressed steel water tank as specified including connections, jointing, fixing in position etc.		
25.	2,700 litres pressed steel water tank.	No	1,800.00
26.	5,400 litres pressed steel water tank.	No	3,240.00
27.	Approved fiberglass water tank with lids fixed including connections and joints, ball valves, overflow pipes, stopcocks, etc. fixed complete as specified :-		
	a) Size 800 gallons (nominal).	No	2,240.00
	b) Size 400 gallons (nominal).	No	800.00
	c) Size 250 gallons (nominal).	No	750.00
	d) Size 200 gallons (nominal).	No	500.00
	e) Size 100 gallons (nominal).	No	220.00
28.	Galvanised mild steel water supply or waste pipes ' Class C' including couplings, connectors, bends, elbows and tees fixed complete as specified :-		
	a) 13mm diameter.	M	8.30
	b) 19mm diameter.	M	9.80
	c) 25mm diameter.	M	13.00
	d) 31mm diameter.	M	15.30
	e) 38mm diameter.	M	18.00
	f) 50mm diameter.	M	19.00
	g) 63mm diameter.	M	25.50
	h) 75mm diameter.	M	32.00

ITEM	DESCRIPTION	UNIT	RATE
	SANITARY FITTINGS Supply and fix the following sanitary fittings and accessories including storing assembling, bending, plugging and screwing with matching screws, cutting and pinning or building in brackets, jointing and connecting to services and to soil and waste pipes and make good all works disturbed (Note : all fittings to be of approved brand and matching design and finish) :		
1.	150mm x 150mm semi-recessed white glazed vitreous china toilet roll holder.	No	25.00
2.	150mm x 150mm semi-recessed white glazed vitreous china soap holder.	No	25.00
3.	300mm x 150mm white glazed vitreous china recessed combined soap dish and sponge holder.	No	46.00
4.	550mm x 125mm plate glass shelf complete with chrome plated brass brackets.	No	22.00
5.	600mm x 25mm diameter chromium plated tower rail with ball and brackets for fixing.	No	40.00
6.	550mm x 400mm bevelled edge plate glass mirror complete with 3mm thick plywood backing and fixing with chrome plated dome headed fixing screws and corks washers.	No	60.00
7.	750mm x 600mm polished plate mirror complete with waterproof plywood backing and fixing with chrome plated dome headed fixing screws and corks washers.	No	90.00
8.	550mm x 400mm wash basin in white vitreous china complete with 12mm chrome plated taps, blank tap hole stopper, 31mm 'P' trap with 38mm seal, waste fittings with chains, plug and painted bracket supports.	No	190.00
9.	Squat w.c set as specified.	No	260.00
10.	Pedestal w.c set as specified.	No	390.00
11.	'Bristile' stainless steel urinal as specified including automatic cistern and c.p. sparge pipes.	No	350.00
12.	White vitreous china single urinal bowl ditto.	No	415.00

ITEM	DESCRIPTION	UNIT	RATE
	SANITARY FITTINGS – (Cont'd)		
13.	White vitreous china urinal range of 2 bowls set.	PR	840.00
14.	Vitreous china division size 325mm x 600mm (approximately) complete with hangers or fixing screws.	No	130.00
15.	100mm diameter chromium plated shower rose armed with swivel joint complete with 13mm chromium plated stopcock.	No	50.00
16.	Unplasticised PVC pipes including connectors, bends, elbows, etc. jointed according to manufacturer's specification and fixed complete as specified.		
	a) 13mm diameter.	M	3.00
	b) 19mm diameter.	M	5.50
	c) 25mm diameter.	M	7.90
	d) 32mm diameter.	M	10.30
	e) 35mm diameter.	M	11.70
	f) 38mm diameter.	M	15.00
	g) 50mm diameter.	M	17.00
	h) 56mm diameter.	M	17.50
	i) 63mm diameter.	M	20.00
	j) 68mm diameter.	M	23.00
	k) 75mm diameter.	M	26.00
17.	Light gauge copper pipes (B.S. 659) fixed complete for hot water services.	M	16.00

ITEM	DESCRIPTION	UNIT	RATE
	GLAZIER		
1.	5mm clear sheet glass and glazing to wood or metal as specified.	Sq.M	38.50
2.	Ditto in louvre blades 150mm wide.	M	5.00
3.	6mm non-actinic glass and glazing to wood or metal as specified.	Sq.M	47.50
4.	Ditto in louvre blades 150mm wide.	M	7.50
5.	5mm rough rolled clear glass in louvre blade 150mm wide.	M	5.70
6.	6mm clear sheet glass and glazing to wood or metal as specified.	Sq.M	31.50
7.	Ditto in louvre blades 150mm wide.	M	5.20
8.	6mm polished plate sheet glass and glazing to wood or metal specified.	Sq.M	47.50
9.	Ditto in louvre blades 150mm wide.	M	7.50
10.	6mm Georgian wired polished plate glass and glazing to wood or metal as specified.	Sq.M	147.00
11.	5mm grey heat absorbing glass and glazing to wood or metal as specified.	Sq.M	73.50
12.	Ditto in louvre blades 150mm wide.	M	11.50
13.	6mm grey heat absorbing glass and glazing to wood or metal as specified.	Sq.M	84.00
14.	Ditto in louvre blades 150mm wide.	M	12.80

ITEM	DESCRIPTION	UNIT	RATE
	PAINTER		
1.	Knot, prime stop and paint three coats of oil based paint to woodwork.	Sq.M	3.50
2.	Ditto on surface not exceeding 75mm girth.	M	0.50
3.	Ditto exceeding 75mm but not exceeding 150mm girth.	M	1.00
4.	Ditto exceeding 150mm but not exceeding 225mm girth.	M	2.00
5.	Clean down, prime and paint three coats gloss enamel paint on metal surfaces generally as specified.	Sq.M	6.00
6.	Ditto to surface not exceeding 75mm girth.	M	0.50
7.	Ditto to surfaces exceeding 75mm but not exceeding 150mm girth.	M	1.00
8.	Ditto to surfaces exceeding 150mm but not exceeding 225mm girth.	M	2.00
9.	Clean down, damped surface and apply two coats cement based water paint to walls and soffits as specified.	Sq.M	3.00
10.	Clean down and apply one coat of petrifying liquid and two coats of distemper to walls as specified.	Sq.M	3.80
11.	Clean down, prime and paint three coats of emulsion paint to walls and ceiling as specified.	Sq.M	3.80
12.	Stain and wax polish to approval on timber as specified.	Sq.M	5.50
13.	Ditto on surfaces not exceeding 75mm girth.	M	0.80
14.	Ditto exceeding 75mm but not exceeding 150mm girth.	M	1.00
15.	Ditto exceeding 150mm but not exceeding 225mm girth.	M	1.40
16.	Wood preservative, two coats on timber as specified.	Sq.M	3.80
17.	Prepare and apply two coats of Sandtex Matt or equivalent on walls and soffits.	Sq.M	9.00

ITEM	DESCRIPTION	UNIT	RATE
	PAINTER – (Cont'd)		
18.	Prepare, stain to approval and apply two coats of varnish on surfaces to woodwork.	Sq.M	7.00
19.	Prepare and apply two coats of flame retardant paint on chipboard ceiling.	Sq.M	8.00
20.	Prepare and apply two coats silicon-based water repellent solution on fir faced concrete.	Sq.M	3.80
21.	Prepare and apply three coats acrylic emulsion paint as described to surface of walls or soffits.	Sq.M	6.50

ITEM	DESCRIPTION	UNIT	RATE
	ROAD, CULVERTS, FENCING & TURFING		
1.	75mm sand spread and leveled, well rolled and compacted to falls and chambers with a 8,000kg roller.	Sq.M	3.20
2.	200mm (finish) thick crusher run base course consisting of two layers 125mm loose layer of metal as specified spread and leveled and ditto.	Sq.M	6.80
3.	38mm (finish) layer of semi-grout or premix binder course consisting of 25mm – 38mm agg. Spread and leveled, well rolled and compacted to falls and combers including blinding with 19mm (nominal) stone.	Sq.M	7.20
4.	Apply one coat of 80/100 penetration bituminous binder seal as described at a rate of 4 litres per square metre on premix binder course including blinding with 19mm (nominal) stone and lightly rolled with a 6,000kg roller.	Sq.M	3.00
5.	Apply one coat of 80/100 penetration bituminous binder seal as described at the rate of 1.35 litres per square metre on finished wearing course including blinding with 19mm stone and lightly rolled with a 6,000kg roller.	Sq.M	2.00
6.	Provide and lay 38mm thick premix wearing course consisting of stones of maximum size 19mm and including a bituminous emulsion track coat applied at the rate of 43.3 litres per square metre.	Sq.M	6.40
7	Concrete (1:3:6 – 25mm to 37.5mm) to culvert base, surround etc.	Cu.M	130.00
8.	Reinforced concrete (1:2:4 – 19mm) to culvert base, surround, head and wing walls.	Cu.M	180.00
9.	Sawn formwork to culvert base, surround, head and wing walls.	Sq.M	24.00
10.	450mm diameter precast reinforced spun concrete pipes as specified and jointing with and including precast concrete collars in cement mortar (1:1) including forming fillet all round at end of collars.	M	86.50
11.	600mm diameter ditto.	M	122.50

ITEM	DESCRIPTION	UNIT	RATE
	ROAD, CULVERTS, FENCING & TURFING – (Cont'd)		
12.	750mm diameter ditto.	M	150.00
13.	900mm diameter ditto.	M	208.00
14.	Concrete (1:2:4 – 19mm) to 150mm thick concrete kerb including curve bend, stop end, etc.	Cu.M	150.00
15.	Chain link fencing 1.5m high consisting of 50mm x 50mm x 6mm painted steel angle posts at 3m centres with the bottom embedded in concrete (1:3:6 – 25mm) and with 50mm diamond mesh (# 10 S.W.G) galvanized chain link fence, including three strands of # 8 S.W.G. galvanized straining wire and including 50mm x 50mm x 6mm painted steel angle corner struts embedded in concrete (1:3: - 25mm) base.	M	42.30
16.	Ditto 50mm diamond mesh (# 12 S.W.G.)	M	46.00
17.	Ditto 63mm diamond mesh (# 10 S.W.G.)	M	47.50
18.	Ditto 63mm diamond mesh (# 12 S.W.G.)	M	48.50
19.	Extra over last 4 items for chain link fencing 1500mm high having three (3) strands of 2 ply barb wire (13 gauge with 4 pointed barbs 45mm c/c) on top.	M	5.50
20.	Pair mild steel gate to suit opening size 3000mm x 1250mm comprising of 50mm x 50mm x 6mm mild steel frames and braces, 50mm diamond mesh (# 10 S.QW.G) chain link infill, 45mm diameter class 'C' mild steel posts embedded in concrete (1:3:6 – 25mm) and including all necessary hinges, lock plates, bolts, welding and painting.	No	600.00
21.	Ditto 50mm diamond mesh (# 12 S.W.G.)	No	680.00
22.	Ditto 63mm diamond mesh (# 10 S.W.G.)	No	600.00
23.	Ditto 63mm diamond mesh (# 12 S.W.G.)	No	580.00
24.	Extra over last 4 items for mild steel gate to suit opening size 3000mm x 1250mm having three (3) strands of 2 ply barb wire (13 gauge with 4 pointed bars at 75mm c/c) on top.	No	30.00

ITEM	DESCRIPTION	UNIT	RATE
	ROAD, CULVERTS, FENCING & TURFING – (Cont'd)		
25.	Ditto item 20 to 23 for use 100 diameter in lieu of 75mm diameter class 'C' mild steel pipe posts.	No	42.00
26.	Mild steel gate to suit opening 900mm x 1500mm comprising of 50mm x 50mm x 6mm painted mild steel frames and braces, 50mm diamond mesh (# 10 S.W.G.) chain link infill, 50mm x 50mm x 6mm painted mild steel angle posts and struts embedded in concrete (1:3:6 – 25mm) and including hinges, lock plate, bolt, welding and painting.	No	270.00
27.	Ditto 50mm diamond mesh (# 12 S.W.G.) ditto.	No	268.00
28.	Ditto 63mm diamond mesh (# 10 S.W.G.) ditto.	M	275.00
29.	Ditto 63mm diamond mesh (# 12 S.W.G.) ditto.	M	274.00
30.	Extra over last 4 items for use of 75mm diameter class 'C' mild steel pipe posts in lieu of 50mm x 50mm x 6mm mild steel angle posts.	No	38.00
31.	Ditto items 26 to 29 for mild steel gate to suit opening size 900mm x 1800mm having three (3) strands of 2 ply barb wire (13 gauge with 4 pointed barb at 75mm c/c) on top.	No	13.00
32.	Provide 38mm brass cylinder padlock (Yale 110 or equivalent).	No	27.00
33.	Ditto 50mm ditto.	No	21.00
34.	Ditto 63mm ditto.	No	29.00
35.	Spot turfing on level surfaces at 450mm centres in chequered pattern and including 50mm bed of black earth as specified.	Sq.M	2.70
36.	Close turfing on level surface and including 50mm bed of black earth as specified.	Sq.M	6.50
37.	Close turfing to banks on and including 50mm bed of black earth and pegging all as specified.	Sq.M	8.00

ITEM	DESCRIPTION	UNIT	RATE
	ELECTRICAL		
1.	Supply and install main switch distribution fuse boards complete with regulation cabinets.	Item	400.00
2.	Submission of wiring diagrams and testing to satisfy all statutory requirements.	Item	200.00
3.	Conduits including wiring, fixing, junctions & fittings for conduit terminals.	M	18.00
4.	Light points including wiring, regulation fittings and switches as specified.	No	45.00
5.	13amp power points ditto.	No	75.00
6.	15amp power points ditto.	No	100.00
7.	Ceiling fan points ditto including fan hooks and mounting boards for speed regulators.	No	80.00
8.	Shaving unit points as specified.	No	45.00
9.	Bell points as specified.	No	45.00
10.	Cooker points as specified.	No	80.00
11.	Water heater points as specified.	No	100.00
12.	Add or deduct cost of the following items as directed :-		
	a) Light point	No	45.00
	b) 13amp power point	No	75.00
	c) 15amp power point	No	100.00
	d) Ceiling fan point	No	80.00
13.	Contractor to insert cost and type/brand of the following items :-		
	a) Air-conditioner regulation starter unit including mounting boards.		
	Type/Brand of Unit		
	i)	Item	
	ii)	Item	
	iii)	Item	

ITEM	DESCRIPTION	UNIT	RATE
	ELECTRICAL – (Cont'd)		
	b) Ceiling fan speed regulator unit including mounting boards.		
	Type/Brand of Unit		
	i)	Item	
	ii)	Item	
	iii)	Item	
14.	1200mm fluorescent light tubes including regulation starters, condensers and fixing.	No	45.00
15.	Propriety fluorescent light fitting including translucent cover and fixing :-		
	a) Single (one 1200mm tube).	No	40.00
	b) Double (two 1200mm tubes).	No	80.00
	c) Triple (three 1200mm tubes).	No	120.00
	d) Quadruple (four 1200mm tubes).	No	160.00
	State here Type/Brand quoted. ----------		

PERCENTAGES INCREASE OR DECREASE ACCORDING TO TRADE/SECTION

The rates contained in the Schedule of Rates under the respective trades/sections shall be increased or decreased as follows :-

	TRADE/SECTION	PERCENTAGE*	
		Increase	Decrease
1.	EXCAVATOR		
2.	CONCRETOR		
	a) Concrete		
	b) Reinforcement		
	c) Formwork		
3.	BRICKLAYER		
4.	DRAINLAYER		
5.	ROOFER		
6.	JOINER AND CARPENTER		
7.	IRONMONGERY		
8.	STEEL AND IRONWORKER		
9.	PAVIOUR, PLASTERER AND TILER		
10.	PLUMBER		
11.	SANITARY FITINGS		
12.	GLAZIER		
13.	PAINTER		
14.	ROADS, CULVERTS, FENCING & TURFING		
15.	ELECTRICAL		

*Insert 'NIL' if there is no increase or decrease.

....

(Tenderer) (Tenderer)

Date : ..... Date : .....

DAYWORK RATES

Daywork rates shall be applied where work cannot properly be measured and valued in accordance with the rates inserted in the Schedule of Rates al according to Clause 14 of the Conditions of Contract.

Daywork rates are Nett and an additional fifteen percent (15%) will be added for the use of all ordinary plant, tools and scaffolding, supervision, establishment charges and profit. Daywork prices shall be taken to mean the actual prime cost to the Contractor of his materials, transport and labour for the work concerned.

The Contractor shall produce for verification to the Architect vouchers specifying the time and materials employed on the work. If required, the Contractor shall also produce his receipted bills and wage books in support of his account.

Where special mechanical plant is required for use in Daywork, the cost to be paid to the Contractor shall be subjected to the Agreement by the Architect.

The Cost of any materials supplied by Employer for use on Daywork shall not be taken into account when calculating the amount on which the fifteen percent (15%) addition is based.

Only time on work actually done will be allowed. A 'Day' is considered to be a normal working day of eight (8) hours. Fractions of a day will be paid for 'pro-rata'.

Rates for power-driven tools are not included in the labour rates but charges for hand tools shall be deemed to be included.

The Contractor is to insert below daywork rates which shall form the basis of payment for daywork in accordance with Clause 14 of the Conditions of Contract. Where daywork is claimed, daywork sheets shall be submitted in accordance with Clause 14 (a) iii of the Conditions of Contract for signature and comments.

DAYWORK LABOUR/PLATN RATES

LABOUR	RATE PER 8-HOUR DAY (RM)	PLANT	RATE PER 8-HOUR DAY (RM)
Trade Supervisor		5-ton lorry	
Bricklayer		Welding set including welding equipment	
Drainlayer		14/10 concrete mixer	
Roofer		Air-compressor	
Carpenter		Pneumatic drills including steel bits	
Joiner			
Steel bender & fixer		Trencher	
Plasterer			
Painter			
Welder			
Pneumatic tool operator			
General labour			

This Schedule of Rates must be completed and returned together with the Tender Form. The rates shall be related to the Drawings and Specification of the job.

Contractor's Name : .....

Address : .....

.....

.....

.....

Witness's Name : .....

Address : .....

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LIST OF DRAWINGS

LIST OF DRAWING

ITEM	DRAWING NO.	TITLE
ARCHITECTURAL DRAWING		
1	K21011-TD-01 REV A	- KEY PLAN, LOCATION PLAN - SITE PLAN - DETAIL OF PILLAR HYDRANT
2	K21011-WD-02	- FLOOR PLAN, CEILING LAYOUT - ROOF PLAN, ELEVATION & SECTIONS
3	K21011-WD-03	- DIAGRAMMATIC SANITARY LAYOUT - DIAGRAMMATIC PLUMBING LAYOUT - DETAIL OF VENT PIPE PENETRATION - DETAIL OF BALLOFIX VALVE
4	K21011-WD-04	- POLYSEPT SEPTIC SYSTEM - ECOSEPT MODEL P-6 - DETAIL OF INSPECTION CHAMBER
5	K21011-DD-01	- DOOR & WINDOW SCHEDULE
6	K21011-DD-02	- DETAIL OF ABLUTION & - DETAIL OF TOILET
7	K21011-DD-03	- DETAIL OF FENCING, GATE & FLAG POST
8	K21011-DD-04	- DETAIL OF STREET LIGHTING
STRUCTURAL DRAWING		
1	SWAZMIX/P2107/S/RC 01	- LAYOUT & TYPICAL DETAILS - COLUMN & FOUNDATION REINFORCEMENT SCHEDULE
2	SWAZMIX/P2107/S/RC 02	- BEAM DETAILS & SLAB SECTIONS

LIST OF DRAWING *(Cont'd)*

ITEM	DRAWING NO.	TITLE
INFRASTRUCTURE DRAWING		
1	SWAZMIX/P21-07/C/EW 01	- EARTHWORK LAYOUT
2	SWAZMIX/P21-07/C/EW 02	- CUT SECTION DETAILS
3	SWAZMIX/P21-07/C/EW 03	- TEMPORARY WASH TROUGH - SILT TRAP DETAIL
4	SWAZMIX/P21-07/C/R&D 01	- ROAD AND DRAINAGE LAYOUT
5	SWAZMIX/P21-07/C/R&D 02	ROAD AND DRAINAGE - Typical Box Culvert and Details - Typical Section of 'U' Drain - Discharge Point Control (DPC) Details - Typical Details od M.S. Grating
6	SWAZMIX/P21-07/C/R&D 03	ROAD AND DRAINAGE - Typical Box Culvert and Details - Typical Section of 'U' Drain - TRAFFIC SIGN DETAILS
7	SWAZMIX/P21-07/C/SW 01	SEWERAGE LAYOUT - Typical Box Culvert and Details - Typical Section of 'U' Drain - TRAFFIC SIGN DETAILS
8	SWAZMIX/P21-07/C/SW 02	- ECOSEPT MODEL P-6
9	SWAZMIX/P21-07/C/WR 01	- WATER RETICULATION LAYOUT
10	SWAZMIX/P21-07/C/WR 02	- PIPE BEDDING AND BACKFILL
11	SWAZMIX/P21-07/C/WR 03	- DETAILS OF MARKER & CULVERT CROSSING - DETAILS OF FITTING, HYDRANT AND CHAMBERS - SUMP CULVERT DETAIL - BULK METER CONNECTION DETAILS - PRESSURE REDUCING VALVE (PRV) DETAILS

TENDER DRAWING
JUNE 2024

CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN
PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326),
BANDAR SERI BANDI, MUKIM HULU CHUKAI,
DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

TENDER DRAWING

LIST OF TENDER DRAWING

ITEM	DWG NO.	DESCRIPTION OF DRAWING
A		ARCHITECTURE
	A1 SIZE	WORKING DRAWING
1	K21011/WD/01	KEY PLAN, LOCATION PLAN & SITE PLAN
2	K21011/WD/02	FLOOR, ROOF PLAN, CEILING & ELECTRICAL LAYOUT PLAN, FRONT, REAR, SIDES ELEVATIONS & SECTIONS
3	K21011/WD/04	DIAGRAMMATIC PLUMBING & SANITARY LAYOUT,
4	K21011/WD/05	POLYSEPT SEPTIC SYSTEM ECOSEPT MODEL P-6 & DETAIL OF INSPECTION CHAMBER
5	K21011/LND/01	LANDSCAPE PLAN
	A1 SIZE	DETAIL DRAWING
1	K21011/DD/01	DOOR & WINDOW SCHEDULE
2	K21011/DD/02	DETAIL OF TOILET
3	K21011/DD/03	FLOOR FINISHES
4	K21011/DD/04	DETAIL OF STREET LIGHTING

ITEM	DWG NO.	DESCRIPTION OF DRAWING
B	A1 SIZE	ENGINEER
1	SWAZMIX / P2107 / RC 01	COLUMN & FOUNDATION SCHEDULE TYPICAL DETAILS
2	SWAZMIX / P2107 / RC 02	BEAM DETAILS
3	SWAZMIX / P21-07 / C / EW 01	EARTHWORK LAYOUT
4	SWAZMIX / P21-07 / C / EW 02	CUT SECTION DETAILS
5	SWAZMIX / P21-07 / C / EW 03	TEMPORARY WASH TROUGH
6	SWAZMIX / P21-07 / C / R&D 01	ROAD & DRAINAGE LAYOUT
7	SWAZMIX / P21-07 / C / R&D 02	TYPICAL BOX CULVERT AND DETAILS
8	SWAZMIX / P21-07 / C / R&D 03	TRAFFIC DESIGN DETAILS
9	SWAZMIX / P21-07 / C / WR 01	WATER RETICULATION LAYOUT
10	SWAZMIX / P21-07 / C / WR 02	PIPE BEDDING AND BACKFILL
11	SWAZMIX / P21-07 / C / WR 03	DETAILS OF MARKER

No. Fail :

Tajuk Projek :

CADANGAN MEMBINA DAN MENYIAPKAN
1 UNIT BANGUNAN PEJABAT 1 TINGKAT
DI ATAS LOT PT 6054 (HSD 9326),
BANDAR SERI BANDI, MUKIM HULU CHUKAI,
DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

Adalah saya mencadangkan agar maksud utama penggunaan cadangan projek seperti di atas adalah dalam Kumpulan Maksud (Pejabat) IV dan keperluan kelengkapan keselamatan kebakaran adalah seperti berikut. (keperluan kelengkapan keselamatan kebakaran hendaklah ditentukan mengikut UBBL pada sesuatu cadangan projek).

PELAN TAPAK:

1. Adakan 1 buah pili bomba jenis tiang dua hala dengan pengeluaran air sebanyak 1135 liter seminit bagi setiap pili bomba sepertimana yang di tandakan di dalam pelan.
2. Adakan jalan masuk pekakas bomba (access road) dengan kelebaran tidak kurang 6 meter yang boleh menanggung beban 30 tan sepertimana yang ditandakan didalam pelan.
3. Kecerunan jalan akses perkakas bomba hendaklah tidak kurang 1:15.
4. Ketinggian kelegaan hendaklah tidak kurang daripada 5 meter
5. Jarak antara bangunan hendaklah mematuhi jadual ke enam UBBL 1984.

KEHENDAK-KEHENDAK AM:

1. Semua pendawaian elektrik bagi system kecemasan hendaklah dalam konduit logam atau daripada kabel yang mempunyai penebatan mineral tahan api. pemasangannya hendaklah sepanjang kawasan yang paling kurang risiko kebakarannya dan mematuhi UUK 253, UUKBS 1984.
2. Semua elemen struktur hendaklah mempunyai tempoh ketahanan api mengikut UBBL 1984.

KEHENDAK-KEHENDAK AKTIF :

1. Adakan 1 unit alat pemadam api yang bersesuaian menurut MS 1539: Part 1:2002 seperti mana yang ditandakan di dalam pelan.
2. Adakan lampu kecemasan yang menggunakan dua kuasa karen sepertimana yang ditandakan di dalam pelan. Lampu-lampu tersebut hendaklah dari jenis yang dibenarkan oleh Jabatan Bomba dan Penyelamat Malaysia.
3. Adakan lampu tanda "keluar" kecemasan yang menggunakan dua kuasa karen sepertimana yang ditandakan di dalam pelan. Lampu-lampu tersebut hendaklah dari jenis yang dibenarkan oleh Jabatan Bomba dan Penyelamat Malaysia.

KEHENDAK-KEHENDAK PASIF :

1. Penggunaan siling bangunan hendaklah menepati kehendak-kehendak UBBL 1984.
2. Adakan dinding pemetakan (compartment wall) setebal 112mm/225mm batu bata yang di bina sehingga paras bumbung/lantai sepertimana yang ditandakan di dalam pelan.
3. Penggunaan kaca-kaca pada dinding luar bangunan hendaklah dari jenis yang dibenarkan oleh Jabatan Bomba dan Penyelamat Malaysia.
4. Semua dinding pembahagi dalaman hendaklah dari jenis rintangan api 1/2 jam dan dari jenis yang dibenarkan oleh Jabatan Bomba dan Penyelamat Malaysia.

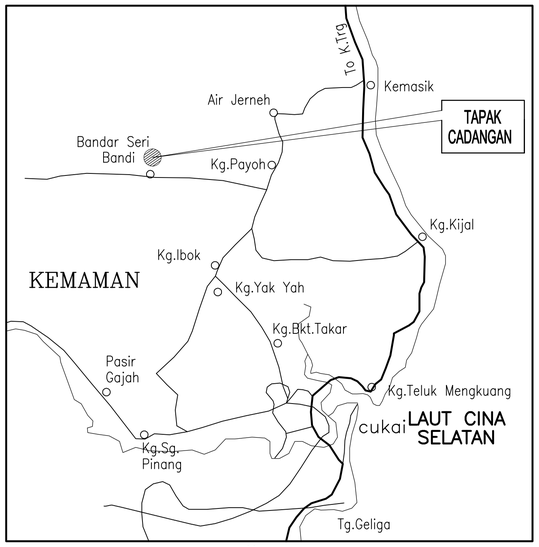
PERINGATAN :

1. Segala syarat-syarat yang dikemukakan adalah tertakluk kepada rekabentuk dan kegunaan serta lokasi bangunan tersebut. Sekiranya sebarang perubahan yang dilakukan ke atas rekabentuk atau kegunaannya seperti yang dicatatkan di atas pelan maka hendaklah dirujuk kejabatan ini untuk dikaji semula.
2. Segala pemilihan bahan dan penggunaannya yang berkaitan dengan keselamatan kebakaran bagi projek cadangan serta system pencegahan kebakaran hendaklah mematuhi UBBL 1984 dan peraturan-peraturan yang diterima sahaja dan yang dibenarkan oleh Jabatan Bomba dan Penyelamat Malaysia.
3. Bagi bangunan yang rekabentuknya melebihi 18.5 meter hingga ke lantai penuh yang tertinggi sekali, sesalur-sesalur naik mengikut Undang-Undang Kecil 232 hendaklah dipasang sebaik sahaja selepas bangunan itu melebihi tinggi tersebut untuk mengadakan kemudahan-kemudahan mencegah kebakaran dalam masa berbagai peringkat pembinaan itu.
4. Pengesahan pelan ini adalah tidak tertakluk kepada penyimpanan, penggunaan, pemerosesan dan penghasilan bahan berbahaya atau kimia berbahaya. Sekiranya terdapat sebarang penyimpanan penggunaan pemerosesan dan penghasilan bahan berbahaya atau kimia berbahaya setelah pelan disahkan maka pelan bangunan tersebut hendaklah dirujuk kembali ke jabatan ini untuk dikaji semula.
5. Pelan lukisan dan pengiraan bagi semua pemasangan tetap hendaklah dikemukakan ke Jabatan Bomba dan Penyelamat Malaysia. Jumlah pelan-pelan yang perlu dikemukakan hendaklah tidak kurang tiga (3) perenggu.
6. Mana-mana premis yang mengendalikan, memproses atau menyimpan bahan-bahan bahaya hendaklah diadakan tanda khas mengikut symbol 'Hazchem Code'. Tanda-tanda ini hendaklah mudah dilihat.
7. Sila patuhi keperluan-keperluan seperti yang dinyatakan di dalam laporan Fire Safety Design Philosophy / laporan aktiir Performance Based-Fire Safety Engineering Design.
8. Bangunan yang melebihi 7000 meter padu hendaklah bersempadanan dengan jalan atau lebuh atau kawasan terbuka yang tidak kurang daripada 6 meter lebar dan boleh dimasuki oleh perkakas pasukan bomba.
9. Adakan tulisan 'LALUAN JENTERA BOMBA – KOSONGKAN LALUAN' di atas akses jentera bomba serta memasang papan tanda 'LALUAN JENTERA BOMBA – KOSONGKAN LALUAN' disebelah kiri atau kanan akses jentera bomba. Ianya hendaklah mematuhi Garis Panduan Berkaitan Keperluan dan Spesifikasi Akses Perkakasan Bomba.
10. Sila kemukakan laporan 'Emergency Respon Planning' ke Jabatan ini untuk semakan dan rekod.

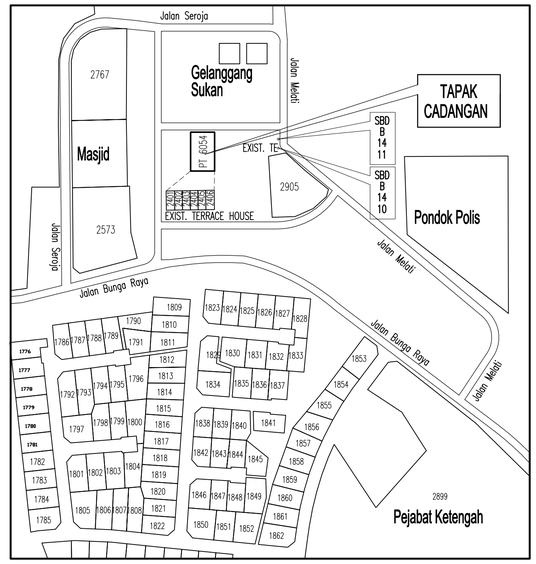
Saya mengakui walaupun apa-apa pelan, lukisan atau kiraan yang telah diperakukan oleh Jabatan Bomba dan Penyelamat Malaysia, tanggungjawab bagi kemungkiran kepada mana-mana bangunan atau sebahagian daripada sesuatu bangunan hendaklah terletak atas orang yang mengemukan pelan, lukisan dan kiraan itu.

LEMBAGA ARKITEK MALAYSIA

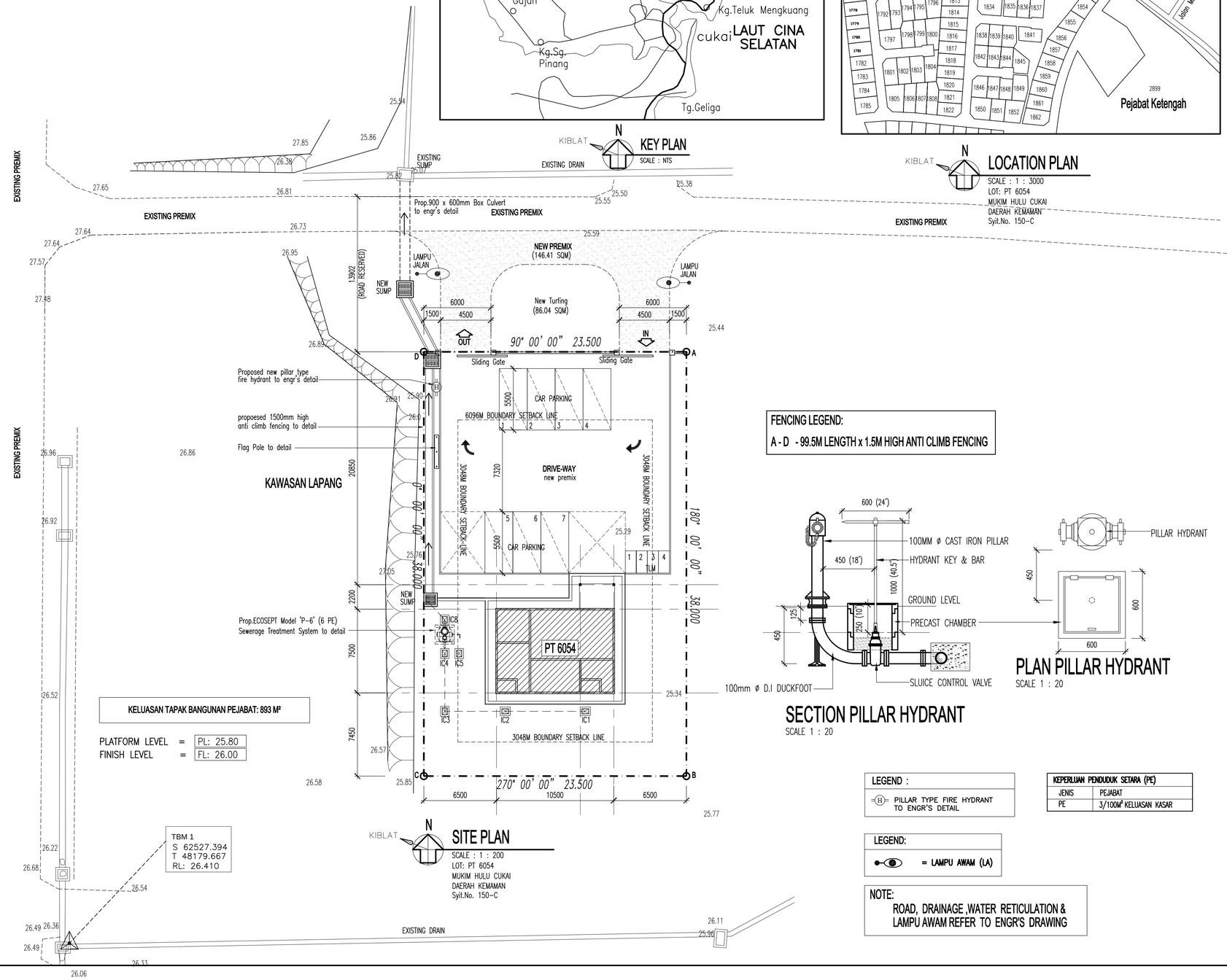
Ar. WAN MUHAMMAD KAMAL BIN WAN ALI
ARKITEK PROFESIONAL
No Pendaftaran LAM : A/W 121



KEY PLAN
SCALE : NTS



LOCATION PLAN
SCALE : 1 : 3000
LOT: PT 6054
MUKIM HULU CUKAI
DAERAH KEMAMAN
Syit.No. 150-C



KEY PLAN
SCALE : NTS

SITE PLAN
SCALE : 1 : 200
LOT: PT 6054
MUKIM HULU CUKAI
DAERAH KEMAMAN
Syit.No. 150-C

KELUASAN TAPAK BANGUNAN PEJABAT: 893 M²

PLATFORM LEVEL = PL: 25.80
FINISH LEVEL = FL: 26.00

FENCING LEGEND:
A - D - 99.5M LENGTH x 1.5M HIGH ANTI CLIMB FENCING

SECTION PILLAR HYDRANT
SCALE 1 : 20

PLAN PILLAR HYDRANT
SCALE 1 : 20

LEGEND :
PILLAR TYPE FIRE HYDRANT TO ENGR'S DETAIL

LEGEND:
= LAMPU AWAM (LA)

NOTE:
ROAD, DRAINAGE ,WATER RETICULATION & LAMPU AWAM REFER TO ENGR'S DRAWING

KEPERLUAN PENDUDUK SETARA (PE)	
JENIS	PEJABAT
PE	3/100M² KELUASAN KASAR

TENDER DRAWING
JUNE 2024

NOTE :

OMISSIONS :
1) PC. ROADSIDE DRAIN & SUMP
2) ROAD KERB & ISLAND AT ENTRANCE
3) AC&DC LANE

PROJEK

CADANGAN MEMBINA DAN MENYIAPKAN
1 UNIT BANGUNAN PEJABAT 1 TINGKAT
DI ATAS LOT PT 6054 (HSD 9326),
BANDAR SERI BANDI, MUKIM HULU CHUKAI,
DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

UNTUK TETUAN:
LADANG RAKYAT TRENGGANU SDN. BHD.

TAJUK LUKISAN
KEY PLAN, LOCATION PLAN
SITE PLAN
DETAIL OF PILLAR HYDRANT

PEMILIK

LADANG RAKYAT TRENGGANU SDN. BHD.
KM1, JALAN CHERUL,
BANDAR CHENEH BAHARU,
24000 KEMAMAN,
TERENGGANU DARUL IMAN.

ARKITEK BERKUASA
Saya memperakui bahawa detail-detail dalam pelan ini adalah menurut kehendak-kehendak Undang-Undang Kecil Bangunan Seragam 1984 Pihak Berkuasa Tempatan dan saya setuju terima tanggungjawab penuh dengan sewajarnya.

LEMBAGA ARKITEK MALAYSIA

Ar. WAN MUHAMMAD KAMAL BIN WAN ALI
ARKITEK PROFESIONAL
No Pendaftaran LAM : A/W 121

KUMPULAN PERUNDING (1988) SDN.BHD.166318-V

44 TINGKAT 1, JALAN SULTAN ISMAIL,
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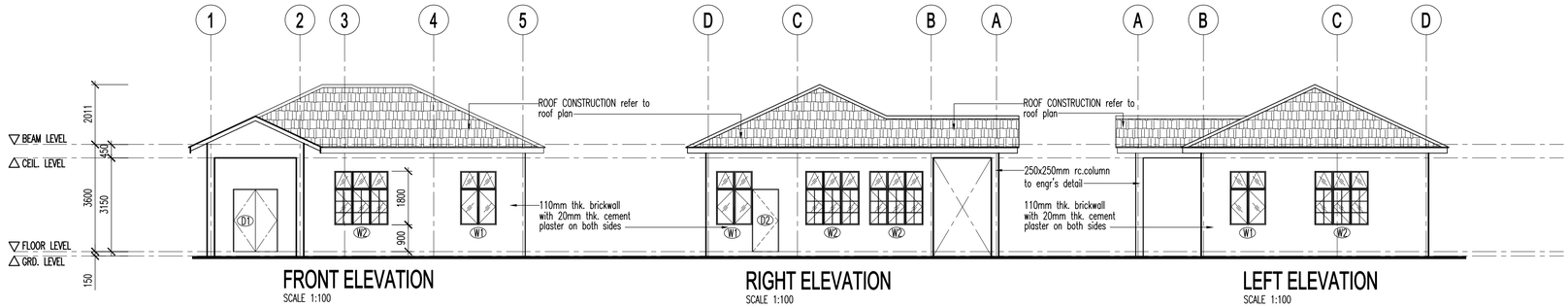
TEL : (609) 6223582, 6223755.
FAX : (609) 6231412
EMAIL : kpk855sb@kpj88sb.com
kpk855sb@yahoo.com
WEBSITE : www.kpj65sb.com

UKURAN : TERCATIT	TARIKH : JUNE 2024	RUJUK LUKISAN: K21011-TD-01	REV.
DILUKIS OLEH : MWR	DISEMAK OLEH : MRH		

TENDER DRAWING JUNE 2024

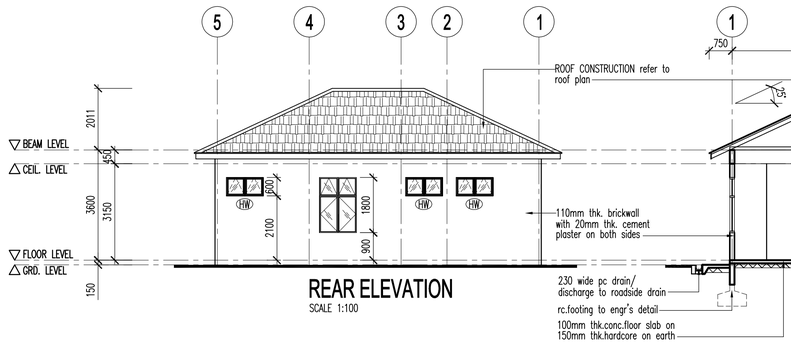
COMPUTER AIDED DESIGN & DRAFTING



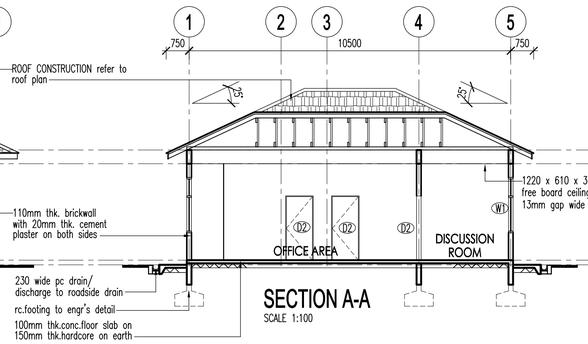
FRONT ELEVATION
SCALE 1:100

RIGHT ELEVATION
SCALE 1:100

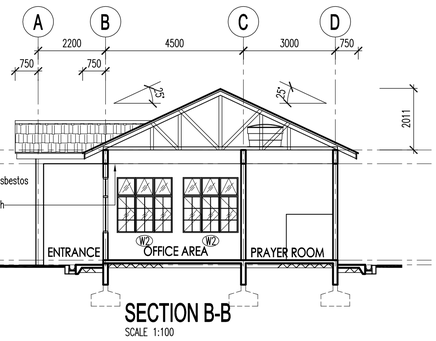
LEFT ELEVATION
SCALE 1:100



REAR ELEVATION
SCALE 1:100



SECTION A-A
SCALE 1:100



SECTION B-B
SCALE 1:100

LIGHTING AND VENTILATION SCHEDULE						
NO.	AREA	FLOOR AREA (m2)	LIGHTING		VENTILATION	
			OPENING (m2)	MIN. (10%)	OPENING (m2)	MIN. (5%)
Ground Floor Plan						
1.	OFFICE AREA	33.75	9.72	28.8	3.24	9.6
2.	MANAGER ROOM	11.34	3.24	28.57	1.08	9.5
3.	DISCUSSION ROOM	9	4.32	48	1.44	16
4.	PRAYER ROOM	9	4.32	48	1.44	16
5.	PANTRY	6.84	2.16	31.57	0.72	10
6.	UTILITY	4.50	0.72	16	0.72	16
7.	TOILET 1	2.16	0.72	33.33	0.72	33.33
8.	TOILET 2	2.16	0.72	33.33	0.72	33.33

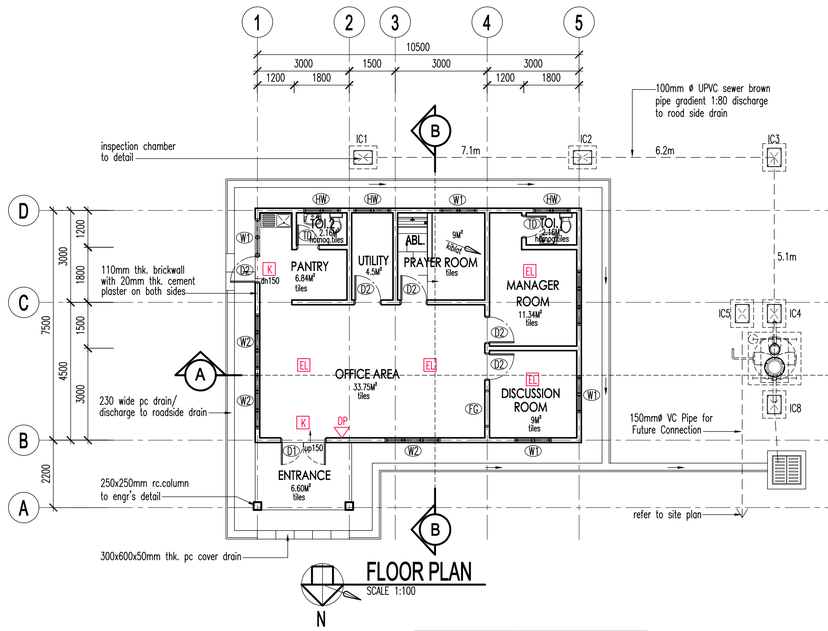
DOOR & WINDOW SCHEDULE		SIZE
D1	Double leaf timber flush door	1500x2100mm
D2	Single leaf timber flush door	900x2100mm
TD	PVC flush door to manut's detail	750x2100mm
W1	H.W. casement adj. glass louvres window with fixed glass louvres window above	1200x1800mm
W2	H.W. casement adj. glass louvres window with fixed glass louvres window above	1800x1800mm
HW	H.W. fixed glass louvres high window	1200x600mm

SYMBOL	ELECTRICAL LEGEND	QUANTITY
	1200mm fluorescent light point	14
	ceiling fan point	1
	ceiling light point	2
	13 amp. power plug point	10
	one way switch	12
F	fuse box	1
M	meter box	1

ELECTRICAL NOTES.
1. All electrical works shall be carried out by TNB. registered contractor.
2. All concealed electrical works must be inspected & approval by TNB.before sealing.
3. All electrical power plug points shall be at 1500mm above floor finish
4. All electrical wiring above ceiling level to be in gi. conduit and flexible pipe connected to light point.

BOMBA LEGEND:

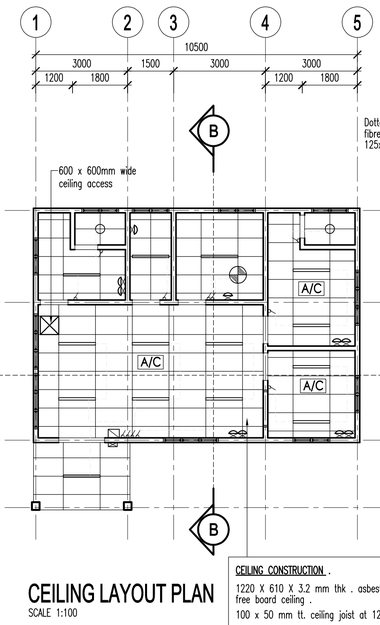
SYMBOL	TYPE
D/P	9kg ABC dry powder
EL	emergency light
K	Exit sign



FLOOR PLAN
SCALE 1:100

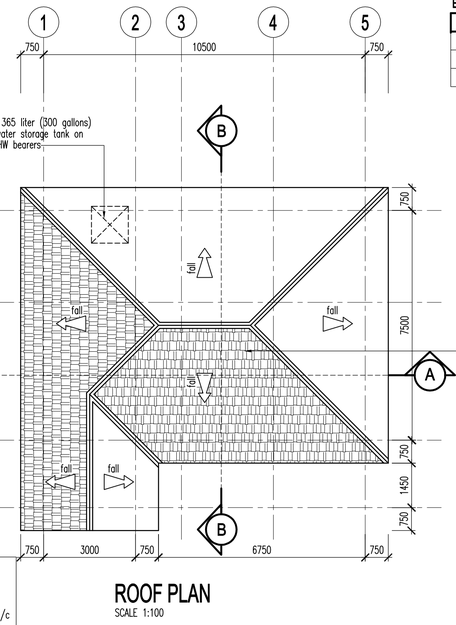
N

	FLOOR PLAN
TOTAL NET AREA	78.75M² 847.6FT²
TOTAL GROSS AREA	85.35M² 918.6FT²



CEILING LAYOUT PLAN
SCALE 1:100

CEILING CONSTRUCTION .
1220 X 610 X 3.2 mm thk . asbestos free board ceiling .
100 x 50 mm tt. ceiling joist at 1200mm c/c
50 x 50mm tt. ceiling batten at 600mm c/c c/c with 13mm gap wide painted finish
50 x 13mm thk. timber beading all round the beam .



ROOF PLAN
SCALE 1:100

ROOF CONSTRUCTION
cement tiles ridge cap
cement tiles roofing tiles at 25° pitch.
on 50 x 50mm thk.hw.batten at 300mm c/c
on single sided aluminium paper
on 125 x 50mm thk.hw.rafter at 750mm c/c with
125 x 50mm thk.hw.tie beam
100 x 50mm thk.hw.trusses bolted with
16mm ø ms.bolts and nuts washer at 1800mm c/c
on 100 x 50mm thk.hw.wall plate all round
250 x 25mm thk.hw.fascia board all round

TENDER DRAWING
JUNE 2024

PROJEK

CADANGAN MEMBINA DAN MENYIAPKAN
1 UNIT BANGUNAN PEJABAT 1 TINGKAT
DI ATAS LOT PT 6054 (HSD 9326),
BANDAR SERI BANDI, MUKIM HULU CHUKAI,
DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

UNTUK TETUAN:
LADANG RAKYAT TERENGGANU SDN. BHD.

TAJUK LUKISAN
FLOOR PLAN, CEILING LAYOUT, ROOF PLAN
ELEVATIONS & SECTIONS

PEMILIK

LADANG RAKYAT TRENGGANU SDN. BHD.
KM1, JALAN CHERUL,
BANDAR CHENEH BAHARU,
24000 KEMAMAN,
TERENGGANU DARUL IMAN.

ARKITEK BERKUASA
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LEMBAGA ARKITEK MALAYSIA

Ar. WAN MUHAMMAD KAMAL BIN WAN ALI
ARKITEK PROFESIONAL
No Pendaftaran LAM : A/W 121

KUMPULAN PERUNDING
(1988) SDN.BHD.166318-V
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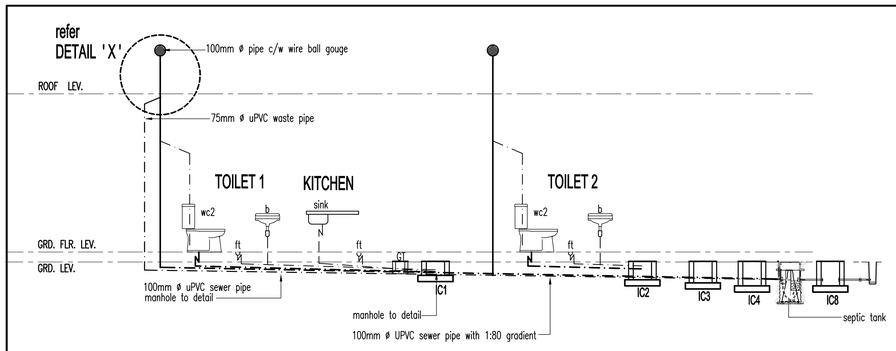
UKURAN : TERCATIT	TARIKH : JUN 2024	RUJUK LUKISAN: K21011-WD-02	REV.
DILUKIS OLEH : MWR	DISEMAK OLEH : MRH		

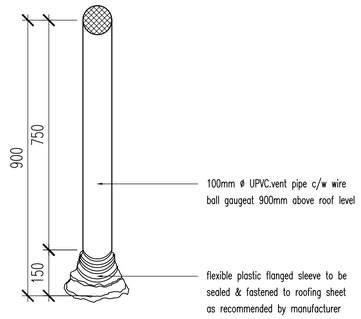
TENDER DRAWING JUNE 2024

COMPUTER AIDED DESIGN & DRAFTING



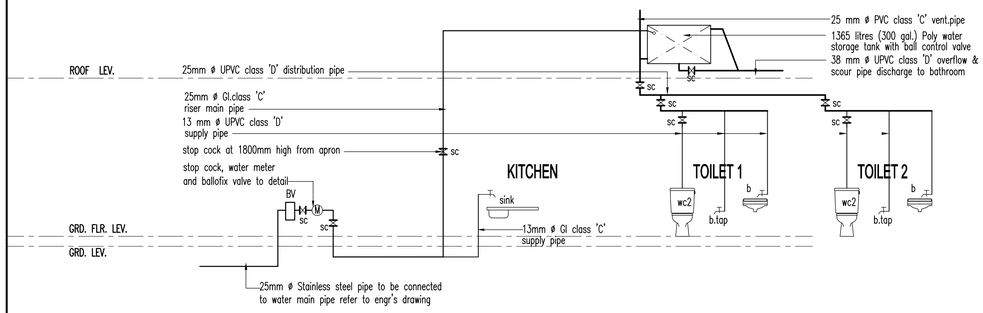
DIAGRAMMATIC SANITARY LAYOUT

NOT TO SCALE



DETAIL 'X' (VENT. PIPE PENETRATION

SCALE 1:10



DIAGRAMMATIC PLUMBING LAYOUT

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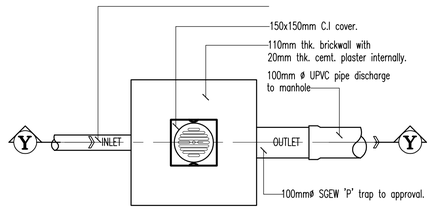
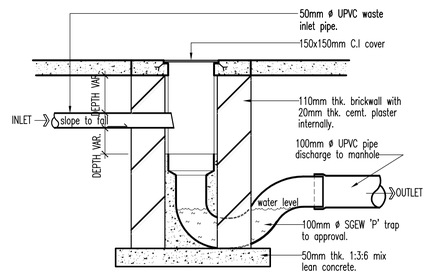


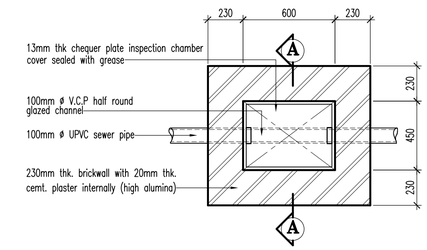
PLAN OF GULLY TRAP

SCALE 1:10



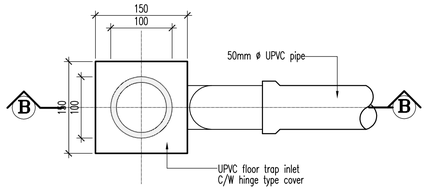
SECTION Y-Y

SCALE 1:10



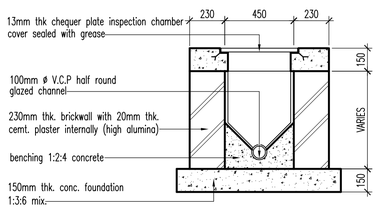
PLAN OF INSPECTION CHAMBER

SCALE 1:20



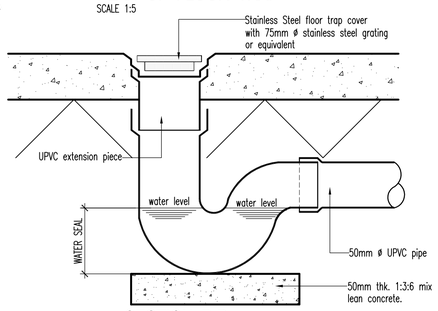
PLAN OF FLOOR TRAP

SCALE 1:5



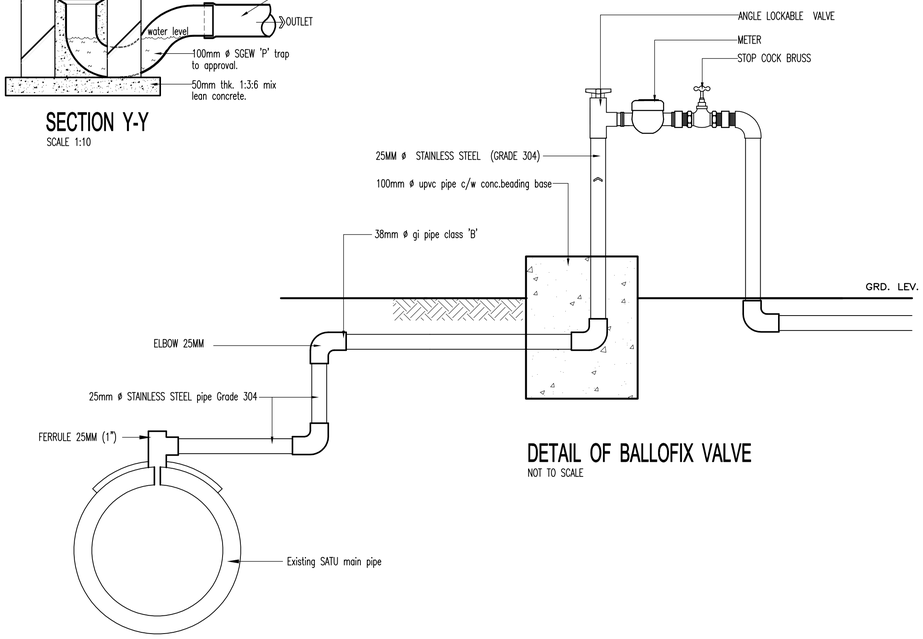
SECTION A-A

SCALE 1:20



SECTION B-B

SCALE 1:5



DETAIL OF BALLOFIX VALVE

NOT TO SCALE

PAIP AIR DALAMAN

1. Paip air dalaman selepas tangki disyorkan dari jenis GI kelas C, UPVC sekurang-kurangnya kelas E, paip stainless steel, polysteel atau paip yang berkualiti yang ada di pasaran.
2. Semua paip pembahagi (distribution pipe) disyorkan bersaiz 38mm dan mempunyai paip pengudaraan (vent pipe).
3. Tangki air diwajibkan dan disyorkan mencukupi 50 gelen sekepala dan sekurang-kurangnya 150 gelen. Tangki mempunyai kelengkapan yang cukup seperti injap bebola yang berkualiti, paip cuci dan paip limpah.
4. Pihak SATU tidak bertanggungjawab semua kerja-kerja pemasangan paip dalaman yang dilaksanakan oleh tukang paip. Tukang paip hendaklah mempunyai lesen yang sah dan sentiasa mematuhi spesifikasi kerja-kerja paip dan peraturan-peraturan yang dikeluarkan oleh SATU.
5. Paip perhubungan dan stand meter hendaklah dari jenis stainless steel bersaiz minima 3/4 inci, manakala paip naik ke tangki (riser pipe) hendaklah dari jenis GI kelas C sahaja. Stand meter perlu dilengkapi dengan ballofix valve 3/4 inci dan kedudukannya di luar kawasan pagar (sebelum longkang). Stand meter dan meter air 1/2 inci dan ballofix valve dibekalkan oleh SATU dengan caj bayaran tertentu.
6. Pepasangan stand meter seperti ballofix, stock cock pertama, meter dan stop cock kedua mestilah di luar pagar dan berkedudukan selari dengan pagar.
7. Semua aras ketinggian paip air melebihi 10m atau melebihi 2 tingkat hendaklah menggunakan sistem pam booster atau suction tank.

PAIP Retikulasi

1. Pemohon / pemaju hendaklah memberitahu secara bertulis kepada Pengurus Daerah SATU sekurang-kurangnya satu (1) MINGGU SEBELUM MEMULAKAN KERJA-KERJA dengan mengemukakan salinan lesen kontraktor, senarai barang-barang untuk pemeriksaan dan menunjukkan akuan kelulusan paip retikulasi dari SATU.
2. Semua paip dan barang-barang yang disediakan hendaklah dari kilang yang mempunyai pengesahan kualiti SIRIM, pengesahan IKRAM serta sijil pengesahan SATU.
3. Penggunaan paip UPVC mestilah mematuhi spesifikasi Lead Free kelas D. Manakala paip ductile iron memenuhi specifikasi K 9. Saiz minima paip retikulasi 150mm garis pusat.
4. Semua injap salur mestilah menepati piawaian BS 5163 jenis B dan diperbuat daripada ductile iron body (disalut dengan polymeric coating-fussion bonded epoxy coating di sebelah dalam dan luar) serta dilengkapi dengan resilient wedge, stainless steel shaft spindle dan double o-rings.
5. Permohon/pemaju perlu menyerahkan paip air dengan mengisi borang berkenaan sebelum air bersih dapat disalurkan ke projek tersebut dan tempoh tanggungan kecacatan ialah satu (1) tahun selepas penerimaan.
6. Tempoh sah laku ulasan/kelulusan ini adalah satu (1) tahun dari tarikh surat ini dan pemaju/pemohon boleh melanjutkan tempoh sah laku dengan menulis surat sekurang-kurangnya satu (1) bulan sebelum luput tempoh asal.

TENDER DRAWING
JUNE 2024

PROJEK

CADANGAN MEMBINA DAN MENYIAPKAN
1 UNIT BANGUNAN PEJABAT 1 TINGKAT
DI ATAS LOT PT 6054 (HSD 9326),
BANDAR SERI BANDI, MUKIM HULU CHUKAI,
DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

UNTUK TETUAN:
LADANG RAKYAT TRENGGANU SDN. BHD.

TAJUK LUKISAN

- DIAGRAMMATIC SANITARY LAYOUT
- DIAGRAMMATIC PLUMBING LAYOUT
- DETAIL OF VENT PIPE PENETRATION
- DETAIL OF BALLOFIX VALVE

PEMILIK

LADANG RAKYAT TRENGGANU SDN. BHD.
KM1, JALAN CHERUL,
BANDAR CHENEH BAHARU,
24000 KEMAMAN,
TERENGGANU DARUL IMAN.

ARKITEK BERKUASA

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LEMBAGA ARKITEK MALAYSIA

Ar. WAN MUHAMMAD KAMAL BIN WAN ALI
ARKITEK PROFESIONAL
No Pendaftaran LAM : A/W 121

KUMPULAN PERUNDING
(1988) SDN.BHD.166318-V

44 TINGKAT 1, JALAN SULTAN ISMAIL,
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TEL : (609) 6223582, 6223755.
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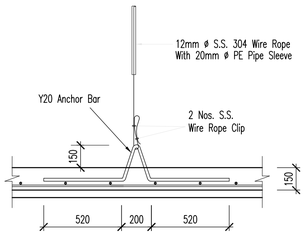
EMAIL : kpk88sdn@kp88sb.com
kpk88sdn@yahoo.com
WEBSITE : www.kp88sb.com

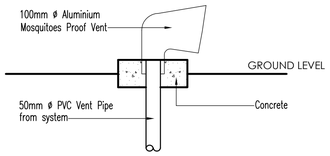
UKURAN : TERCATIT	TARIKH : JUNE 2024	RUJUK LUKISAN:	REV.
DILUKIS OLEH : MWR	DISEMAK OLEH : MRH	K21011-WD-03	

COMPUTER AIDED DESIGN & DRAFTING

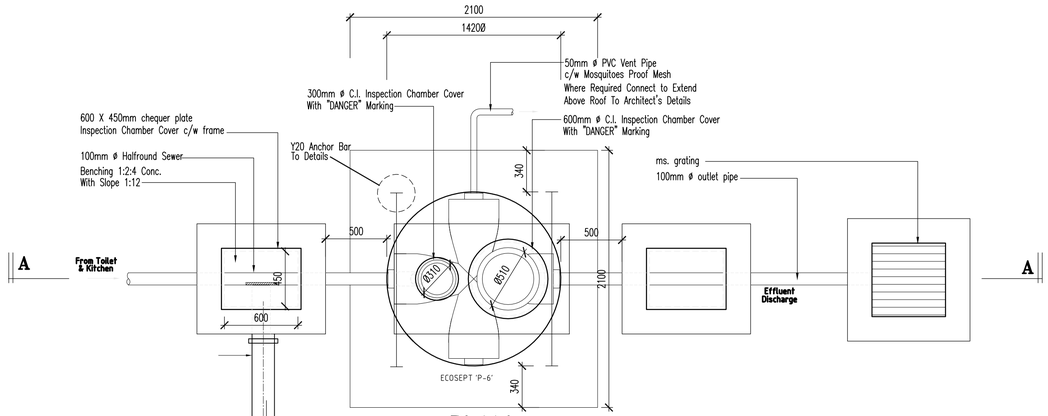
TENDER DRAWING JUNE 2024



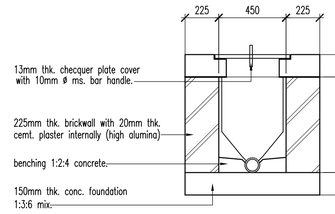
DETAILS - ANCHORAGE



DETAIL VENT.PIPE

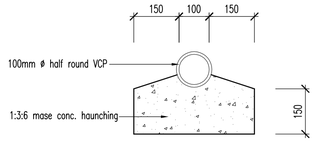


PLAN



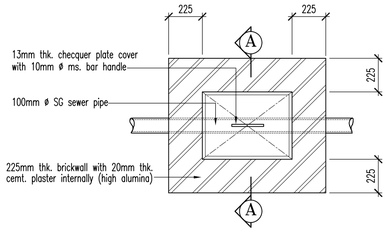
THRU' SECTIONAL A-A

SKALA 1 : 10



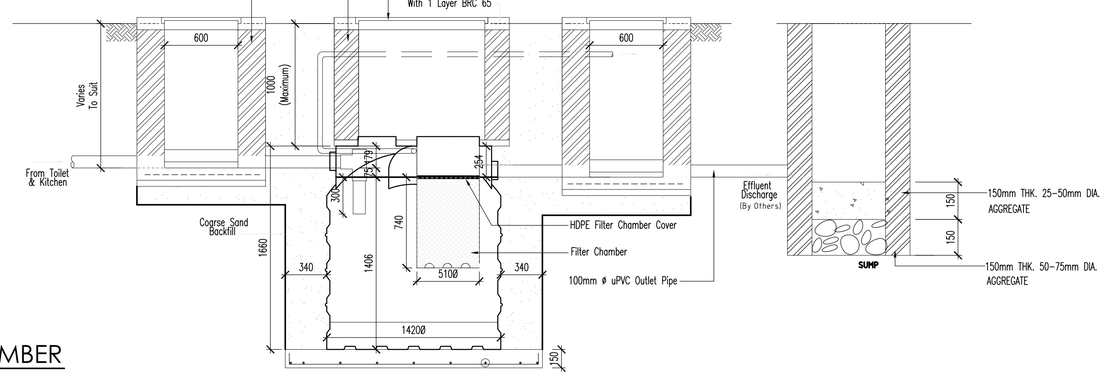
TYPICAL DETAIL OF BEDDING AND HAUNCHING

scale 1:10

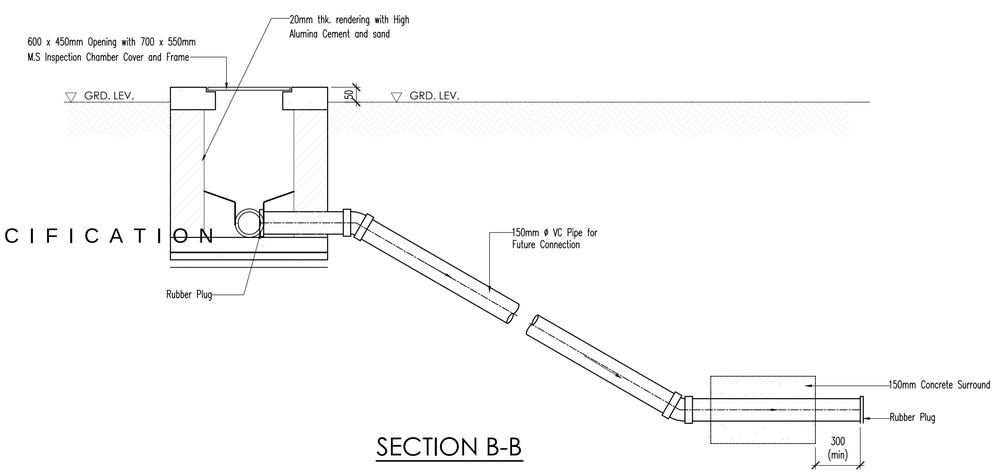


DETAIL OF INSPECTION CHAMBER

SKALA 1 : 10



SECTION A-A



SECTION B-B

NOTES :

1 Immediately after lowering and positioning all tanks must be filled to 3/4 depth water.
2 The septic tank must be seeded by approximately 20 Litres of sludge taken from working septic tank or Digesters.
3 Direction of inlet and outlet Effluent pipes to be adjusted to suit site.
4 The end discharge of Effluent pipe should be at least 150mm higher than the bottom of the receiving drain.
5 Sand without sharp stones or objects to be used for backfill.
6 Backfill in layers not exceeding 250mm thick and well compacted. Each Layer to be properly compacted before the next layer.
7 Each layer of backfill must be completely level all around the system before the next layer is added. Backfilling must not be placed unevenly from one side or corner.
8 If kitchen waste is also directed into the system, an oil and grease trap must be provided in before the septic tank.
9 All dimensions are in mm unless otherwise specified.
10 The septic tank must NOT be buried with the top lower than 600mm below ground level.
11 The septic tank must NOT be installed under traffic areas or under heavy loads unless proper support slabs are provided above the septic tank.
12 All civil & structural works shall be to civil & structural consultant's design & constructed by others.
13 All works labelled as (Not By W.I.I.) means that it is not included in the scope of works to be supplied or constructed by WEIDA INTEGRATED INDUSTRIES SDN. BHD.

ECOSEPT P-6 SEPTIC TANK SPECIFICATION

POPULATION EQUIVALENT RECOMMENDED (FOR ALL WASTE)	6
DETENTION TIME (HRS)	> 24
VOLUME TO WATER LEVEL (L)	> 2000
VENTILATION PIPE (mm)	50
INLET PIPE DIAMETER (mm)	100
OUTLET PIPE DIAMETER (mm)	100

TENDER DRAWING
JUNE 2024

PROJEK

CADANGAN MEMBINA DAN MENYIAPKAN
1 UNIT BANGUNAN PEJABAT 1 TINGKAT
DI ATAS LOT PT 6054 (HSD 9326),
BANDAR SERI BANDI, MUKIM HULU CHUKAI,
DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

UNTUK TETUAN:
LADANG RAKYAT TRENGGANU SDN. BHD.

TAJUK LUKISAN

POLYSEPT SEPTIC SYSTEM
ECOSEPT MODEL P-6
DETAIL OF INSPECTION CHAMBER

PEMILIK

LADANG RAKYAT TRENGGANU SDN. BHD.
KM1, JALAN CHERUL,
BANDAR CHENEH BAHARU,
24000 KEMAMAN,
TERENGGANU DARUL IMAN.

ARKITEK BERKUASA

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ARKITEK PROFESIONAL
No Pendaftaran LAM : A/W 121

KUMPULAN PERUNDING (1988) SDN.BHD.166318-V

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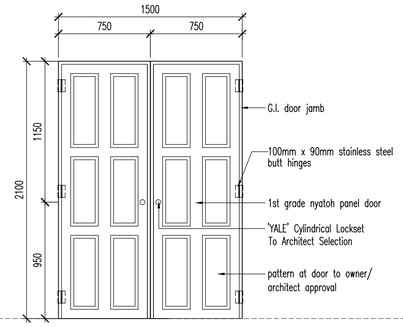
kpk88sb@yahoo.com
WEBSITE : www.kp88sb.com

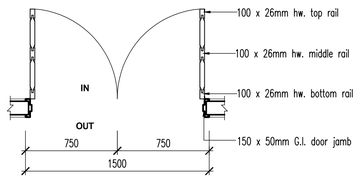
UKURAN : TERCATIT	TARIKH : JUNE 2024	RUJUK LUKISAN: K21011-WD-04	REV.
DILUKIS OLEH : MWR	DISEMAK OLEH : MRH		

TENDER DRAWING JUNE 2024

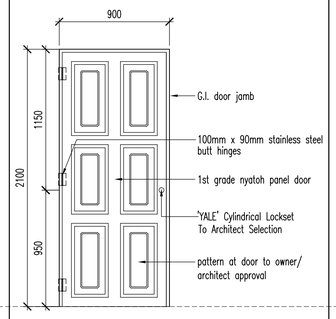
COMPUTER AIDED DESIGN & DRAFTING

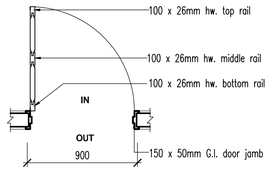
D1–GI. Frame Solid Timber Decorative Door



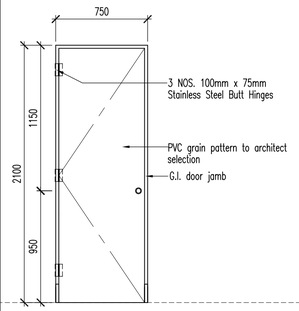


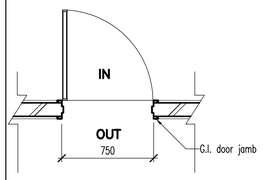
D2–GI. Frame Solid Timber Decorative Door



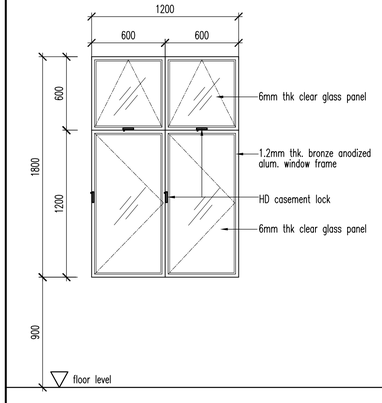


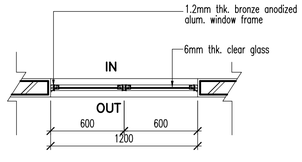
TD–PVC Door To Manuf's Detail



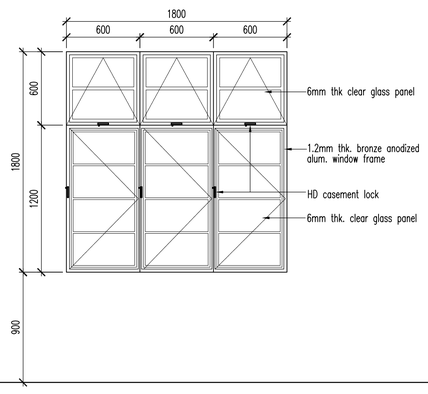


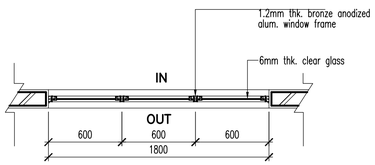
W1–Alumn. frame casement window with top hung above to detail



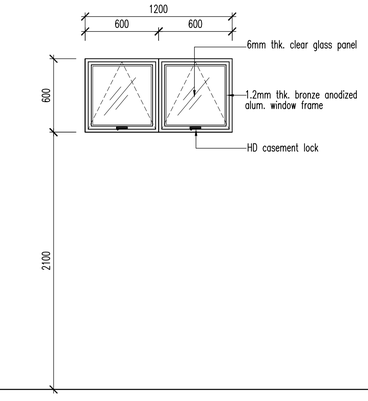


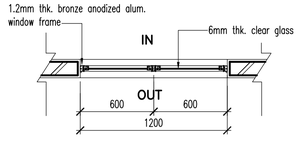
W2–Alumn. frame casement window with top hung above to detail





HW–Alumn. frame top hung high window





TENDER DRAWING
JUNE 2024

PROJEK

CADANGAN MEMBINA DAN MENYIAPKAN
1 UNIT BANGUNAN PEJABAT 1 TINGKAT
DI ATAS LOT PT 6054 (HSD 9326),
BANDAR SERI BANDI, MUKIM HULU CHUKAI,
DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

UNTUK TETUAN:
LADANG RAKYAT TERENGGANU SDN. BHD.

TAJUK LUKISAN
DOOR & WINDOW SCHEDULE

PEMILIK

LADANG RAKYAT TRENGGANU SDN. BHD.
KM1, JALAN CHERUL,
BANDAR CHENEH BAHARU,
24000 KEMAMAN,
TERENGGANU DARUL IMAN.

ARKITEK BERKUASA
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ARKITEK PROFESIONAL
No Pendaftaran LAM : A/W 121

KUMPULAN PERUNDING
(1988) SDN.BHD.166318-V

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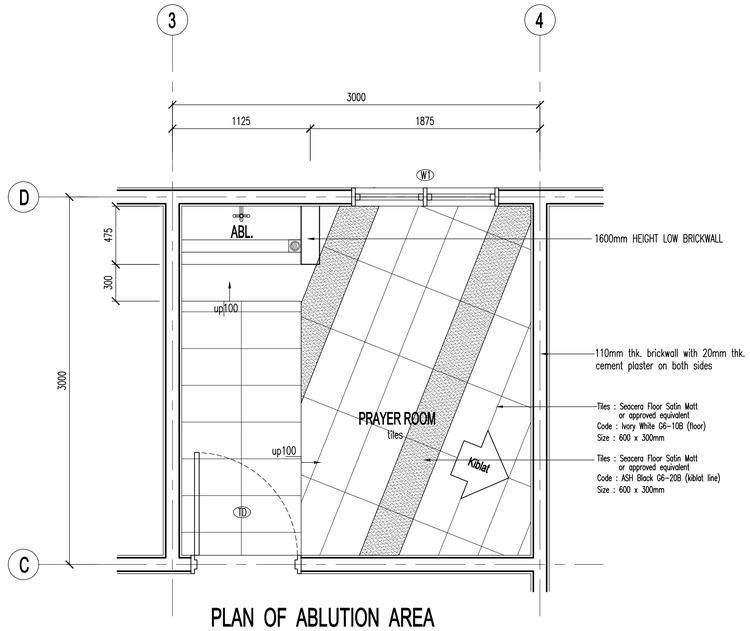
WEBSITE : www.kp88sb.com

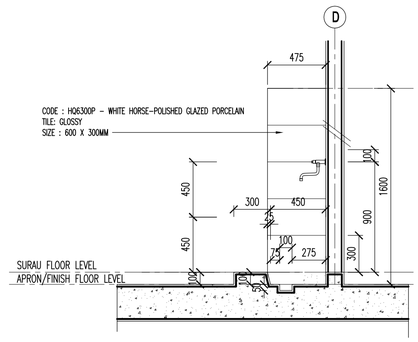
UKURAN : TERCATIT	TARIKH : JUNE 2024	RUJUK LUKISAN: K21011-DD-01	REV.
DILUKIS OLEH : MWR	DISEMAK OLEH : MRH		

TENDER DRAWING JUNE 2024

COMPUTER AIDED DESIGN & DRAFTING

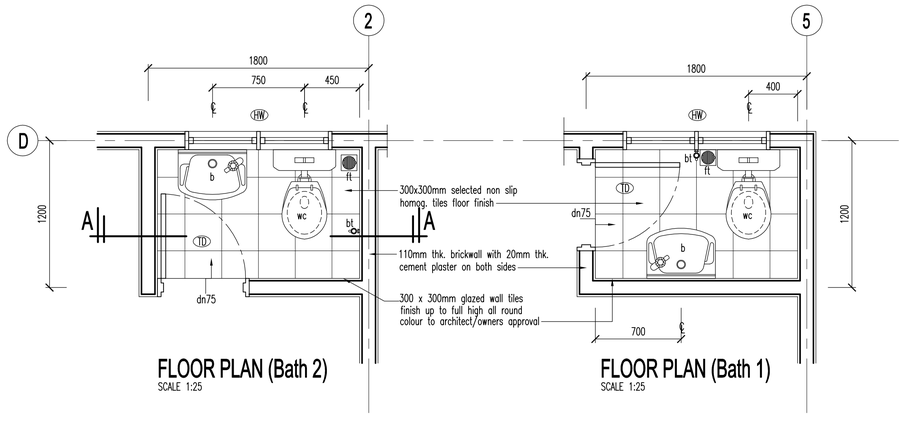


PLAN OF ABLUTION AREA
SCALE 1:25



SECTION OF ABLUTION AREA
SCALE 1:25

(DETAIL OF ABLUTION)



FLOOR PLAN (Bath 2)
SCALE 1:25

FLOOR PLAN (Bath 1)
SCALE 1:25

SANITARY FITTING LEGEND:

WC WATER CLOSET
Brand : ECONAX OR EQUIVALENT
Model : CLOSE COUPLED (C10S/T80P) close coupled wash down 6/3L WC set

B WASH HAND BASIN
Brand : ECONAX OR EQUIVALENT
Model : WALL HUNG (L400PP) Wall Hung Wash Basin Set 3 Semi-punched tapholes with overflow

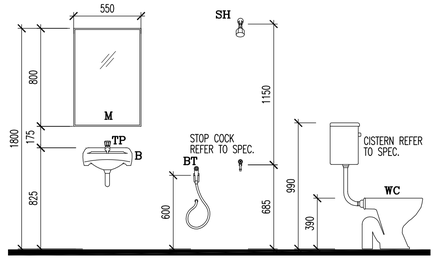
SH FIXED SHOWER HEAD
Brand : ECONAX OR EQUIVALENT
Model : EC901 Fixed shower head with 100mm arm and wall flange

TP PILLAR TAP
Brand : ECONAX OR EQUIVALENT
Model : Amori-N Series Faucets ½" Basin Pillar Tap

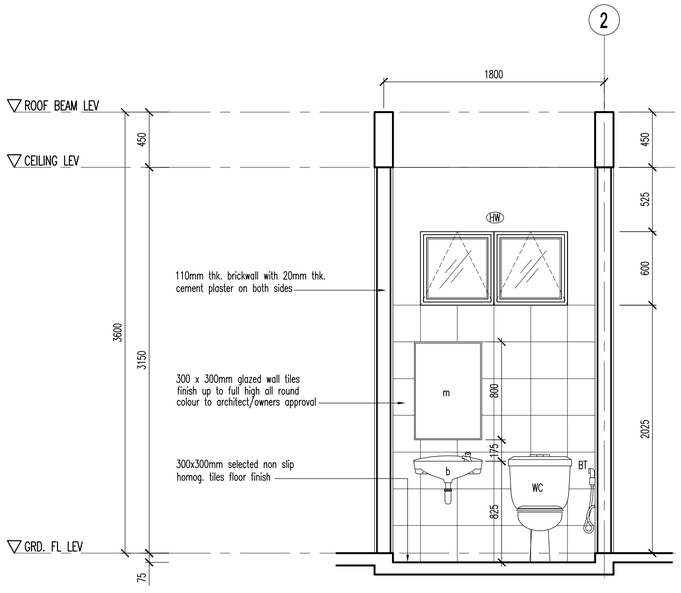
BT HAND BIDET
Brand : ECONAX OR EQUIVALENT
Model : Hand Bidet Set CW hand spray 1.2m Double interlock flexible hose wall-mounted bracket Abs Chrome plate

FT FLOOR TRAPS
Brand : ECONAX OR EQUIVALENT
Model : Stainless Steel Floor Trap (150x150mm)

M Mirror
High quality 550x800mm mirror with mat finished aluminium framing fixed to the wall



STD. HIGH OF SANITARY FITTING & FIXTURES
SCALE 1:25



SECTION A-A
SCALE 1:25

(DETAIL OF TOILET)

TENDER DRAWING
JUNE 2024

PROJEK

CADANGAN MEMBINA DAN MENYIAPKAN
1 UNIT BANGUNAN PEJABAT 1 TINGKAT
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UNTUK TETUAN:
LADANG RAKYAT TERENGGANU SDN. BHD.

TAJUK LUKISAN
DETAIL OF ABLUTION AND DETAIL OF TOILET

PEMILIK

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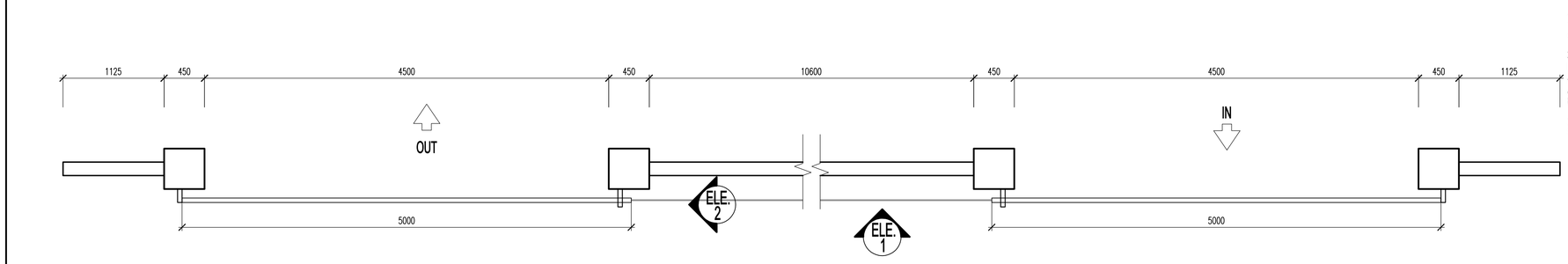
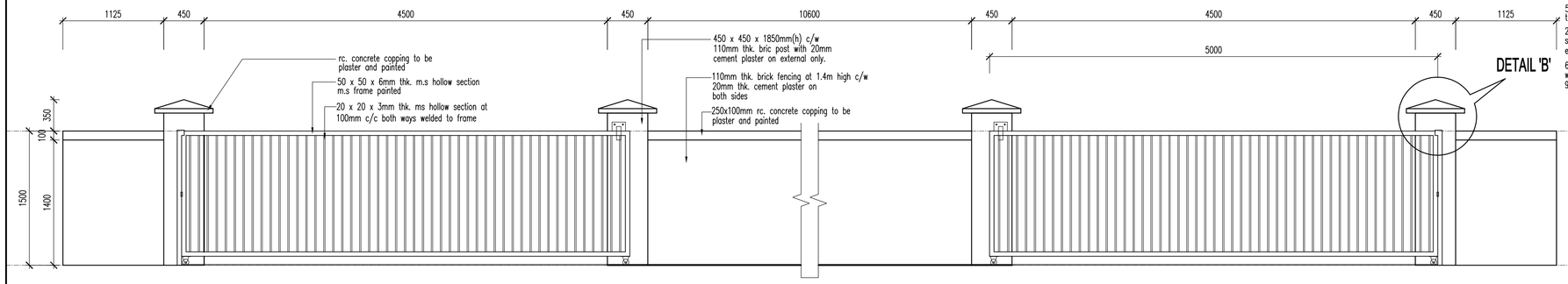
UKURAN : TERCATIT	TARIKH : JUNE 2024	RUJUK LUKISAN: K21011-DD-02	REV.
DILUKIS OLEH : MWR	DISEMAK OLEH : MRH		

TENDER DRAWING JUNE 2024

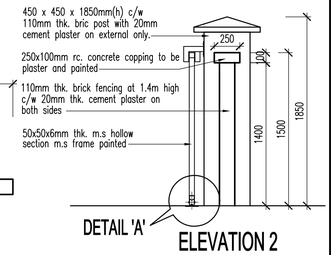
COMPUTER AIDED DESIGN & DRAFTING



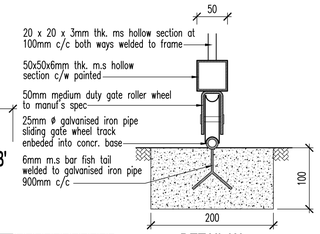
PLAN OF GATE
SCALE 1:30



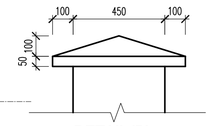
ELEVATION 1
SCALE 1:30



ELEVATION 2
SCALE 1:30

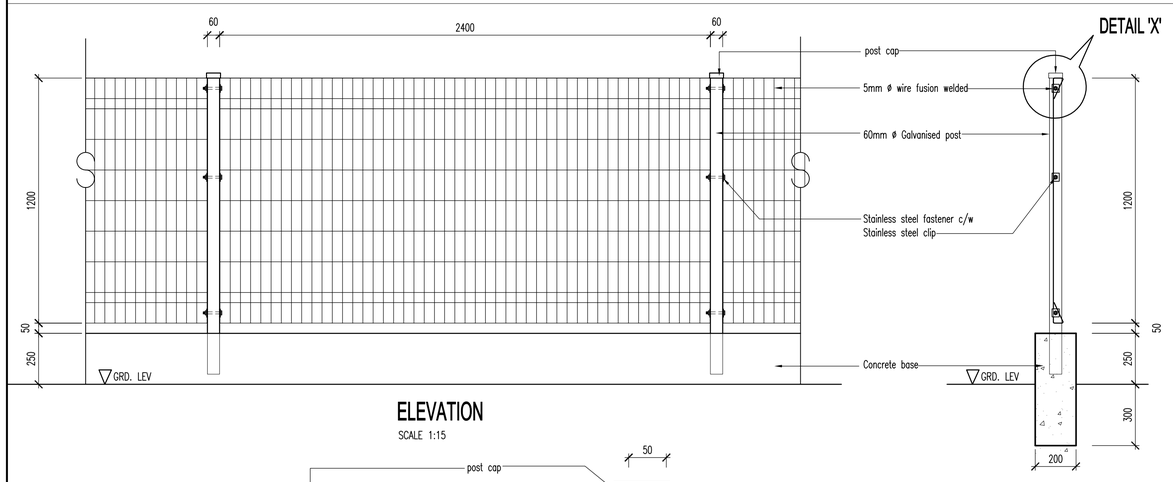


DETAIL 'A'
SCALE 1 : 5



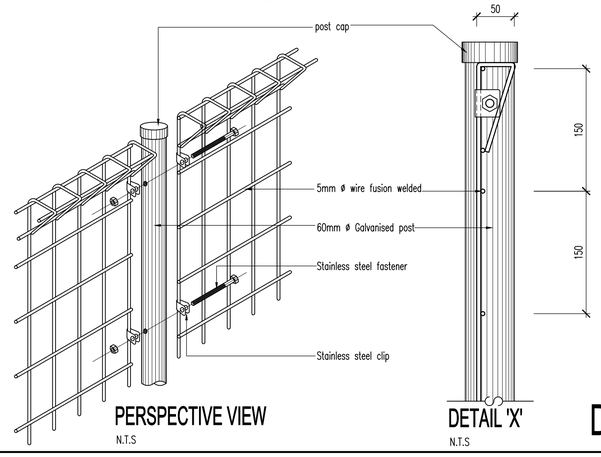
DETAIL 'B'
SCALE 1:15

DETAIL OF GATE



ELEVATION
SCALE 1:15

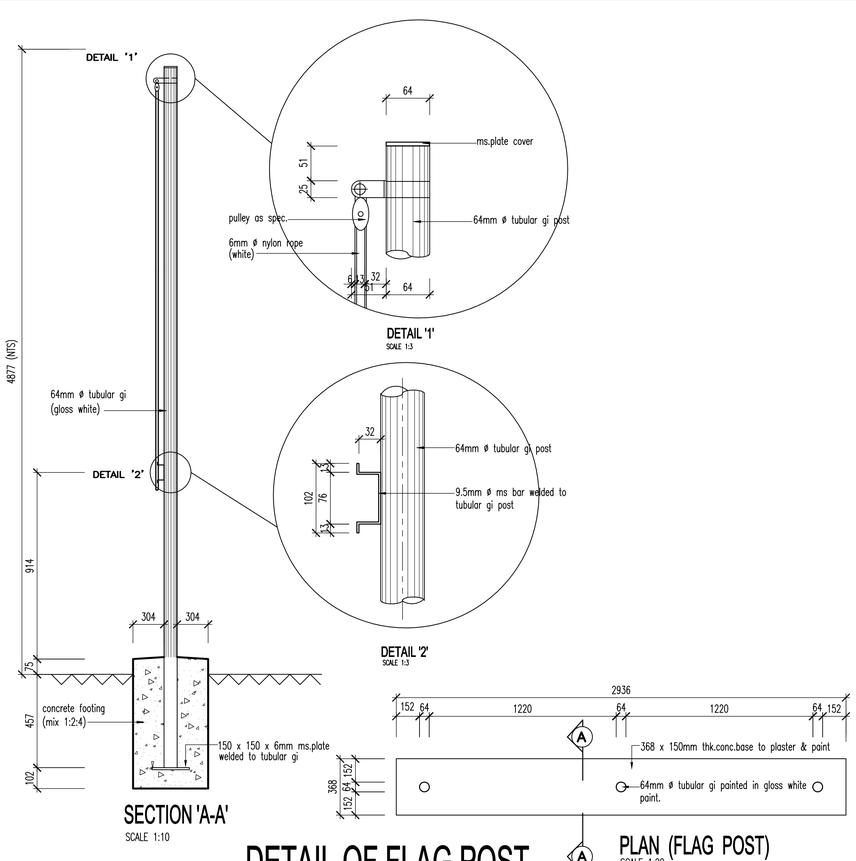
SECTION
SCALE 1:15



PERSPECTIVE VIEW
N.T.S

DETAIL 'X'
N.T.S

DETAIL OF FENCING



DETAIL '1'
SCALE 1:3

DETAIL '2'
SCALE 1:3

SECTION 'A-A'
SCALE 1:10

PLAN (FLAG POST)
SCALE 1:20

DETAIL OF FLAG POST

TENDER DRAWING
JUNE 2024

PROJEK

CADANGAN MEMBINA DAN MENYIAPKAN
1 UNIT BANGUNAN PEJABAT 1 TINGKAT
DI ATAS LOT PT 6054 (HSD 9326),
BANDAR SERI BANDI, MUKIM HULU CHUKAI,
DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

UNTUK TETUAN:
LADANG RAKYAT TRENGGANU SDN. BHD.

TAJUK LUKISAN
DETAIL OF FENCING, GATE & FLAG POST

PEMILIK

LADANG RAKYAT TRENGGANU SDN. BHD.
KM1, JALAN CHERUL,
BANDAR CHENEH BAHARU,
24000 KEMAMAN,
TERENGGANU DARUL IMAN.

ARKITEK BERKUASA
Saya memperakui bahawa details-details dalam pelan ini adalah menurut kehendak-kehendak Undang-Undang Kecil Bangunan Seragam 1984 Pihak Berkuasa Tempatan dan saya setuju terima tanggungjawab penuh dengan sewajarnya.

LEMBAGA ARKITEK MALAYSIA

Ar. WAN MUHAMMAD KAMAL BIN WAN ALI
ARKITEK PROFESIONAL
No Pendaftaran LAM : A/W 121

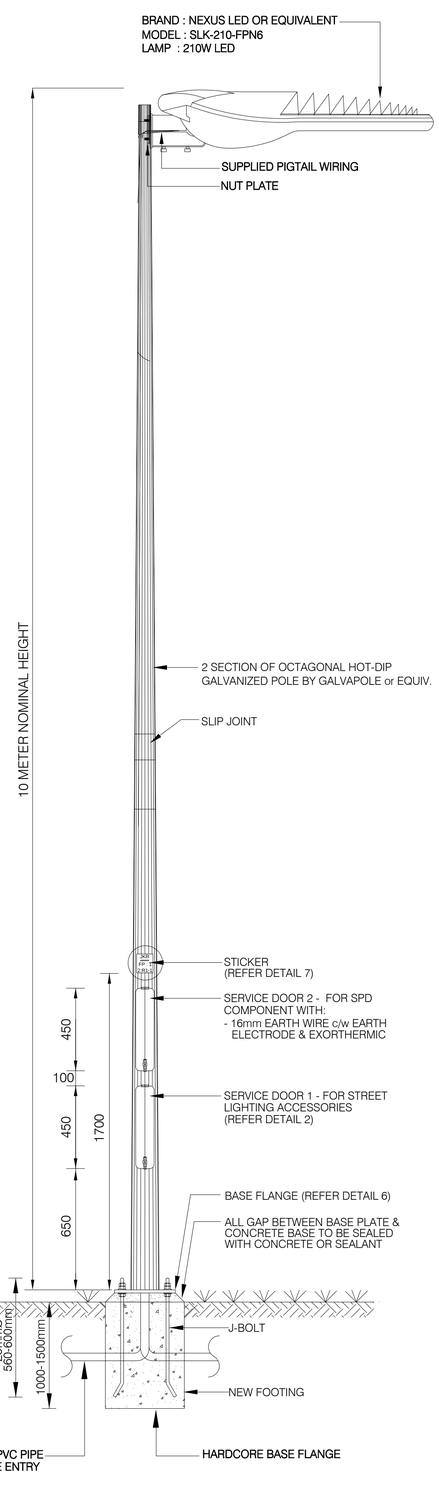
KUMPULAN PERUNDING
(1988) SDN.BHD.166318-V

44 TINGKAT 1, JALAN SULTAN ISMAIL,
20200, KUALA TERENGGANU, TERENGGANU DARUL IMAN.
TEL : (609) 6223582, 6223755.
FAX : (609) 6231412
EMAIL : kp4188sb@kp88sb.com
kp4188sb@yahoo.com
WEBSITE : www.kp88sb.com

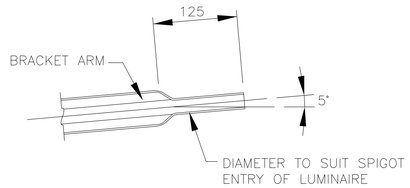
UKURAN : TERCATIT	TARIKH : JUNE 2024	RUJUK LUKISAN: K21011-DD-03	REV.
DILUKIS OLEH : MWR	DISEMAK OLEH : MRH		

TENDER DRAWING JUNE 2024

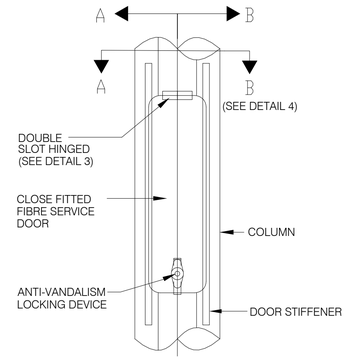
COMPUTER AIDED DESIGN & DRAFTING



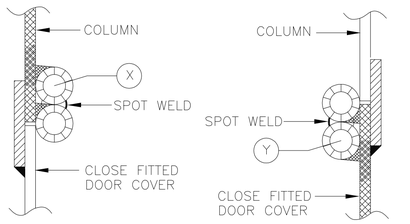
TYPICAL NEW SINGLE SHORT ARM STREET LIGHTING POLE WITH NEW LANTERN AND NEW FOOTING



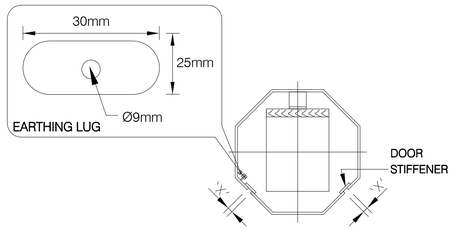
DETAIL 1 : SPIGOT END OF BRACKET ARM



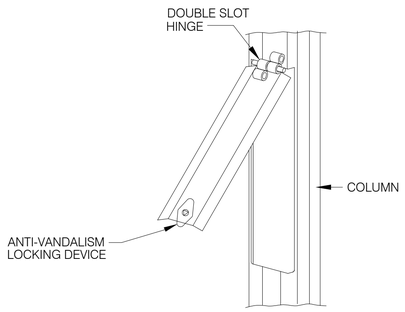
DETAIL 2 : DOUBLE SLOT HINGED FIBRE SERVICE DOOR



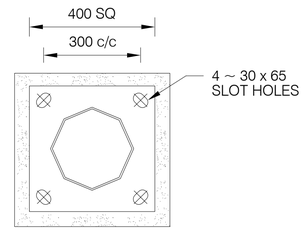
DETAIL 3 : DOUBLE SLOT HINGED RIVED TO COLUMN



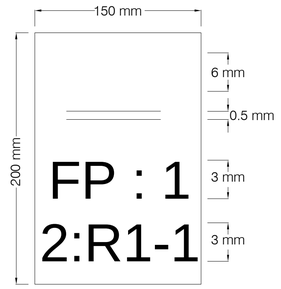
DETAIL 4 : BASE BOARD FOR TERMINAL PANEL



DETAIL 5 : HINGED DOOR ISOMETRIC VIEW



DETAIL 6 : BASE FLANGE



LEGEND :-

FP:1 ~ FEEDER PILLAR NUMBER

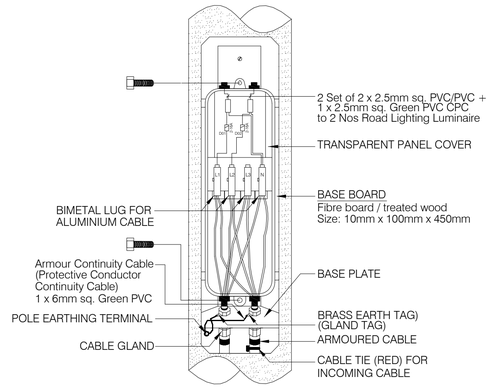
2 ~ CIRCUIT NUMBER

R1-1 ~ POLE NUMBER

PVC TYPE ~ HIGH PERFORMANCE PVC FILM WITH SPECIAL POLYMER.

COLOUR~ BACKGROUND-GOLDEN YELLOW (BS 381C). FONT- BLACK.

DETAIL 7 : STICKER FOR ROAD LIGHTING COLUMN



MODULAR TERMINATION BOX C/W LOOPING IN & OUT CABLE

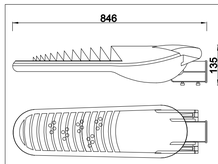
1. COLUMN DESIGN CONFORMS TO BS 5649
2. BASIC WIND SPEED - 35 m/s
3. STEEL COLUMN MATERIAL CONFORMS TO BS EN 10025 Fe 430 OR Fe 510 OTHER STEEL ACCESSORIES CONFORMS TO Fe 360
4. COLUMS SEAM WELDING CONFORMS TO BS 5135 BY AUTOMATIC CONTINOUS WELDING PROCESS
5. COLUMS ARE HOT DIPPED GALVANIZED TO BS 729 WITH MINIMUM AVERAGE COATING WEIGHT OF 460 gm/m FOR ANY INDIVIDUAL TEST AREA
6. ALL DIMENSIONS IN mm UNLESS INDICATED OTHERWISE
7. QUALITY CONTROL PROCEDURE : THE SUPPLIER/MANUFACTURER AND GALVANIZER OF THE COLUMN SHALL BE ISO 9001 ACCREDITED
8. MANDATORY TESTING AT MANUFACTURER'S FACTORY :- - TYPE TEST TO BS 5649 PART 8 - GALVANIZING TEST - MATERIAL TEST

ONE (1) SET OF ALL PRINCIPAL TEST RECORDS, TEST CERTIFICATES INCLUDING QUALITY CONTROL TEST RESULTS, SHALL BE SUPPLIED FOR ALL TEST, CARRIED OUT IN ACCORDANCE WITH THE SPECIFICATION, AND DULY WITNESS AND ENDORSED BY THE RELEVANT AUTHORITY / CONSULTANT.

TECHNICAL INFORMATION FOR ROAD LIGHTING COLUMN

NOTE:

LIGHTING CLOUMN SHALL BE INSTALLED AT MINIMUM 600mm AWAY FROM PAVED SHOULDER / GUARDRAIL AS RECOMENDED IN NTJ 29/2015.



Basic Specifications		
AC Input	:	100~240Vac, 50~60Hz
System Power	:	210W ± 5%
LED Driving Current	:	2,800 mA (100mA per LED)
Number of LEDs	:	336 pcs (3030 Package LED)
Luminous Flux (Hot Lumens)	:	26,330 lm
Luminous Efficacy	:	>128 lm/W
Light Color	:	WARM White (CCT : 5250~6000K)
Color Rendering Index (CRI)	:	>70
Beam Angle	:	45° x 155°
Operating Temperature	:	-30°C ~ +50°C
Storage Temperature	:	-30°C ~ +90°C
Lifetime (typical)	:	50,000 hrs at Ta 25°C
Heatsink Material	:	Aluminium Casting
Luminaire Cover Material	:	Tempered Glass
LED Lumens Maintenane Class		LM80
Casing Color	:	Grey
Size (L) x (W) x (H)	:	846mm x 368mm x 135mm
Weight	:	12.0kg
IP Rating	:	IP66
Electrical Safety	:	Class I
Compliance	:	CE, IEC, SIRIM

TECHNICAL SPECIFICATION FOR STREET LIGHTING LANTERN

TENDER DRAWING
JUNE 2024

PROJEK

CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326), BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

UNTUK TETUAN:
LADANG RAKYAT TERENGGANU SDN. BHD.

TAJUK LUKISAN
DETAIL OF STREET LIGHTING

PEMILIK

LADANG RAKYAT TRENGGANU SDN. BHD.
KM1, JALAN CHERUL,
BANDAR CHENEH BAHARU,
24000 KEMAMAN,
TERENGGANU DARUL IMAN.

ARKITEK BERKUASA
Saya memperakui bahawa detail-detail dalam pelan ini adalah menurut kehendak-kehendak Undang-Undang Kecil Bangunan Seragam 1984 Pihak Berkuasa Tempatan dan saya setuju terima tanggungjawab penuh dengan sewajarnya.

LEMBAGA ARKITEK MALAYSIA

Ar. WAN MUHAMMAD KAMAL BIN WAN ALI
ARKITEK PROFESIONAL
No Pendaftaran LAM : A/W 121

KUMPULAN PERUNDING (1988) SDN.BHD. 166318-V
44 TINGKAT 1, JALAN SULTAN ISMAIL,
20200, KUALA TERENGGANU, TERENGGANU DARUL IMAN.
TEL : (609) 6223582, 6223755.
FAX : (609) 6231412
EMAIL : kpk65bd@kp65bb.com
kpk65bd@yahoo.com
WEBSITE : www.kp65bb.com

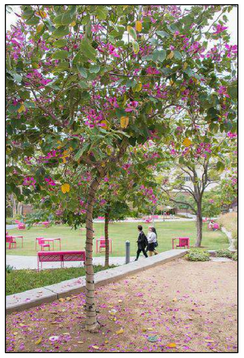
UKURAN : TERCATIT	TARIKH : JUNE 2024	RUJUK LUKISAN: K21011-DD-04	REV.
DILUKIS OLEH : MWR	DISEMAK OLEH : MRH		

TENDER DRAWING JUNE 2024

COMPUTER AIDED DESIGN & DRAFTING

JENIS TANAMAN POKOK

VEITCHIA MERRILLII
(MANILA PALM)

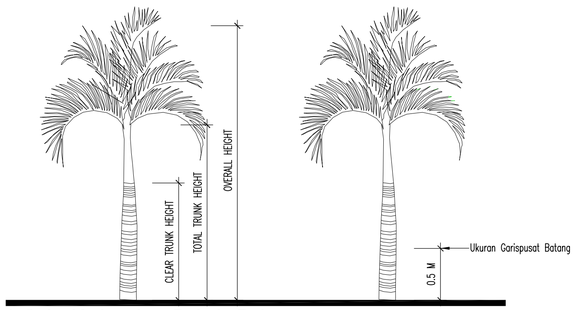


TAPAK KUDA

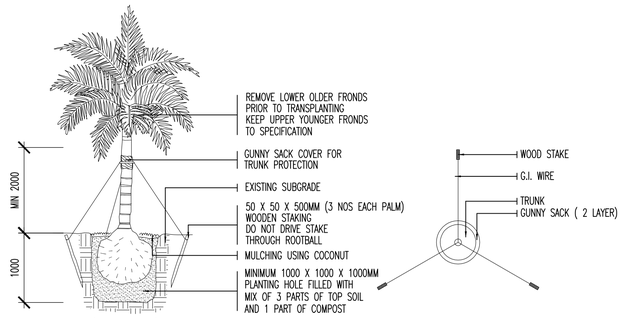
PETUNJUK

PLANTING SCHEDULE

BIL.	SIMBOL (SYMBOL)	SPESIS POKOK		KETINGGIAN POKOK (OVERALL HEIGHT)	KETINGGIAN BATANG (CLEAR TRUNK HEIGHT)	GARISPUSAT BATANG (TRUNK DIAMETER)	JARAK PENANAMAN POKOK	JUMLAH POKOK
		NAMA BOTANI (BOTANICAL NAME)	NAMA TEMPATAN (COMMON NAME)					
1.		VEITCHIA MERRILLII	MANILA PALM	2.5 M	–	–	5M–6M	2
2.		BAUHINIA BLAKEANA	TAPAK KUDA	2.5 M	2.5 M	75 MM	5M–6M	4
3.		AXONOPUS COMPRESSUS	COW GRASS	–	–	–	–	CLOSE TURFING (EXTERNAL & INTERNAL)

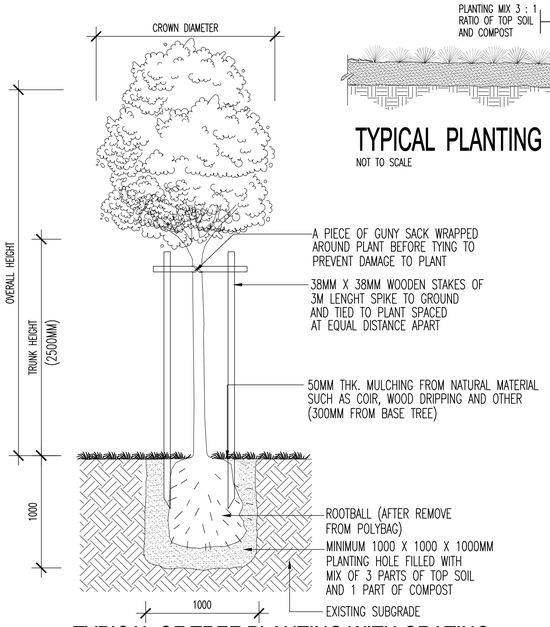


Kategori Saiz Ketinggian Pokok Palma Pengukuran Garispusat Batang

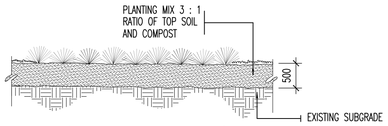


TYPICAL OF PALM PLANTING AND STAKING DETAIL
NOT TO SCALE

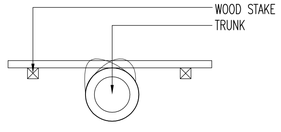
PLAN OF PALM PLANTING AND STAKING DETAIL
NOT TO SCALE



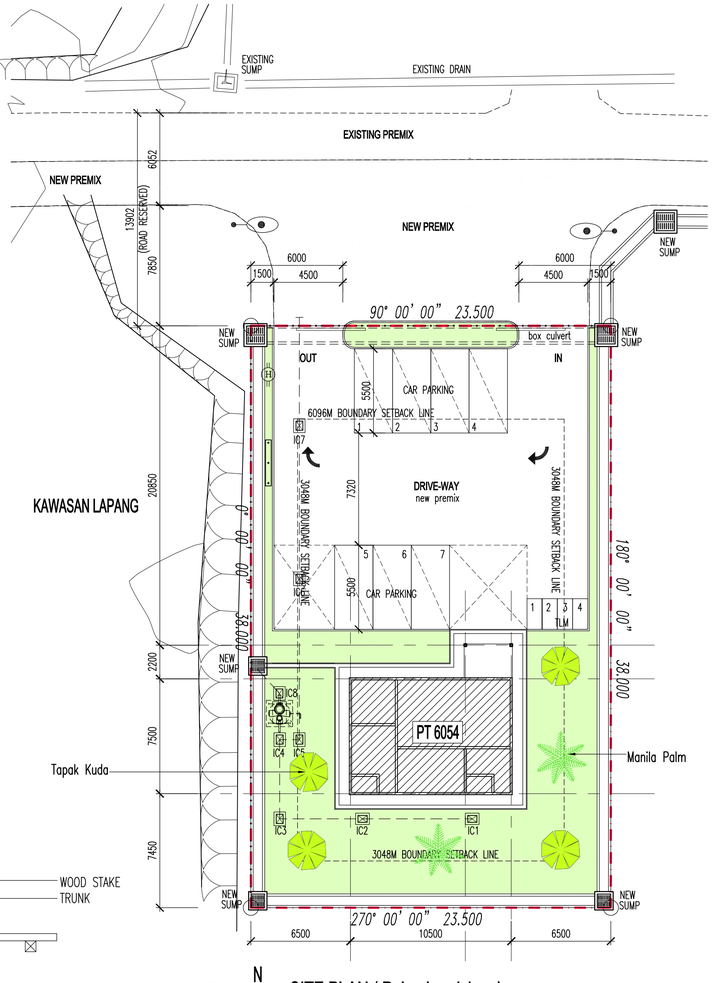
TYPICAL OF TREE PLANTING WITH GRATING AND STAKING DETAIL
SCALE : N.T.S.



TYPICAL PLANTING OF TURFING
NOT TO SCALE

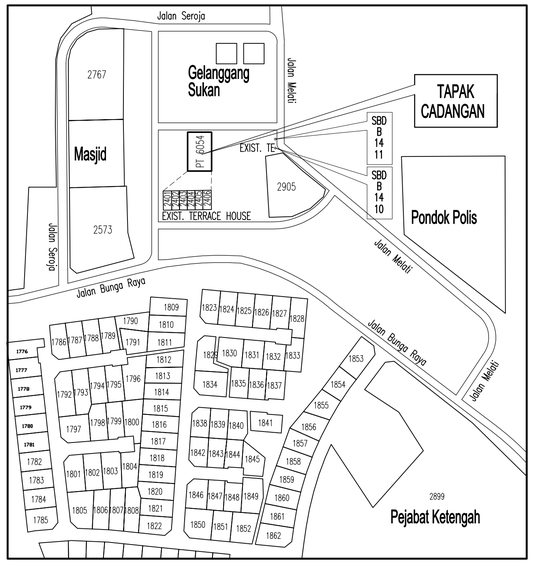


PLAN OF TREE PLANTING AND STAKING DETAIL
NOT TO SCALE



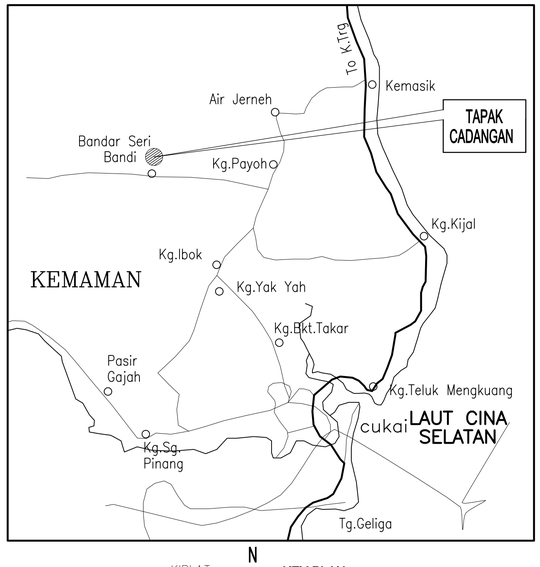
KIBLAT N

SITE PLAN (Pelan Landskap)
SCALE : 1 : 200
LOT: PT 6054
MUKIM HULU CUKAI
DAERAH KEMAMAN
Syit.No. 150–C



KIBLAT N

LOCATION PLAN
SCALE : 1 : 3000
LOT: PT 6054
MUKIM HULU CUKAI
DAERAH KEMAMAN
Syit.No. 150–C



KIBLAT N

KEY PLAN
SCALE : NTS

KELUASAN TAPAK BANGUNAN PEJABAT: 893 M²

PLATFORM LEVEL = PL: 25.80
FINISH LEVEL = FL: 26.00

LEGEND :
(H) PILLAR TYPE FIRE HYDRANT TO ENGR'S DETAIL

LEGEND:
= LAMPU AWAM (LA)

NOTE:
ROAD, DRAINAGE ,WATER RETICULATION & LAMPU AWAM REFER TO ENGR'S DRAWING

TENDER DRAWING
JUNE 2024

PROJEK

CADANGAN MEMBINA DAN MENYIAPKAN
1 UNIT BANGUNAN PEJABAT 1 TINGKAT
DI ATAS LOT PT 6054 (HSD 9326),
BANDAR SERI BANDI, MUKIM HULU CHUKAI,
DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

UNTUK TETUAN:
LADANG RAKYAT TRENGGANU SDN. BHD.

TAJUK LUKISAN

LANDSCAPE PLAN
- key plan, location plan, site plan

PEMILIK

LADANG RAKYAT TRENGGANU SDN. BHD.
KM1, JALAN CHERUL,
BANDAR CHENEH BAHARU,
24000 KEMAMAN,
TERENGGANU DARUL IMAN.

ARKITEK LANDSKAP

Hazmar Land'Art Sdn Bhd
No. 477, Jln F-14, Taman Melawati,
Hulu Klang, 53100 Kuala Lumpur
Tel : 03-41019945 ; 0122760164
E-mail : hazmarlandart@gmail.com

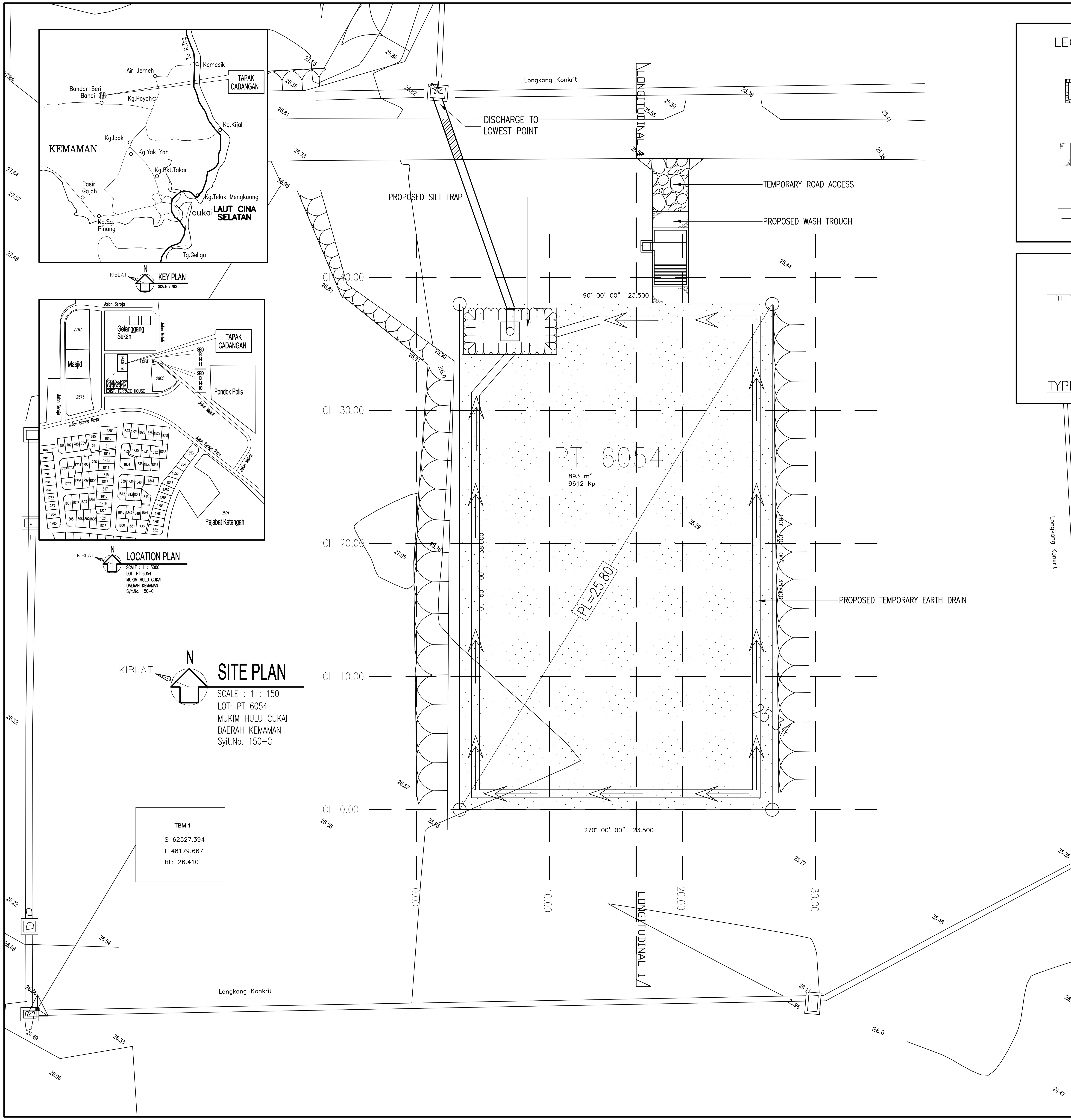
Ar. Syahrul Malik S.
Arkitek Landskap
INSTITUTE OF LANDSCAPE ARCHITECT MALAYSIA
(INSTITUT ARKITEK LANDSKAP MALAYSIA)
AILA No. : 8100013

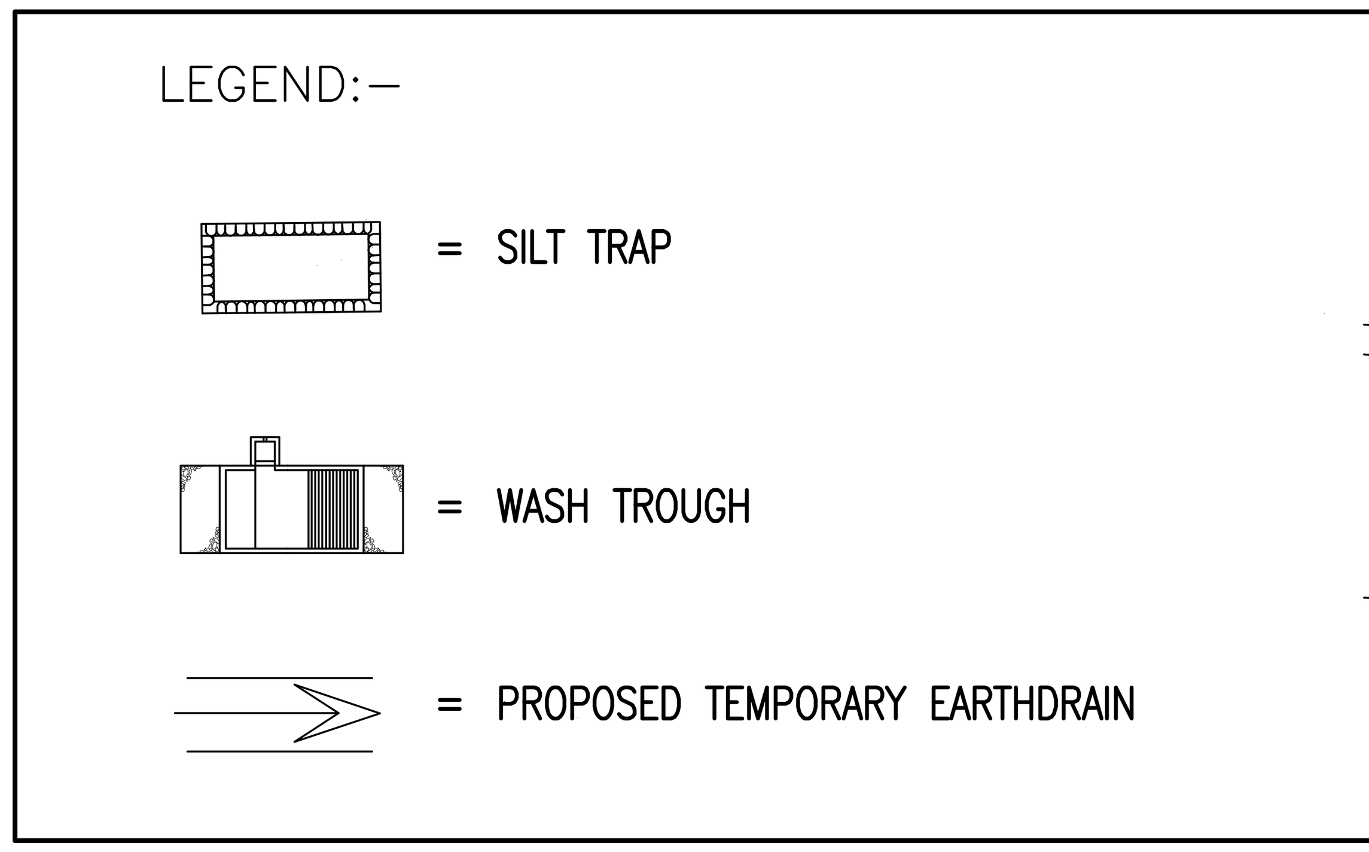
Saya memperakui details-details dalam pelan-pelan ini adalah menurut kehendak-kehendak Garispanduan Kelulusan Pelan Landskap dan Akta Perancang Bandar dan Desa 1976(Akta 172 Pindaan 1995) dan saya setuju terima tanggungjawab dengan sewajarnya.

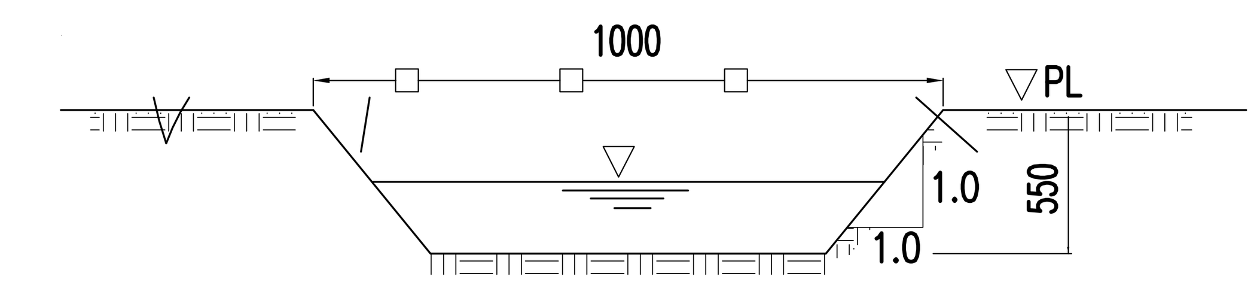
UKURAN : TERCATIT	TARIKH : OKTOBER 2022	RUJUK LUKISAN: K21011-LND-01	REV.
DILUKIS OLEH : MWR	DISEMAK OLEH : MRH		

PELAN LANDSKAP OKTOBER 2022

COMPUTER AIDED DESIGN & DRAFTING







TYPICAL SECTION OF TEMPORARY EARTHDRAIN

3151

EARTHWORK NOTES:-

1. UNSUITABLE MATERIAL SHALL BE EXCAVATED TO APPROXIMATE 1500mm AND OVER SUCH AREA AS DIRECTED BY S.O. AND BE TRANSPORTED AND DISPOSED OF IN AN APPROVED MANNER.

2. ALL MATERIALS USED IN FILLING SHALL BE COMPACTED AS SOON AS PRACTICABLE AFTER BEING PLACED AND SPREAD. COMPACTION SHALL BE UNDERTAKEN TO THE REQUIREMENT APPROVED BY S.O. ALL COMPACTION REQUIREMENT SHALL BE CONTROLLED BY MEANS OF FIELD DENSITY MEASUREMNET.

3. FILLING SHALL BE DONE IN LAYERS NOT MORE THAN 300mm IN DEPTH (COMPACTED MEASUREMENT) AND SHALL BE COMPACTED TO A DENSITY COMPARABLE WITH THE ADJACENT UNDISTURBED MATERIALS.

4. TOP SOIL SHALL BE REMOVE TO APPROXIMATE 150mm AND OVER SUCH AREA AS DIRECTED BY S.O. AND BE TRANSPORTED AND DISPOSED OF IN AN APPROVED MANNER.

5. ALL EXISTING BUILDING SHALL BE DEMOLISH

NOTA :

1. Asas Koordinate Cassini GDM 2000 (PA 244576)
2. Semua aras laras berpandukan daripada BM T 5690 Jabatan Ukur dan Pemetaan

CUT VOLUME	340.0 m3
FILL VOLUME	10.92 m3

TAJUK PROJEK : Project Title :

PERMOHONAN PELAN KERJA TANAH BAGI CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326), MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN

PEMILIK TANAH / BANGUNAN : Land / Building Owner :

LADANG RAKYAT TRENGGANU SDN. BHD.
KM 1, JALAN CERUL,
BANDAR CENEH BAHARU,
24000 KEMAMAN,
TERENGGANU DARUL IMAN.

Arkitek : Architect :

KUMPULAN PERUNDING (1988) SDN.BHD. 166318-V
44 TINGKAT 1, JALAN SULTAN ISMAIL,
20200, KUALA TERENGGANU, TERENGGANU DARUL IMAN.
TEL : (609) 6223582, 6223755.
FAX : (609) 6231412
EMAIL : kpkt88sb@yahoo.com
WEB SITE : www.kp88sb.com

RUJ	TARIKH	PINDAAN

JURUTERA AWAM & STRUKTUR : civil & structural engineer :

SWAZMIX CONSULTANT.
Lot 1886K, Tingkat Atas, Taman KP Perdana,
Kubang Parit, 20050,
Kuala Terengganu,
Terengganu Darul Iman.
Tel/Fax: +609-620 5027
Email: swazmixconsultant@yahoo.com

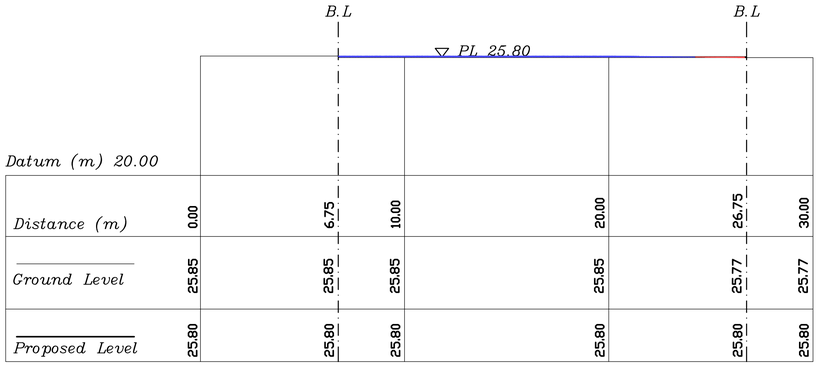
" I hereby certify that these works have been designed by me in accordance with sound engineering practice and that I take full responsibility for the design and proper performance of the same"

TAJUK LUKISAN : Drawing Title:

EARTHWORK

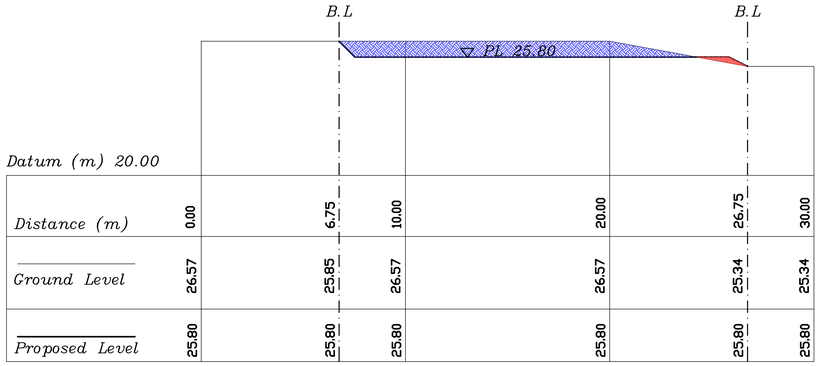
- EARTHWORK LAYOUT

Drawing No :	Swazmix/P21-07/C/EW 01		
Drawn By	Zainuddin Amir	Designed	Zainuddin Amir
Checked	Ir. Nik Mat	Date	Nov 2021
Approved	Ir. Saffuan	Scale	1:150
REVISION	0 1 2 3 4 5 6 7 8 9 10		



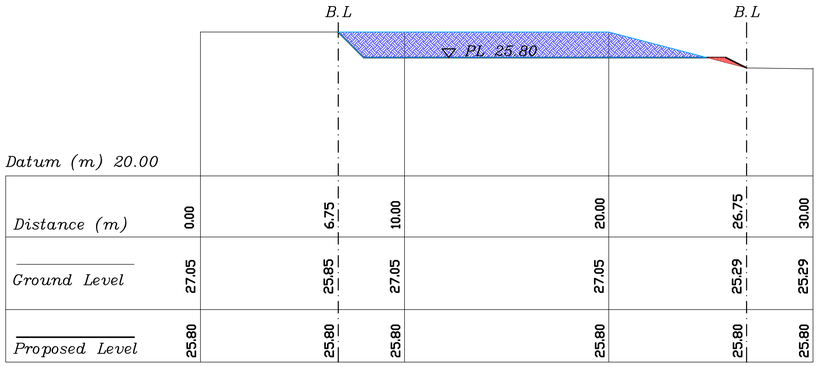
CH–0.00

CUT : 0.70M2
FILL: 0.03M2



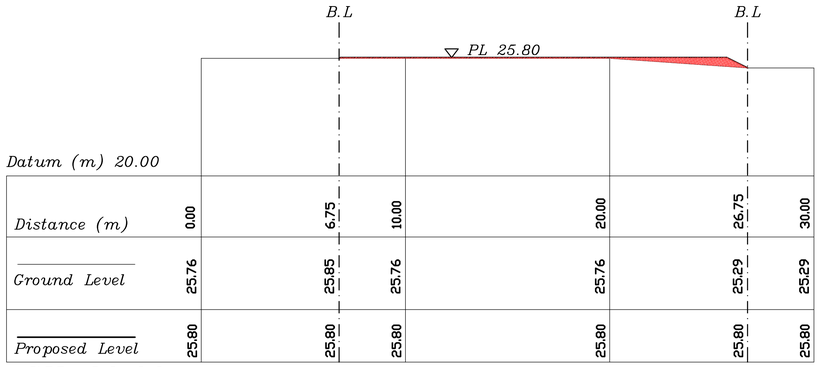
CH–10.00

CUT : 11.60M2
FILL: 0.40M2



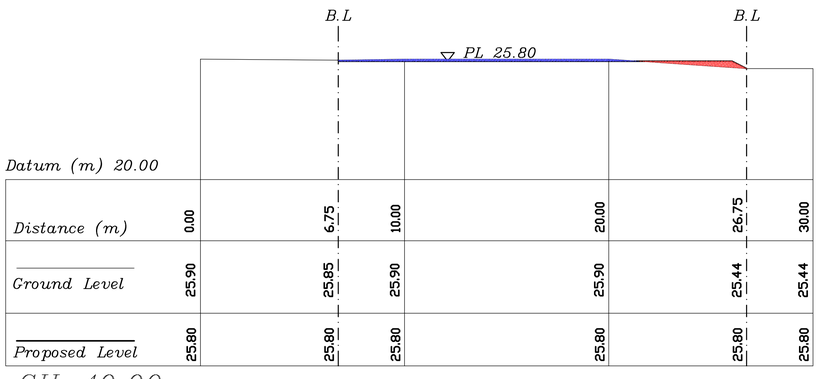
CH–20.00

CUT : 18.80M2
FILL: 0.03M2



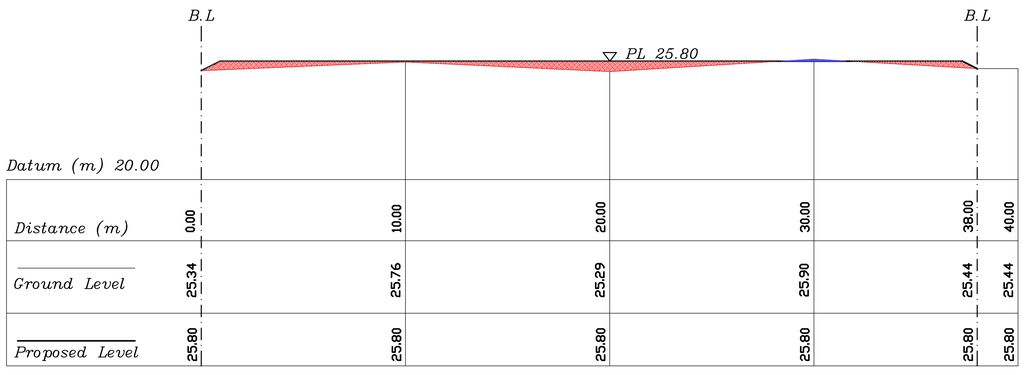
CH–30.00

CUT : 2.20M2
FILL: –M2



CH–40.00

CUT : 1.40M2
FILL: 0.90M2



LONGITUDINAL 1

CUT : 0.20M2
FILL: 8.20M2

LEGEND :

CUT

FILL

BL BOUNDARY LINE

TAJUK PROJEK : Project Title :

PERMOHONAN PELAN KERJA TANAH BAGI CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326), MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN

PEMILIK TANAH / BANGUNAN : Land / Building Owner :

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KM 1, JALAN CERUL,
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24000 KEMAMAN,
TERENGGANU DARUL IMAN.

Arkitek : Architect :

KUMPULAN PERUNDING
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44 TINGKAT 1, JALAN SULTAN ISMAIL,
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TEL : (609) 6223582, 6223755.
FAX : (609) 6231412
EMAIL : kpkt88sb@yahoo.com
WEB SITE : www.kp88sb.com

RUJ	TARIKH	PINDAAN

JURUTERA AWAM & STRUKTUR : civil & structural engineer :

SWAZMIX CONSULTANT.
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Email: swazmixconsultant@yahoo.com

* I hereby certify that these works have been designed by me in accordance with sound engineering practice and that I take full responsibility for the design and proper performance of the same*

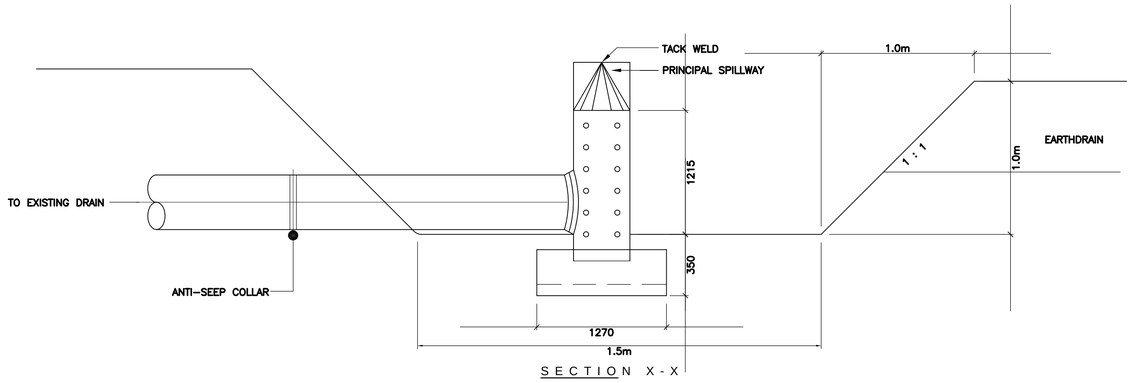
TAJUK LUKISAN : Drawing Title:

FARTHWORK

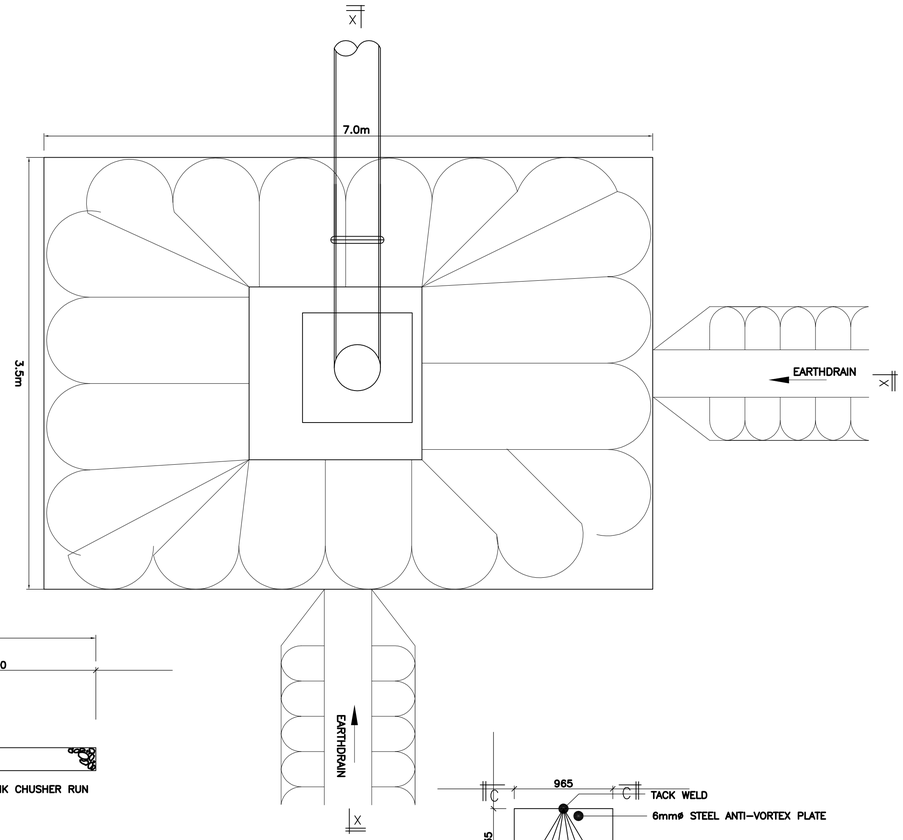
– CUT SECTION DETAILS

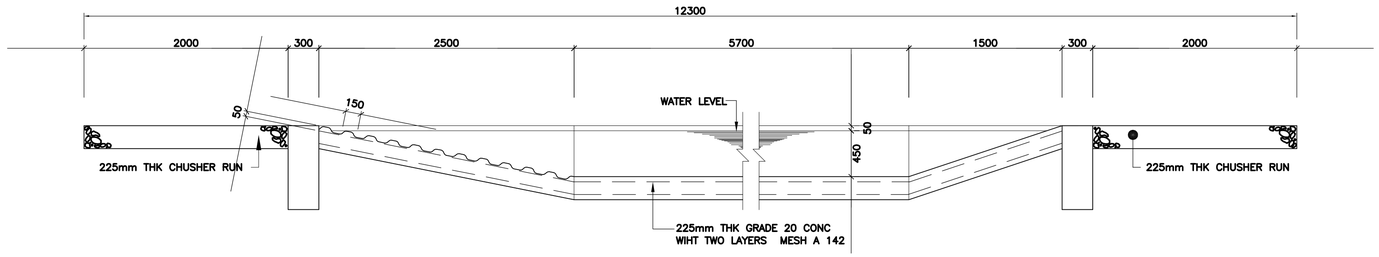
Drawing No :	Swazmix/P21-07/C/EW 02		
Drawn By	**Zainuddin Amir**	Designed	**Zainuddin Amir**
Checked	**Ir. Nik Mat**	Date	**Nov 2021**
Approved	**Ir. Saffuan**	Scale	**1:150**

REVISION 0 1 2 3 4 5 6 7 8 9 10

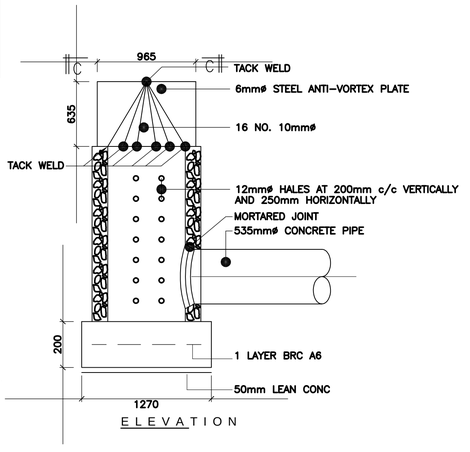


SECTION X-X

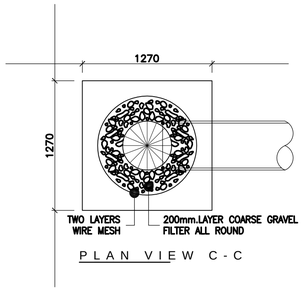




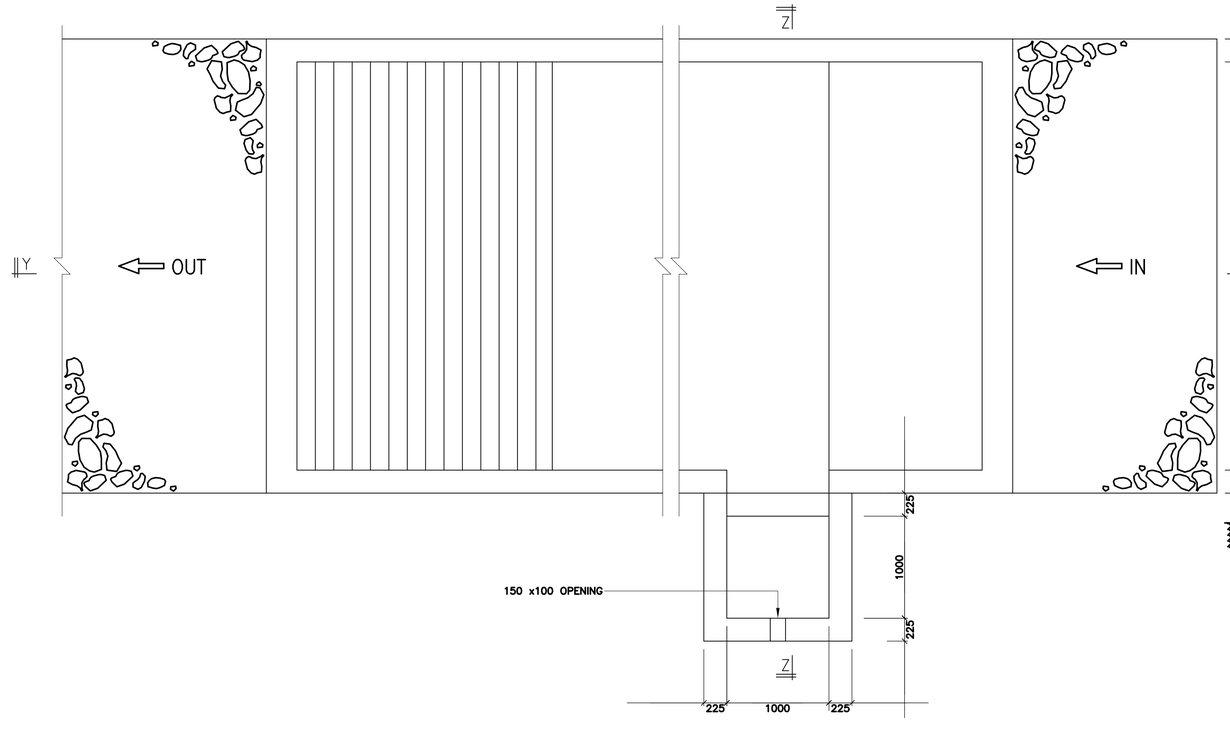
SECTION Y-Y



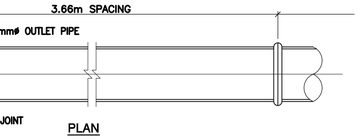
ELEVATION



PLAN VIEW C-C

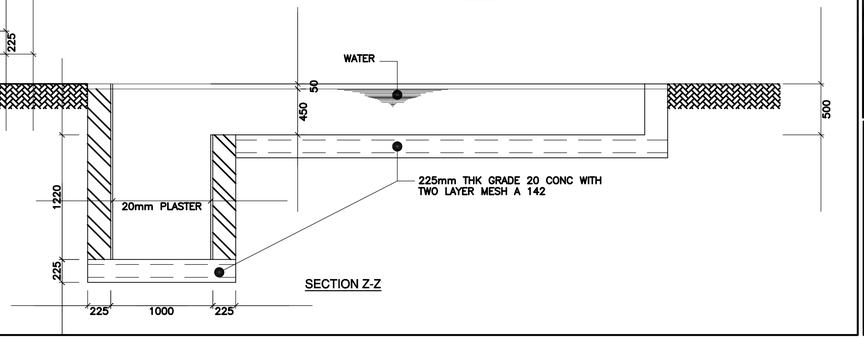


PLAN OF WASH TROUGH



PLAN

PLAN OF SILT TRAP



SECTION Z-Z

TAJUK PROJEK : Project Title :

PERMOHONAN PELAN KERJA TANAH BAGI CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326), MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN

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Arkitek : Architect :

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FAX : (609) 6231412
EMAIL : kpkl88sb@yahoo.com
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RUJ	TARIKH	PINDAAN

JURUTERA AWAM & STRUKTUR : civil & structural engineer :

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Terengganu Darul Iman.
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Email: swazmixconsultant@yahoo.com

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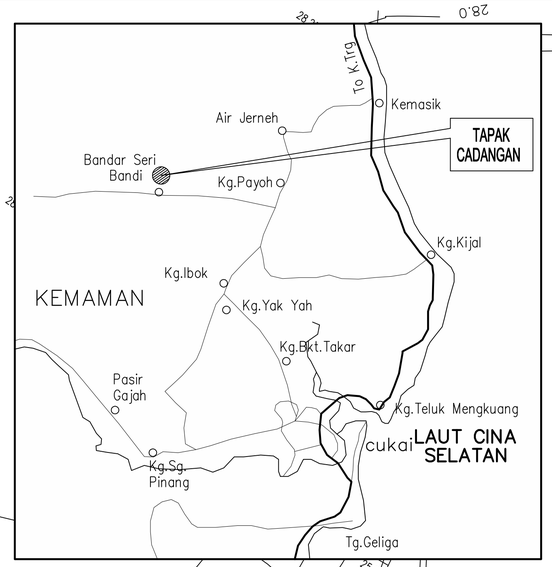
TAJUK LUKISAN : Drawing Title:

FARTHWORK

- TEMPORARY WASH TROUGH
- SILT TRAP DETAIL

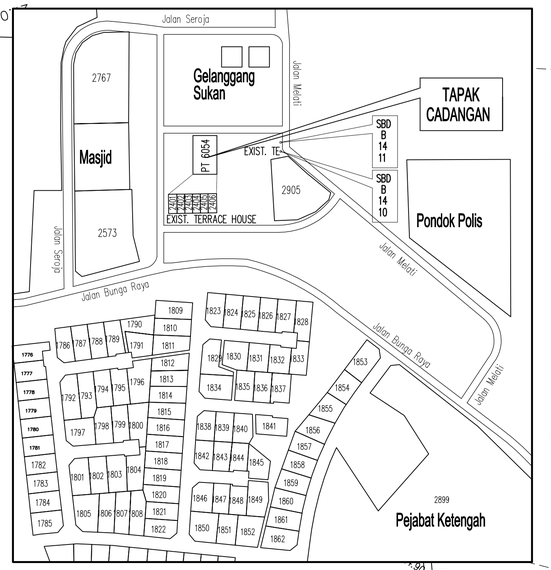
Drawing No :	SWAZMIX/P21-07/C/EW 03		
Drawn By	Zainuddin Amir	Designed	Zainuddin Amir
Checked	Ir. Nik Mat	Date	Nov 2021
Approved	Ir. Saffuan	Scale	1:30
REVISION	0 1 2 3 4 5 6 7 8 9 10		



KIBLAT N

KEY PLAN

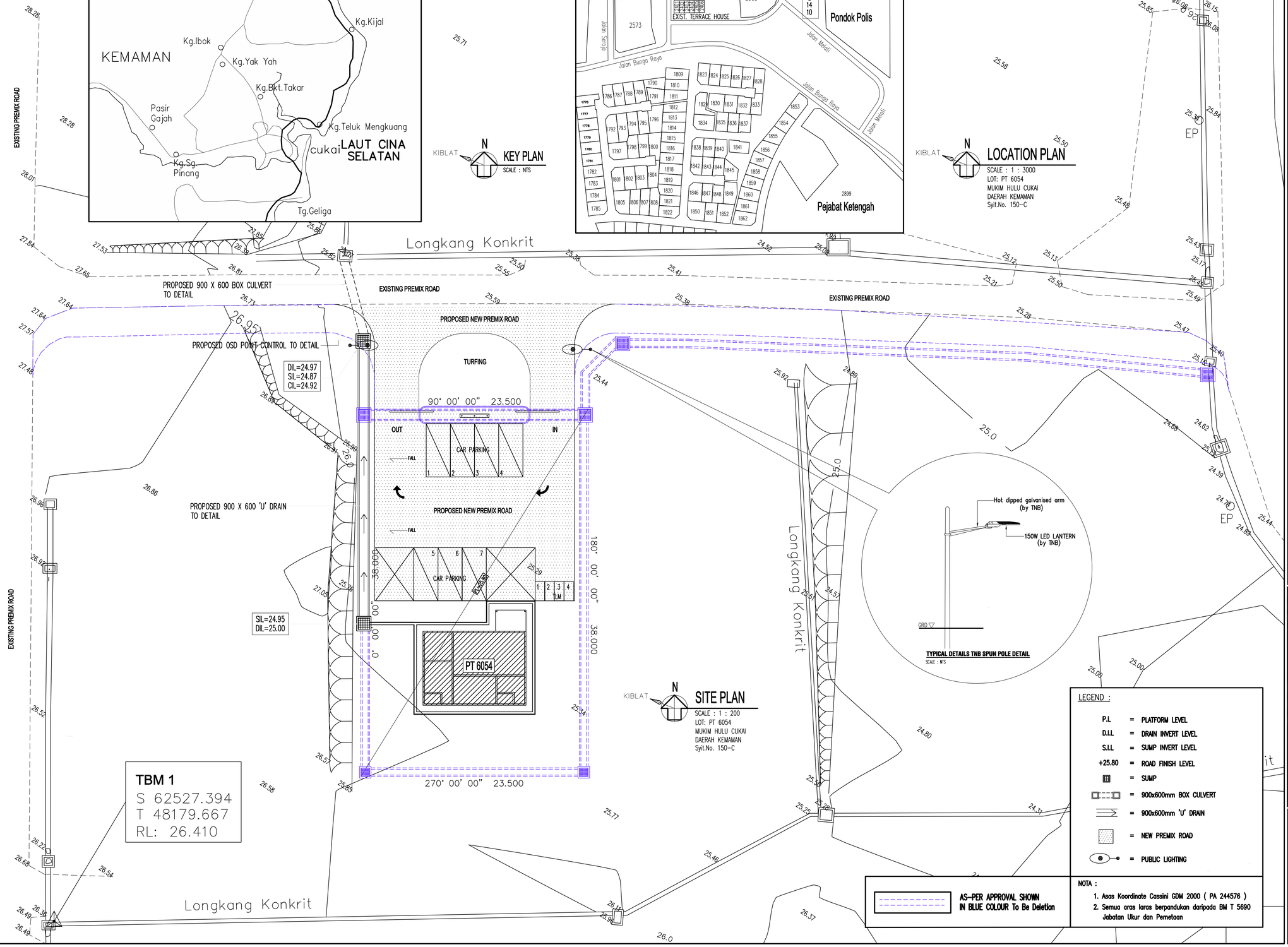
SCALE : NTS



KIBLAT N

LOCATION PLAN

SCALE : 1 : 3000
LOT: PT 6054
MUKIM HULU CUKAI
DAERAH KEMAMAN
Syit.No. 150-C



KIBLAT N

SITE PLAN

SCALE : 1 : 200
LOT: PT 6054
MUKIM HULU CUKAI
DAERAH KEMAMAN
Syit.No. 150-C

LEGEND :

P.L	=	PLATFORM LEVEL
D.I.L	=	DRAIN INVERT LEVEL
S.I.L	=	SUMP INVERT LEVEL
+25.80	=	ROAD FINISH LEVEL
	=	SUMP
	=	900x600mm BOX CULVERT
	=	900x600mm 'U' DRAIN
	=	NEW PREMIX ROAD
	=	PUBLIC LIGHTING

AS-PER APPROVAL SHOWN IN BLUE COLOUR To Be Deletion

NOTA :

1. Asas Koordinate Cassini GDM 2000 (PA 244576)
2. Semua aras laras berpandukan daripada BM T 5690 Jabatan Ukur dan Pemetaan

TAJUK PROJEK : Project Title :

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RUJ	TARIKH	PINDAAN
1	20/04/2022	PERUBAHAN ALIRAN LONGKANG DAN JALAN
2	16/10/2023	PEMADAMAN LONGKANG DAN JALAN

JURUTERA AWAM & STRUKTUR : civil & structural engineer :

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Email: swazmixconsultant@yahoo.com

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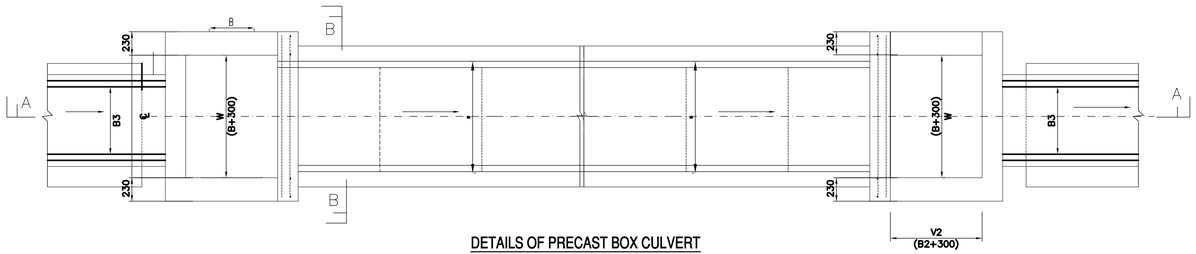
TAJUK LUKISAN : Drawing Title:

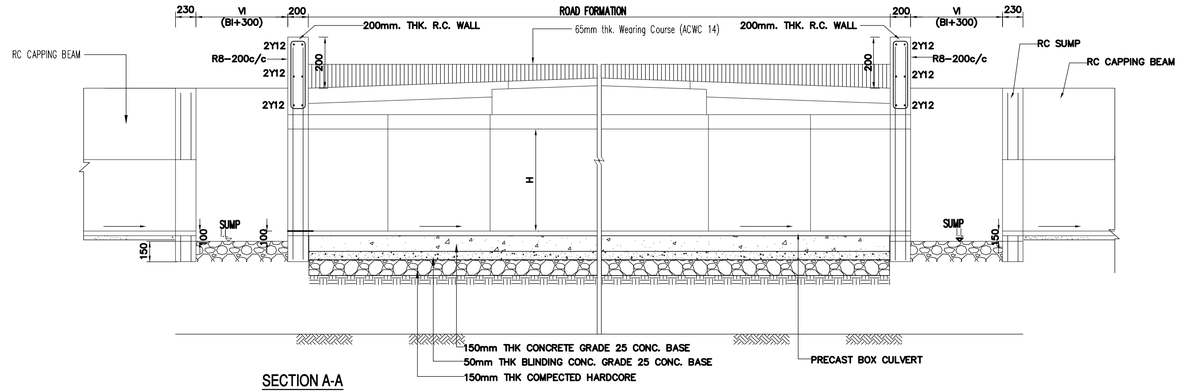
ROAD & DRAINAGE

- ROAD AND DRAINAGE LAYOUT

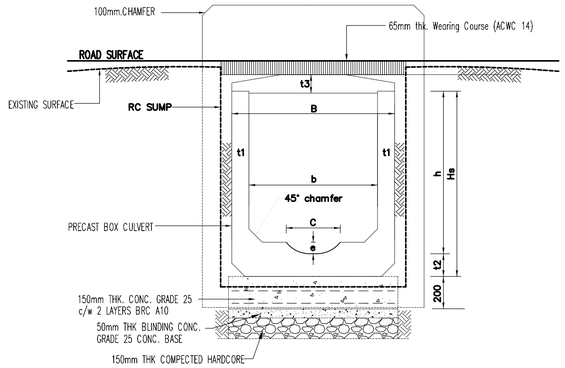
Drawing No :	SWAZMIX/P21-07/C/R&D 01		
Drawn By	S.I.	Designed	S.I.
Checked	Ir. Nik Mat	Date	OkT 2023
Approved	Ir. Dr. Saffuan	Scale	1:200
REVISION	0 1 2 3 4 5 6 7 8 9 10		



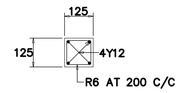
DETAILS OF PRECAST BOX CULVERT
SCALE 1:30



SECTION A-A
NOT TO SCALE



SECTION B-B
SCALE 1:30



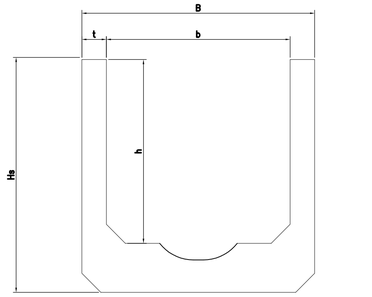
R.C. STRUT DETAIL

NOTE:

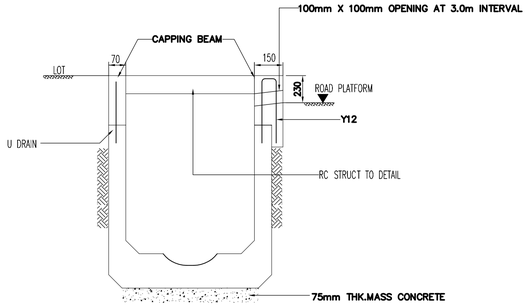
1. R.C. STRUCT ONLY TO BE PROVIDED WHEN HEIGHT OF BRICK WALL > 600mm AT PRIMETER BUILDING
2. AT AREA HAS A ROAD AND PARKING AREA RC STRUCT SHALL BE PROVIDED ALONG THE DRAIN

STANDARD SIZE BOX CULVERT

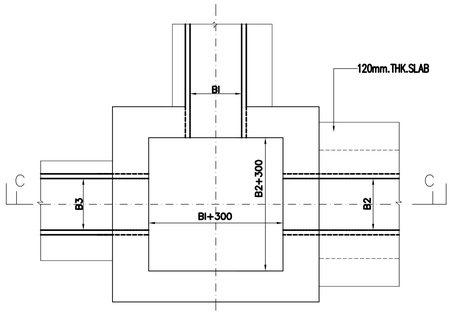
NOMINAL SIZE (mm)			COMMON DIMENSIONS				WITH DWF		
SIZE (m)	b (mm)	h (mm)	B (mm)	t1 (mm)	t2 (mm)	t3 (mm)	Hs (mm)	e (mm)	c (mm)
0.60 x 0.60	600	600	750	75	80	125	885	80	300
0.75 x 0.75	750	750	910	80	90	135	1055	80	300
0.90 x 0.60	900	600	1060	80	90	145	915	80	450
0.90 x 0.75	900	750	1060	80	90	145	1065	80	450
0.90 x 0.90	900	900	1060	80	90	145	1215	80	450
1.20 x 1.20	1200	1200	1380	90	100	150	1675	225	1075



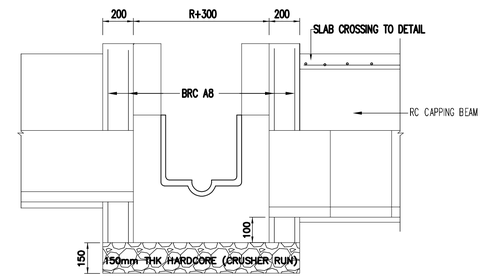
'U' DRAIN DETAIL
SCALE 1:10



TYPICAL U DRAIN WITH CONCRETE
NOT TO SCALE



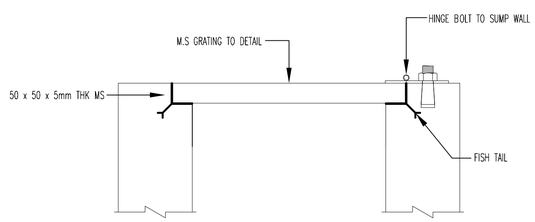
DRAIN SUMP DETAIL
NOT TO SCALE



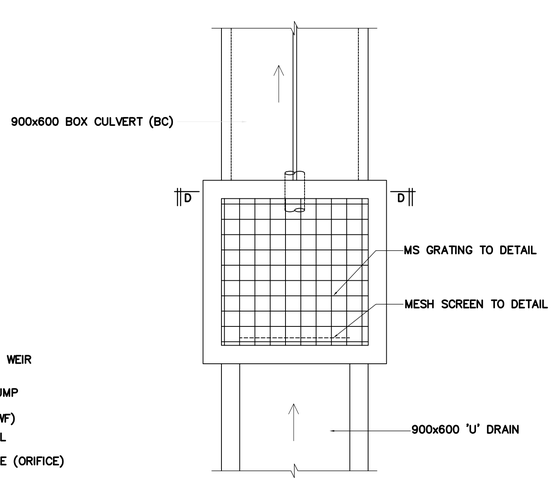
SECTION C-C
NOT TO SCALE

STANDARD SIZE U-SHAPE DRAIN

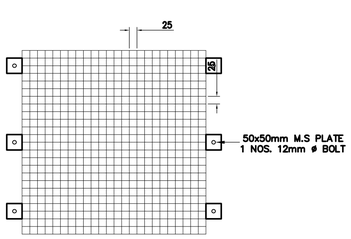
NORMAL SIZE (mm x mm)	COMMON DIMENSIONS				U-DRAIN WITH DWF		
	B (mm)	b (mm)	h (mm)	t (mm)	Hs (mm)	e (mm)	c (mm)
450 x 450	590	450	450	70	605	80	300
600 x 600	760	600	600	80	760	80	300
900 x 600	1060	900	600	80	770	80	450
1200 x 1200	1360	1200	1200	80	1505	225	1075



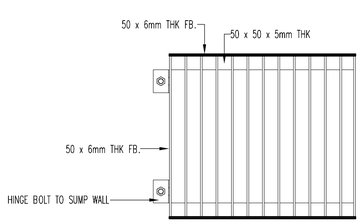
TYPICAL SECTION M.S GRATING
NOT TO SCALE



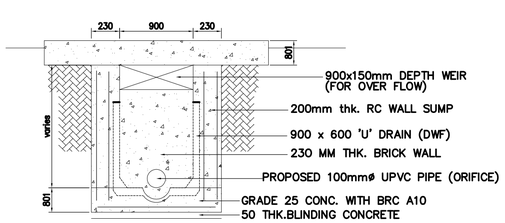
OSD POINT 1 CONTROL DETAIL
NOT TO SCALE



MESH SCREEN DETAIL
SCALE 1:10



M.S GRATING
SCALE 1:10



SECTION D-D
NOT TO SCALE

TAJUK PROJEK : Project Title :

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1	20/4/2022	PERUBAHAN ALIRAN LONGKANG DAN JALAN
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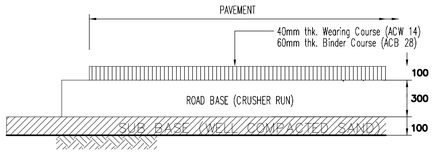
TAJUK LUKISAN : Drawing Title:

ROAD & DRAINAGE
- Typical Box Culvert And Details
- Typical Section Of 'U' Drain
- Discharge Point Control (DPC) Details
- Typical Details Of M.S. Grating

Drawing No :	SWAZMIX/P21-07/C/R&D 02		
Drawn By	S.I.	Designed	S.I.
Checked	Ir. Nik Mat	Date	OkT 2023
Approved	Ir. Dr. Saffuan	Scale	1:100
REVISION	0 1 2 3 4 5 6 7 8 9 10		

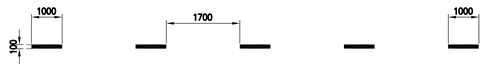


PAVEMENT DETAILS

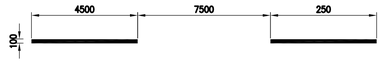
NOT TO SCALE

CONTINUITY LINE
(TYPE 1)

GIVE-WAY LINE
(TYPE 2)



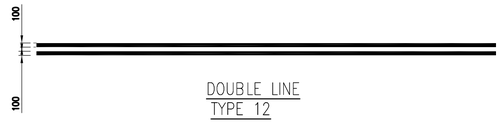
CENTRE LINE / LANE LINE
(URBAN AREA) TYPE 3



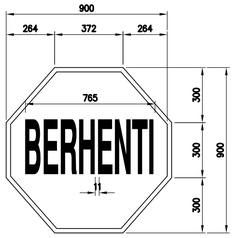
CENTRE LINE / LANE LINE
(RURAL AREA) TYPE 4

EDGE LINE AT ROADSIDE / CHANNELISING LINE
TYPE 5 OR TYPE 8

STOP LINE
TYPE 7



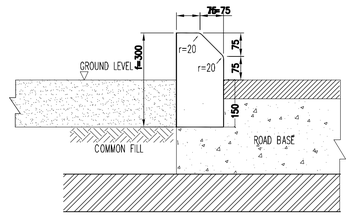
DOUBLE LINE
TYPE 12



COLOUR
BACKGROUND - RED
BORDER - WHITE
LETTERING - WHITE

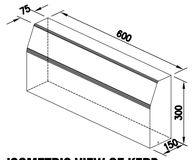
STOP AT INTERSECTION

NOT TO SCALE

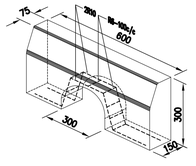


KERB DETAIL (SEMI BARRIER TYPE)

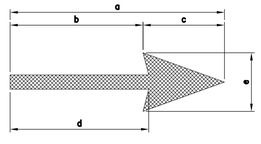
NTS



ISOMETRIC VIEW OF KERB

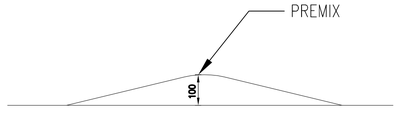


SOMETRIC VIEW OF KERB WITH ROUND INLET OPENING AT 3.0m c/c



PAVEMENT DIRECTION ARROWS

NOT TO SCALE



SECTION E-E

NOT TO SCALE

	RURAL ROAD	URBAN ROAD
a	5000	3000
b	3125	1875
c	1875	1125
d	3250	1950
e	1375	825
f	315	185
g	470	200
h	3065	1835
i	1250	750
j	1150	690
k	625	375
l	720	430
m	1000	600
n	1063.5	638.5
p	1250	750
r	1625	975
s	2500	1500

* PREMIX

40mm THK COMPACTED THICKNESS ASPHALTIC CONCRETE WEARING COURSE TO B.S. 594 14mm SIZE

* SUBGRADE

SUBGRADE MATERIAL SHALL HAVE A MAXIMUM PARTICLE SIZE OF 75mm OR LESS, AND SHALL HAVE A SOAKED CBR VALUE OF NOT LESS THAN 5%.

* SUBBASE

SUBBASE MATERIAL SHALL HAVE A CBR VALUE OF 30 OR MORE WHEN COMPACTED TO 95% OF THE MAXIMUM DRY DENSITY DETERMINED IN SOAKED FOR 4 DAYS UNDER SURCHARGE OF 4.5KG.THE GRADATION SHALL CONFORM TO ONE OF THE ENVELOPES SHOWN IN THE TABLE 4.1 CLAUSE 4.1.2.2 JKR STANDART SPECIFICATION FOR ROADWORKS

* ROAD BASE (CRUSHER RUN)

ROADBASE MATERIAL SHALL HAVE A CBR VALUE OF NOT LESS THAN 80 WHEN COMPACTED TO 95% OF THE MAXIMUM DRY DENSITY DETERMINED IN THE B.S. 1377 COMPACTION TEST (4.5 KG RAMMER METHOD) AND SOAKED FOR 4 DAYS UNDER SURCHARGE OF 4.5KG. THE GRADATION SHALL CONFORM TO ONE OF THE ENVELOPES SHOWN IN THE TABLE 4.3 CLAUSE 4.1.2.2 JKR STANDART SPECIFICATION FOR ROADWORK.

NOTES:-

1) TYPE 1. CONTINUITY LINE:
   a) -(S = 1000 G = 1000 W = 150) AT ON INTERSECTION
   b) -(S = 1000 G = 1000 W = 200) AT EXISTING RAMP AND ENTRANCE

2) TYPE 2. GIVE - WAY LINE (S = 300 G = 300 W = 200) AT THE MOUTH OF AN INTERSECTION.

3) TYPE 3. CENTRE LINE / LANE LINE (S = 1000 G = 1700 W = 100) IN URBAN AREA.

4) TYPE 4. CENTRE LINE / LANE LINE (S = 4500 G = 7500 W = 100) IN RURAL AREA.

5) TYPE 5. CENTRE LINE / LANE LINE (S = 2700 W = 4500 G = 100) ON MOUTAINOUS OR SHORT RADIUS CURVES IN RURAL AREA.

6) TYPE 6. EDGE LINE / LANE LINE
   a) EDGE LINE - (CONTINUOUS 150mm WIDTH) AT TRAFFIC ISLAND OR PAVEMENT EDGE WHITE FOR CONTINUOUS GUIDE AND YELLOW FOR PROHIBITION OF PARKING.
   b) CHANNELISING LINE - (CONTINUOUS 150mm WIDTH) AT THE JUNCTION GHOST - ISLAND.

7) TYPE 7. STOP LINE (CONTINUOUS 300mm WIDTH)

8) TYPE 8. STOP LINE WITH PEDESTRIAN CROSSING AT INTERSECTION.

9) TYPE 9. PEDESTRIAN CROSSING (ZEBRA) ON STRAIGHT ROAD.

10) TYPE 10. DOUBLE LINE (W = 100) NO PASSING ZONES OR CENTRE LINE OF MULTILANE ROAD IN URBAN AREA.

11) TYPE 11. CLIMBING LINE PROVIDED AT STEEP GRADES.

12) TYPE 13. TURN LINE (S = 600 G = 600 W = 100) TO INDICATE THE PROPPER COURSE TO BE FOLLOWED BY TURNING VEHICLES.

ALL DIMENSION ARE IN MILLIMETRES UNLESS OTHERWISE STATED

S = STROKE G = GAP W = WIDTH

APPLICATION PRINCIPLES OF ROAD MARKING ARE DEFINED IN J.K.R ARAHAN TEKNIK (JALAN) 2B/85

13) ALL ROAD MARKING SHALL BE USE THERMO PLASTIC PAINT ACCORDING TO ATJ 2D/85(PINDAAN 2019) :
YELLOW THERMOPLASTIC LINE = NOT LESS THAN 3mm THK BUT NOT MORE THAN 7mm THK
WHITE THERMOPLASTIC LINE = 3mm THK

TAJUK PROJEK : Project Title :

PERMOHONAN PELAN INFRASTRUKTUR BAGI CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326), MUKIM HULU CHUKAI, DAERAH KEMAMAN TERENGGANU DARUL IMAN

PEMILIK TANAH / BANGUNAN : Land / Building Owner :

LADANG RAKYAT TRENGGANU SDN. BHD.
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24000 KEMAMAN,
TERENGGANU DARUL IMAN.

Arkitek : Architect :

KUMPULAN PERUNDING
(1988) SDN.BHD. 166318-V

44 TINGKAT 1, JALAN SULTAN ISMAIL,
20200, KUALA TERENGGANU, TERENGGANU DARUL IMAN.
TEL : (609) 6223582, 6223755.
FAX : (609) 6231412
EMAIL : kpk188sb@yahoo.com
WEB SITE : www.kp88sb.com

RUJ	TARIKH	PINDAAN
1	20/4/2022	PERUBAHAN ALIRAN LONGKANG DAN JALAN
2	16/10/2023	PEMADAMAN LONGKANG DAN JALAN

JURUTERA AWAM & STRUKTUR : civil & structural engineer :

SWAZMIX CONSULTANT.
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Kubang Parit, 20050,
Kuala Terengganu,
Terengganu Darul Iman.
Tel/Fax: +609-620 5027
Email: swazmixconsultant@yahoo.com

* I hereby certify that these works have been designed by me in accordance with sound engineering practice and that I take full responsibility for the design and proper performance of the same *

TAJUK LUKISAN : Drawing Title:

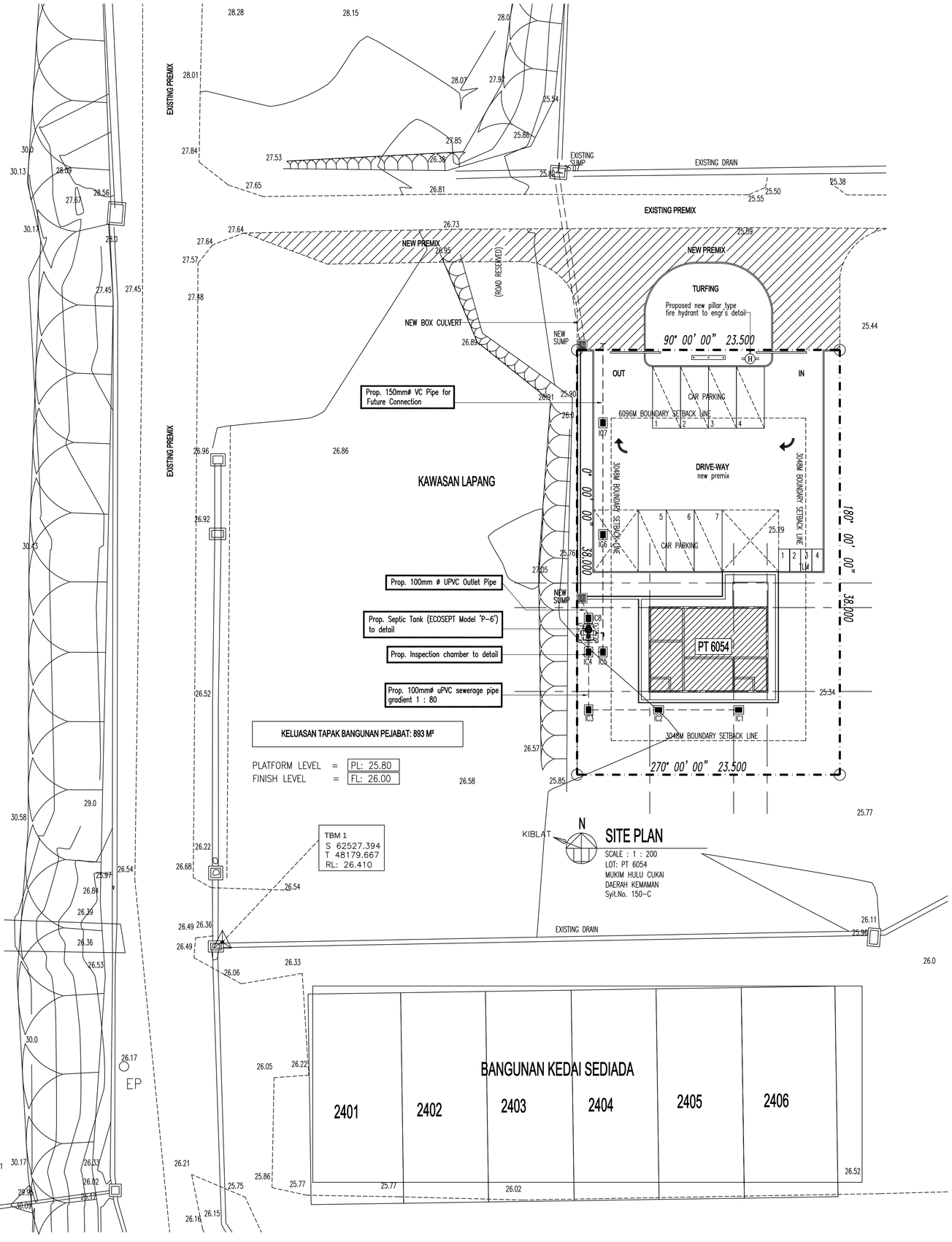
ROAD & DRAINAGE

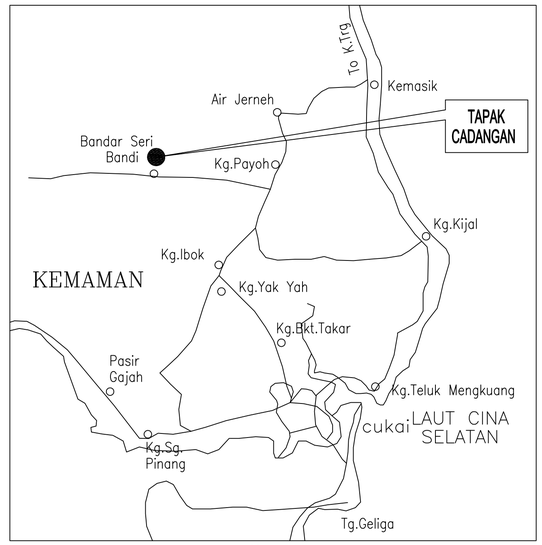
- Typical Box Culvert And Details
- Typical Section Of 'U' Drain
- TRAFFIC SIGN DETAILS

Drawing No :	SWAZMIX/P21-07/C/R&D 03		
Drawn By	S.I.	Designed	S.I.
Checked	Ir. Nik Mat	Date	OkT 2023
Approved	Ir. Dr. Saffuan	Scale	1:100
REVISION	0 1 2 3 4 5 6 7 8 9 10		

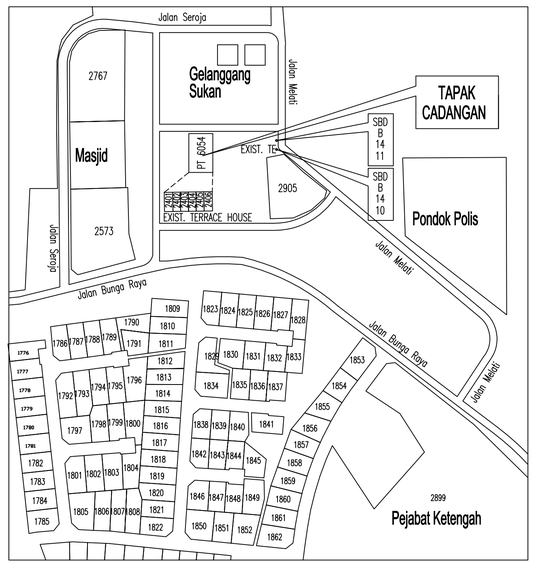
Kerja-kerja hendaklah berdasarkan kepada ukuran yang ditunjukkan sahaja. Sebarang kesilapan hendaklah dilaporkan kepada wakil pegawai penguasa sebelum memulakan sebarang kerja.

Kontraktor dimestikan memeriksa semua ukuran di tapak.





KIBLAT N **KEY PLAN**
SCALE : NTS



KIBLAT N **LOCATION PLAN**
SCALE : 1 : 3000
LOT: PT 6054
MUKIM HULU CUKAI
DAERAH KEMAMAN
Syit.No. 150-C

INVERT LEVEL CALCULATION

	GL	IC1	IC2	IC3	IC4	IL Pipe	OL Pipe	IC8	SIL(min.)
	25.80	25.35	25.26	25.18	25.11	25.10	25.03	25.02	25
DEPTH	–	450mm	540mm	620mm	690mm	700mm	770mm	780mm	800mm
									0.3m
MODEL	ECO-SEPT system model 'P-6' (6 PE) – Gradient 1:80								

KEPERLUAN PENDUDUK SETARA (PE)	
JENIS	PEJABAT
PE	3/100M² KELUASAN KASAR

PENGIRAAN PE	
TYPE(keluasan)	PEJABAT (85.35²)
PE	85.35² X 3/100M
PE	2.5 PE
	MINIMA 5 PE

LEGEND :

=Ⓗ= PILLAR TYPE FIRE HYDRANT TO ENGR'S DETAIL

TAJUK PROJEK : Project Title :

PERMOHONAN PELAN KERJA TANAH BAGI CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326), BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

PEMILIK TANAH / BANGUNAN : Land / Building Owner :

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ARKITEK : Architect :

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RUJ	TARIKH	PINDAAN

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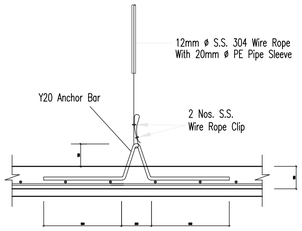
Email: swazmixconsultant@yahoo.com

* I hereby certify that these works have been designed by me in accordance with sound engineering practice and that I take full responsibility for the design and proper performance of the same

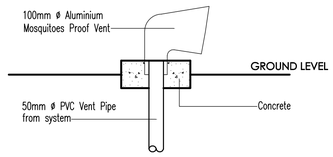
TAJUK LUKISAN : Drawing Title:

– SEWERAGE LAYOUT

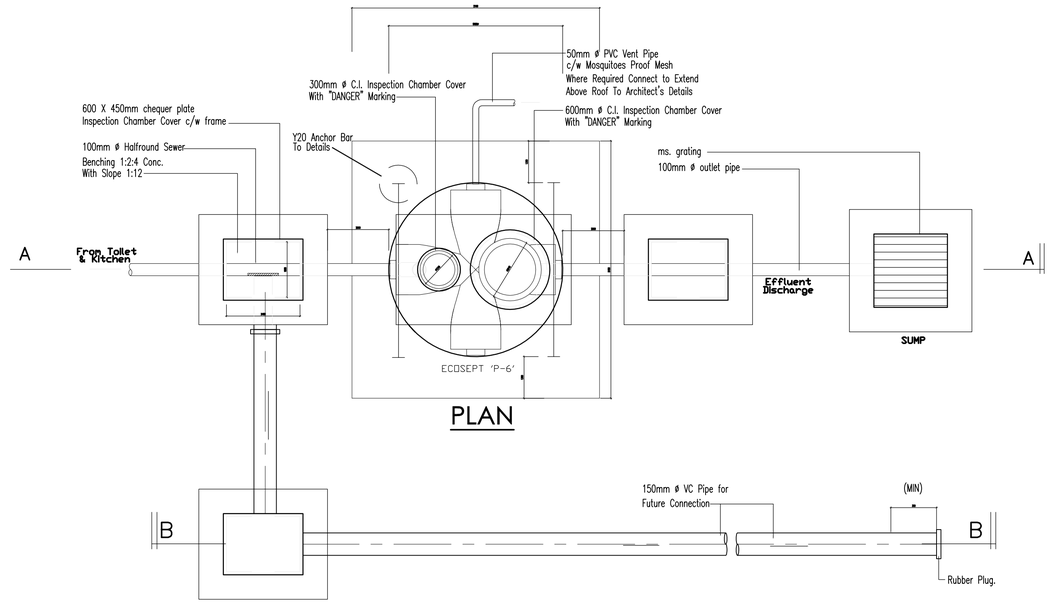
Drawing No :	SWAZMIX/P21-07/C/SW 01		
Drawn By	Zainuddin Amir	Designed	Zainuddin Amir
Checked	Ir. Nik Mat	Date	May 2022
Approved	Ir. Dr. Saffuan	Scale	1:200
REVISION	0 (X) 1 2 3 4 5 6 7 8 9 10		



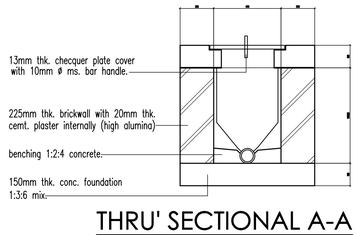
DETAILS - ANCHORAGE



DETAIL VENT.PIPE

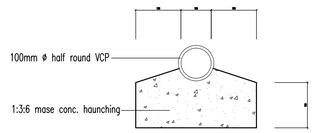


PLAN



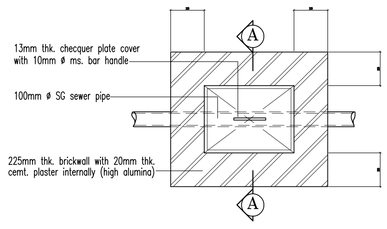
THRU' SECTIONAL A-A

SKALA 1:10



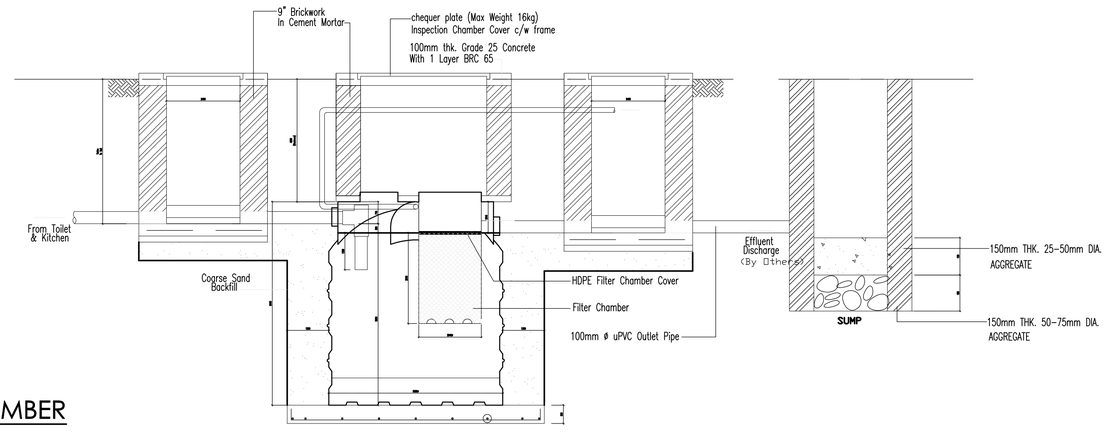
TYPICAL DETAIL OF BEDDING AND HAUNCHING

scale 1:10

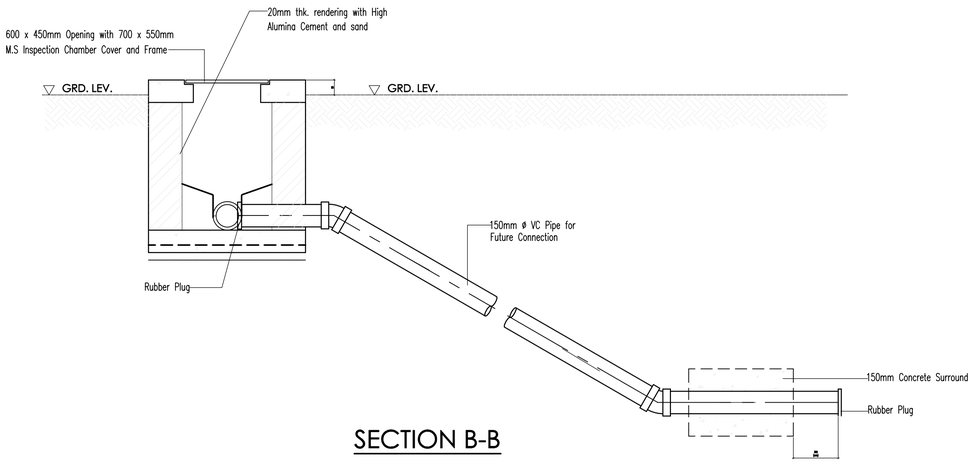


DETAIL OF INSPECTION CHAMBER

SKALA 1:10



SECTION A-A



SECTION B-B

NOTES :

1. Immediately after lowering and positioning all tanks must be filled to 3/4 depth water.
2. The septic tank must be seeded by approximately 20 Litres of sludge taken from working septic tank or Digesters.
3. Direction of inlet and outlet Effluent pipes to be adjusted to suit site.
4. The end discharge of Effluent pipe should be at least 150mm higher than the bottom of the receiving drain.
5. Sand without sharp stones or objects to be used for backfill.
6. Backfill in layers not exceeding 250mm thick and well compacted. Each Layer to be properly compacted before the next layer.
7. Each layer of backfill must be completely level all around the system before the next layer is added. Backfilling must not be placed unevenly from one side or corner.
8. If kitchen waste is also directed into the system, an oil and grease trap must be provided in before the septic tank.
9. All dimensions are in mm unless otherwise specified.
10. The septic tank must NOT be buried with the top lower than 600mm below ground level.
11. The septic tank must NOT be installed under traffic areas or under heavy loads unless proper support slabs are provided above the septic tank.
12. All civil & structural works shall be to civil & structural consultant's design & constructed by others.
13. All works labelled as (Not By W.I.I.) means that it is not included in the scope of works to be supplied or constructed by WEIDA INTEGRATED INDUSTRIES SDN. BHD.

ECOSEPT P-6
SEPTIC TANK SPECIFICATION

POPULATION EQUIVALENT RECOMMENDED (FOR ALL WASTE)	6
DETENTION TIME (HRS)	> 24
VOLUME TO WATER LEVEL (L)	> 2000
VENTILATION PIPE (mm)	50
INLET PIPE DIAMETER (mm)	100
OUTLET PIPE DIAMETER (mm)	100

TAJUK PROJEK : Project Title :

PERMOHONAN PELAN KERJA TANAH
BAGI CADANGAN MEMBINA DAN MENYIAPKAN
1 UNIT BANGUNAN PEJABAT 1 TINGKAT
DI ATAS LOT PT 6054 (HSD 9326),
BANDAR SERI BANDI, MUKIM HULU CHUKAI,
DAERAH KEMAMAN,
TERENGGANU DARUL IMAN.

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TERENGGANU DARUL IMAN.

Architect :

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RUJ	TARIKH	PINDAAN

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TAJUK LUKISAN : Drawing Title:

- ECOSEPT MODEL P-6

Drawing No :	SWAZMIX/P21-07/C/SW 02		
Drawn By	Zainuddin Amir	Designed	Zainuddin Amir
Checked	Ir. Nik Mat	Date	May 2022
Approved	Ir. Dr. Saffuan	Scale	1:100

REVISION 0 1 2 3 4 5 6 7 8 9 10

EXISTING PREMIX

EXISTING PREMIX ROAD TO MAINTAIN MAKING GOOD

EXISTING PREMIX

EXISTING DRAIN

EXISTING SUMP

PROPOSED PREMIX ROAD

PROPOSED PREMIX ROAD

(ROAD RESERVED 12m)

(ROAD RESERVED 12m)

PROP. SLUICE VALVE

HOT TAPPING

SCOUR VALVE

L=34m

L=27m

L=12m

L=32m

15mmø WATER METER FOR DOSMESTIC

100mmø WATER METER FOR HYDRANT

PROP. 155mm ø MULTILAYER UPVC PIPE (PN 12)

PROP. 150MM ø M.S PIPE [ROAD CROSSING]

PROP. 150MM ø M.S PIPE [ROAD CROSSING]

PROPOSED 25mmø S.S PIPE

EXISTING PIPE DUCTILE IRON 150mmø

90° 00' 00" 23.500

180° 00' 00" 38.000

270° 00' 00" 23.500

180° 00' 00" 38.000

OUT

IN

PROPOSED FIRE HYDRANT CAR PARKING

CAR PARKING

KAWASAN LAPANG

PT 6054

END CAP

TLM

TBM 1
S 62527.394
T 48179.667
RL: 26.410

NOTE:

TAPPING SHALL BE ALLOW WHEN ALL INDIVIDUAL METER HAS BEEN REGISTERED

DIAGRAMMATIC PLUMBING LAYOUT

NOT TO SCALE

ROOF LEV.

GRD. FLR. LEV.

GRD. LEV.

25mm ø UPVC class 'D' distribution pipe

25mm ø GI.class 'C' riser main pipe

13 mm ø UPVC class 'D' supply pipe

stop cock at 1800mm high from apron

stop cock, water meter and ballofix valve to detail

25mm ø Stainless steel pipe to be connected to water main pipe refer to engr's drawing

25 mm ø PVC class 'C' vent.pipe

1365 litres (300 gal.) Poly water storage tank with ball control valve

32 mm ø UPVC class 'D' overflow & scour pipe discharge to bathroom

13mm ø GI class 'C' supply pipe

KITCHEN

TOILET 1

TOILET 2

sink

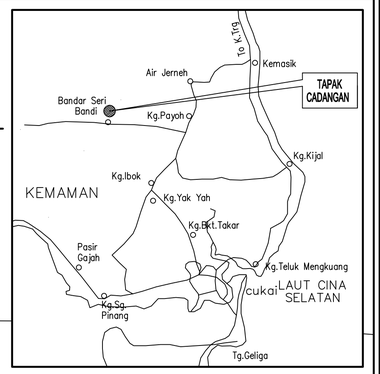
wc

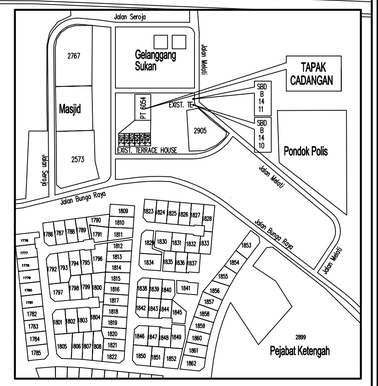
b.top

KEY PLAN

SCALE : NTS

KIBLAT





LOCATION PLAN

SCALE : 1 : 3000
LOT: PT 6054
MUKIM HULU CUKAI
DAERAH KEMAMAN
Syit.No. 150-C

KIBLAT

SITE PLAN

SCALE : 1 : 150
LOT: PT 6054
MUKIM HULU CUKAI
DAERAH KEMAMAN
Syit.No. 150-C

KIBLAT

COORDINATE
4.33806
103.328

LEGEND :

- = EXISTING MAIN PIPE DUCTILE IRON 150mmø
- = PROP. 155mmø MULTILAYER uPVC PIPE (PN12)
- = PROP. 150MM ø MSCL PIPE [ROAD CROSSING]
- = PROPOSED 25mmø S.S PIPE
- = SCOUR VALVE
- = SLUICE VALVE
- = FIRE HYDRANT
- = NODE
- L = LENGTH
- = MARKER POST

TAJUK PROJEK : Project Title :

PERMOHONAN PELAN INFRASTRUKTUR BAGI CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326), MUKIM HULU CHUKAI, DAERAH KEMAMAN TERENGGANU DARUL IMAN

PEMILIK TANAH / BANGUNAN : Land / Building Owner :

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TAJUK LUKISAN : Drawing Title:

– WATER RETICULATION LAYOUT

Drawing No :	SWAZMIX/P21-07/C/WR 01		
Drawn By	Zainuddin Amir	Designed	Zainuddin Amir
Checked	Ir. Nik Mat	Date	Nov 2021
Approved	Ir. Dr. Saffuan	Scale	1:150
REVISION	0 1 2 3 4 5 6 7 8 9 10		

11 1/2° / 22 1/4° BENDS

PIPE DIA.	A	B	C	D	E
100	100	150	375	300	225
150	100	150	450	300	300
200	150	150	600	375	375
250	150	225	600	450	525
300	225	225	750	525	600
375	225	225	1050	600	900

45° BENDS

PIPE DIA.	A	B	C	D	E
100	100	150	450	300	225
150	150	150	600	300	375
200	225	150	750	375	525
250	225	225	900	450	675
300	300	300	1200	525	750
375	300	300	1350	600	1050

90° BENDS

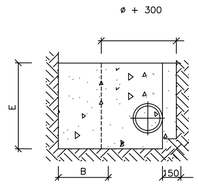
PIPE DIA.	A	B	C	D	E
100	100	150	600	225	375
150	150	150	900	300	450
200	225	150	1125	375	675
250	225	225	1275	450	900
300	300	300	1575	525	1050
375	300	300	1950	600	1350

TEES

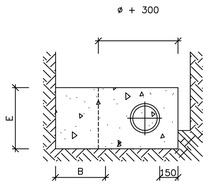
PIPE DIA.	A	B	C	D	E	F
100 x 100	100	150	600	225	225	100
150 x 100	150	150	600	225	225	150
150 x 150	225	100	625	300	375	150
200 x 100	150	225	600	300	225	150
200 x 150	225	225	825	300	375	150
200 x 200	300	225	1200	375	450	150
250 x 250	300	225	1200	450	675	225
300 x 300	375	300	1425	525	825	225
375 x 375	525	300	1500	625	1200	300

NOTE:

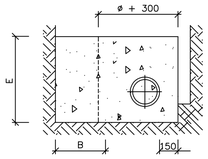
1. ALL CONCRETE SHALL BE GRADE 20
2. THE EARTH BEHIND THE CONCRETE BLOCK SHALL BE WELL COMPACTED PRIOR TO FILLING OF THE EXCAVATION.



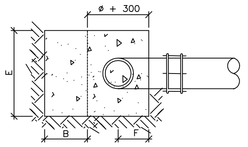
SECTION A–A



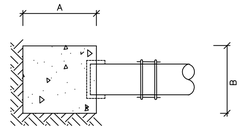
SECTION B–B



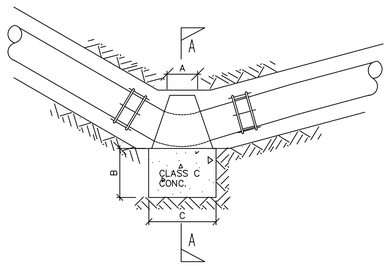
SECTION C–C



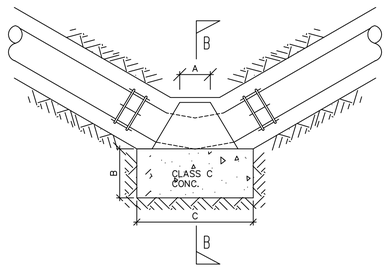
SECTION D–D



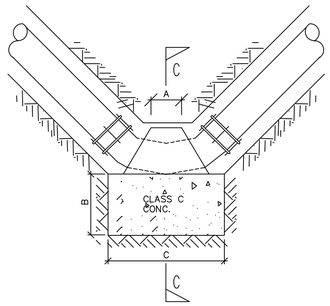
SECTION E–E



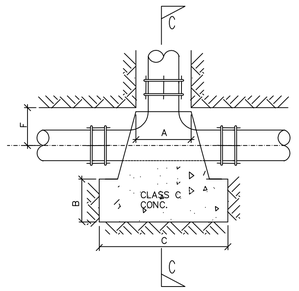
PLAN



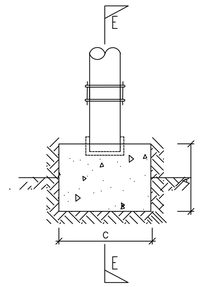
PLAN



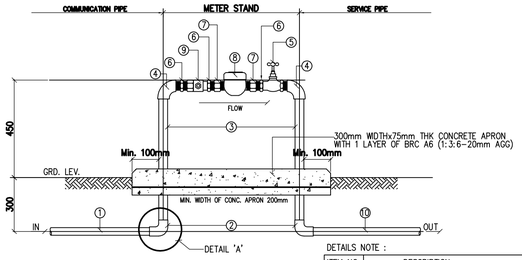
PLAN



PLAN



PLAN

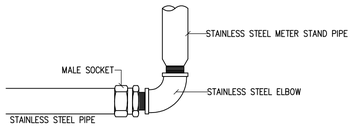


FRONT ELEVATION

DETAILS NOTE :

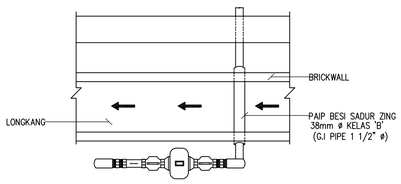
ITEM NO.	DESCRIPTION	SIZE (mm)
1	COMMUNICATION STAINLESS STEEL PIPE	25
2	STAINLESS STEEL ELBOW (INTERNALLY TREADED)	20
3	STAINLESS STEEL PIPE	20
4	STAINLESS STEEL STRAIGHT/REDUCER ELBOW (MALE AND FEMALE TREADED)	20
5	BRASS STOP COCK	20
6	BRASS STAINLESS STEEL BUSH	20
7	BRASS UNION/COUPING	20
8	WATER METER	15
9	LOCKABLE VALVE	20
10	SERVICE PIPE (STAINLESS STEEL PIPE)	20

*REMARK :
1) STAINLESS STEEL METER STAND – SS304/316 SCHEDULE 40S
2) POLYMETER METER STAND – USING SAME SIZE AS DRAWING



DETAIL 'A'

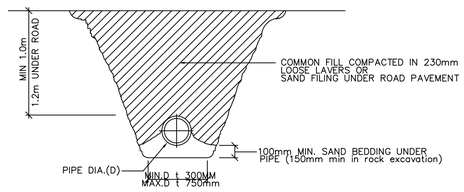
STAINLESS STEEL COMMUNICATION PIPE



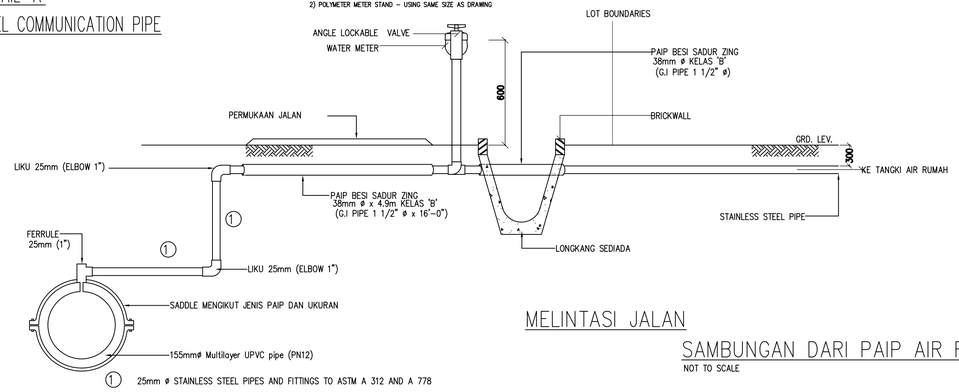
PLAN

END PIPE

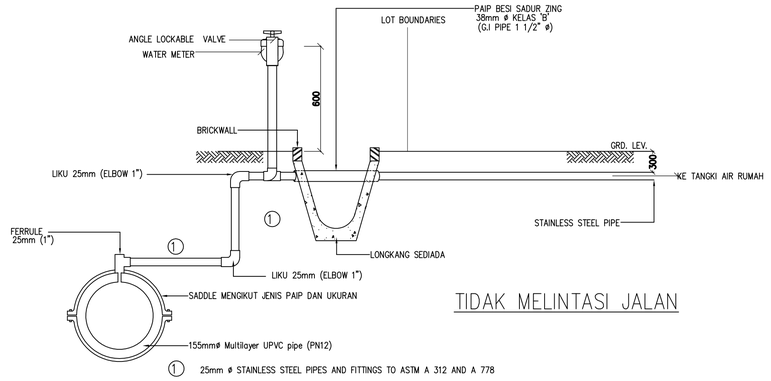
PIPE DIA.	A	B	C
100	375	375	450
150	375	375	450



PIPE BEDDING AND BACKFILL



MELINTASI JALAN



TIDAK MELINTASI JALAN

SAMBUNGAN DARI PAIP AIR RETIKULASI KE METER BANGUNAN

NOT TO SCALE

TAJUK PROJEK : Project Title :

PERMOHONAN PELAN INFRASTRUKTUR BAGI CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326), MUKIM HULU CHUKAI, DAERAH KEMAMAN TERENGGANU DARUL IMAN

PEMILIK TANAH / BANGUNAN : Land / Building Owner :

LADANG RAKYAT TRENGGANU SDN. BHD.
KM 1, JALAN CERUL,
BANDAR CENEH BAHARU,
24000 KEMAMAN,
TERENGGANU DARUL IMAN.

Arkitek : Architect :

KUMPULAN PERUNDING (1988) SDN.BHD. 166318-V
44 TINGKAT 1, JALAN SULTAN ISMAIL,
20200, KUALA TERENGGANU, TERENGGANU DARUL IMAN.
TEL : (609) 6223582, 6223755.
FAX : (609) 6231412
EMAIL : kpk188sb@yahoo.com
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RUJ	TARIKH	PINDAAN

JURUTERA AWAM & STRUKTUR : civil & structural engineer :

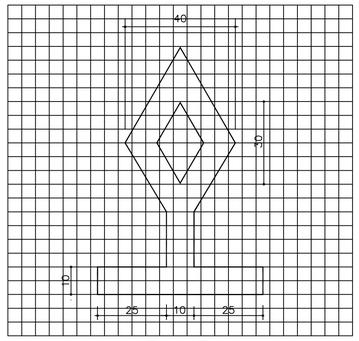
SWAZMIX CONSULTANT.
Lot 1886K, Tingkat Atas, Taman KP Perdana,
Kubang Parit, 20050,
Kuala Terengganu,
Terengganu Darul Iman.
Tel/Fax: +609–620 5027
Email: swazmixconsultant@yahoo.com

" I hereby certify that these works have been designed by me in accordance with sound engineering practice and that I take full responsibility for the design and proper performance of the same"

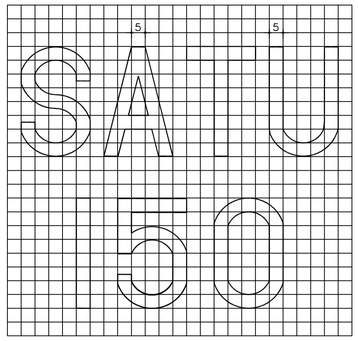
TAJUK LUKISAN : Drawing Title:

– PIPE BEDDING AND BACKFILL

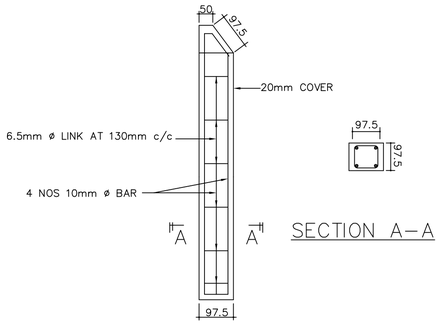
Drawing No :	SWAZMIX/P21–07/C/WR 02		
Drawn By	**Zainuddin Amir**	Designed	**Zainuddin Amir**
Checked	**Ir. Nik Mat**	Date	**Nov 2021**
Approved	**Ir. Dr. Saffuan**	Scale	**1:100**
REVISION	0 1 2 3 4 5 6 7 8 9 10		



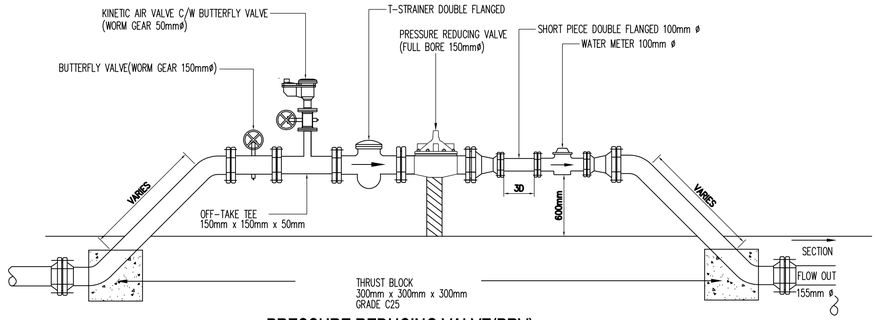
AIR VALVE



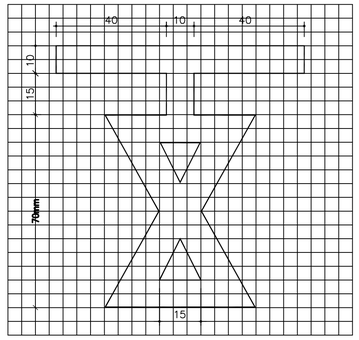
FULL SIZE LETTERING



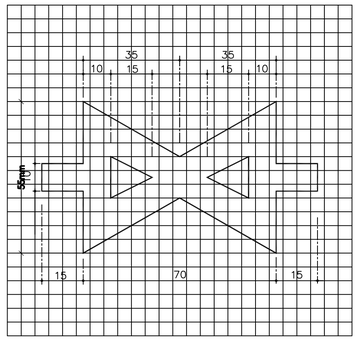
SECTION A–A



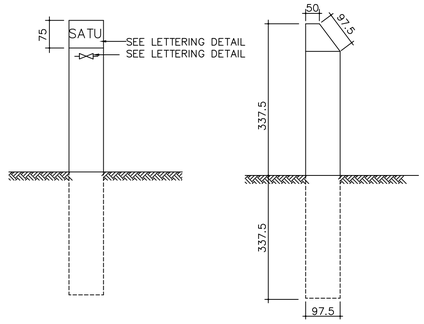
PRESSURE REDUCING VALVE(PRV)



WASH OUT (SCOUR)

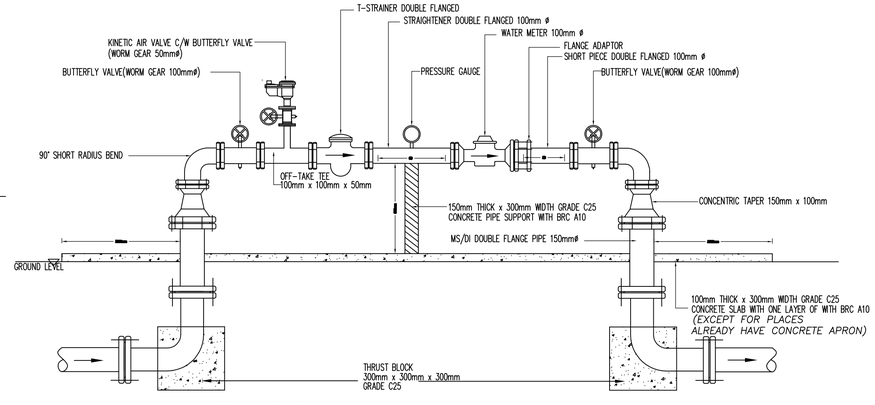


SLUICE VALVE



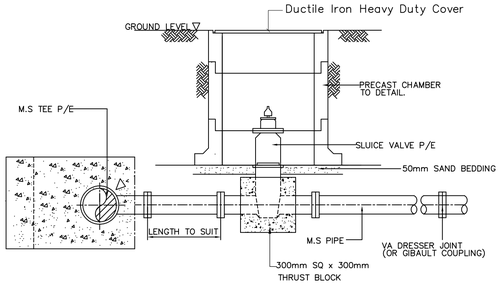
FRONT ELEVATION SIDE ELEVATION

PIPE MARKER



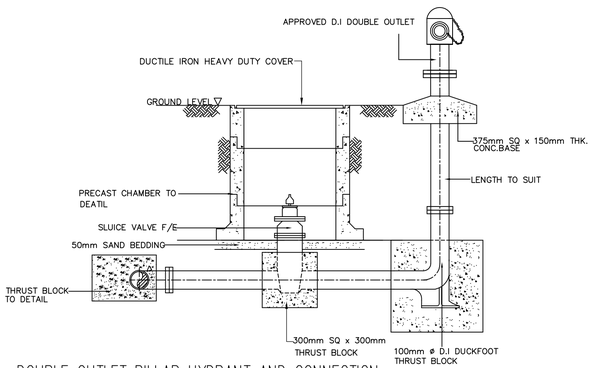
BULK METER CONNECTION HYDRANT

SCALE : NOT TO SCALE



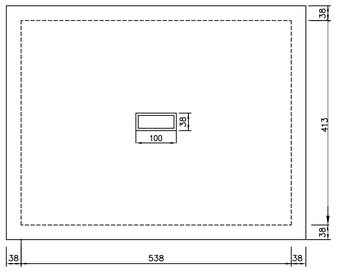
SECTIONAL ELEVATION OF CHAMBER

SCALE : C



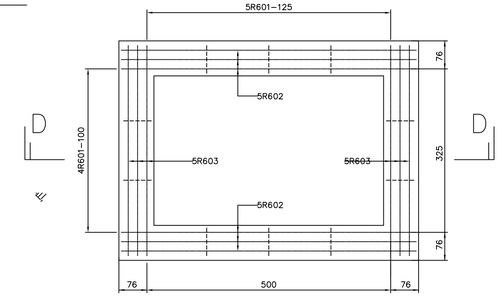
DOUBLE OUTLET PILLAR HYDRANT AND CONNECTION

SCALE : C



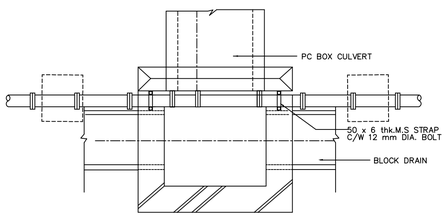
PLAN OF TOP SECTION

SCALE : B

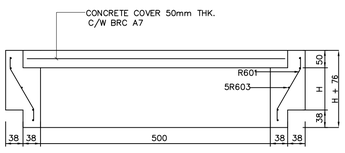


PLAN OF INTERMEDIATE UNIT.

SCALE : B

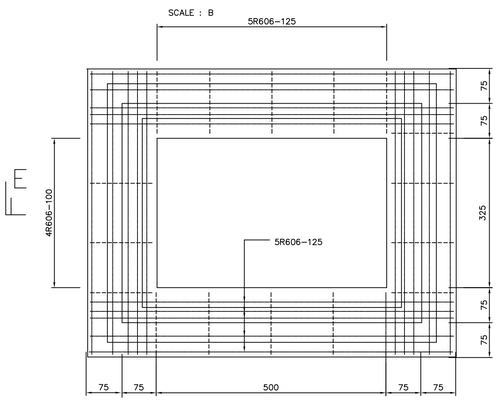


TYPICAL PLAN CULVERT CROSSING



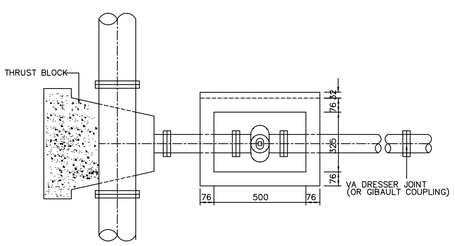
SECTION D–D

SCALE : B



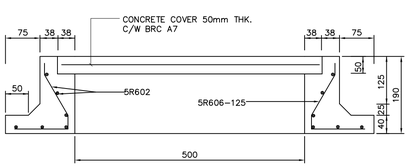
PLAN OF BASE UNIT.

SCALE : B



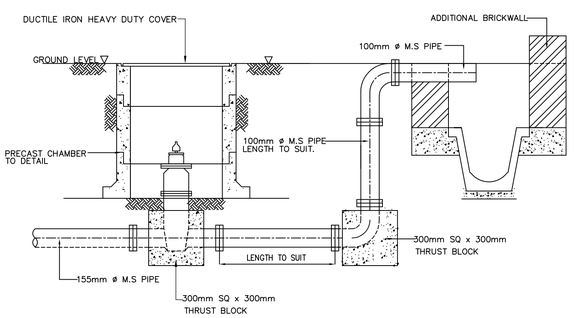
TEE OF DETAILS

SCALE :C



SECTION E–E

SCALE : B



100mm ø SCOUR VALVE

SCALE :C

TAJUK PROJEK : Project Title :

PERMOHONAN PELAN INFRASTRUKTUR BAGI CADANGAN MEMBINA DAN MENYAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326), MUKIM HULU CHUKAI, DAERAH KEMAMAN TERENGGANU DARUL IMAN

PEMILIK TANAH / BANGUNAN : Land / Building Owner :

LADANG RAKYAT TRENGGANU SDN. BHD.
KM 1, JALAN CERUL,
BANDAR CENEH BAHARU,
24000 KEMAMAN,
TERENGGANU DARUL IMAN.

Arkitek : Architect :

KUMPULAN PERUNDING
(1988) SDN.BHD. 166318-V

44 TINGKAT 1, JALAN SULTAN ISMAIL,
20200, KUALA TERENGGANU, TERENGGANU DARUL IMAN.
TEL : (609) 6223582, 6223755.
FAX : (609) 6231412
EMAIL : kpk188sb@yahoo.com
WEB SITE : www.kp88sb.com

RUJ	TARIKH	PINDAAN

JURUTERA AWAM & STRUKTUR : civil & structural engineer :

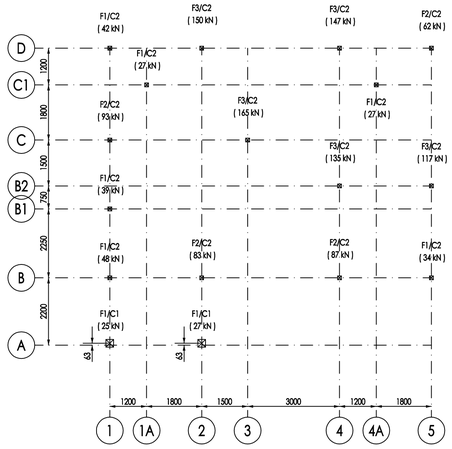
SWAZMIX CONSULTANT.
Lot 1886K, Tingkat Atas, Taman KP Perdana,
Kubang Parit, 20050,
Kuala Terengganu,
Terengganu Darul Iman.
Tel/Fax: +609-620 5027
Email: swazmixconsultant@yahoo.com

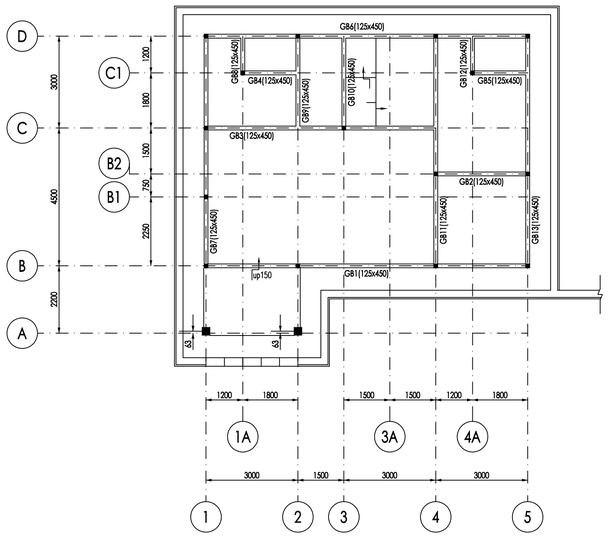
" I hereby certify that these works have been designed by me in accordance with sound engineering practice and that I take full responsibility for the design and proper performance of the same

TAJUK LUKISAN : Drawing Title:

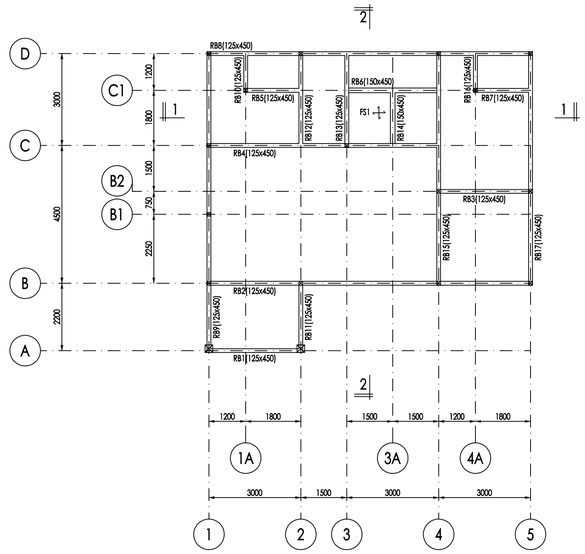
- DETAILS OF MARKER & CULVERT CROSSING
- DETAIS OF FITTING, HYDRANT AND CHAMBERS.
- SUMP CULVERT DETAIL.
- BULK METER CONNECTION DETAILS
- PRESSURE REDUCING VALVE(PRV) DETAILS

Drawing No :	SWAZMIX/P21-07/C/WR 03		
Drawn By	Zainuddin Amir	Designed	Zainuddin Amir
Checked	Ir. Nik Mat	Date	Nov 2021
Approved	Ir. Dr. Saffuan	Scale	1:100
REVISION	0 1 2 3 4 5 6 7 8 9 10		





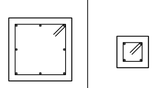
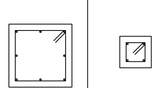
GROUND FLOOR BEAM LAYOUT
SCALE 1:100



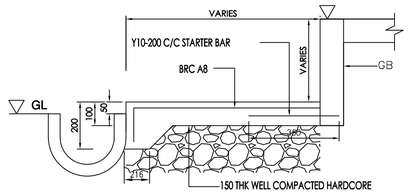
ROOF BEAM LAYOUT
ALL SLAB THICKNESS = 125 MM THK. U.N.O
SCALE 1 :100

PAD FOOTING	PAD FOOTING DIMENSIONS			REINFORCEMENT		
MARK	B,mm	L,mm	H,mm	XDirBAR	YDirBAR	TIES
F4 (B/1)	700	700	300	Y12-125	Y12-125	2Y10
F7 (C/1)	1000	1000	300	Y12-125	Y12-125	2Y10
F11 (C/3)	1300	1300	300	Y12-125	Y12-125	2Y10

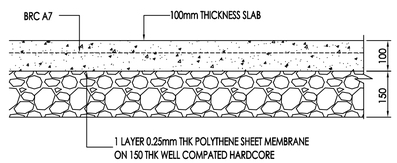
FOUNDATION REINFORCEMENT SCHEDULE

FLOOR \ COLUMN MARK		C1	C2
Floor GB-RB			
	MAIN BAR	8Y10	4Y10
	TIES	R10-100	R6-100
	COL. SIZE	250 X 250	125 X 125
Stump			
	MAIN BAR	8Y10	4Y10
	TIES	R10-100	R6-100
	COL. SIZE	250 X 250	125 X 125

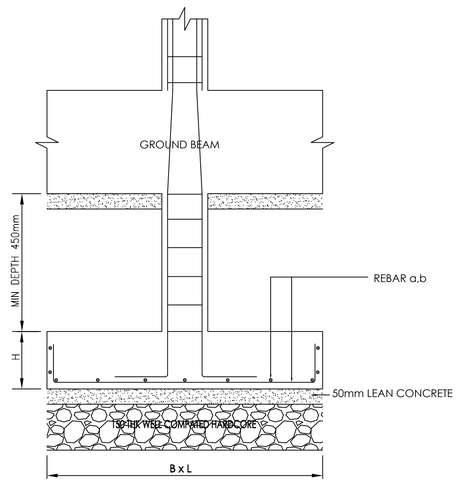
COLUMN REINFORCEMENT SCHEDULE



TYPICAL APRON DETAILS
NTS



NON-SUSPENDED SLAB DETAILS
SCALE 1 : 10



TYP. FOOTING DETAIL
SCALE 1 : 10

TAJUK PROJEK : Project title :

PERMOHONAN KELULUSAN PELAN BANGUNAN BAGI CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326), BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

PEMILIK TANAH / BANGUNAN : Land / Building Owner :

LADANG RAKYAT TRENGGANU SDN. BHD.
KM1, JALAN CHERUL,
BANDAR CHENEH BAHARU,
24000 KEMAMAN,
TERENGGANU DARUL IMAN.

ARKITEK : Architect :

KUMPULAN PERUNDING (1988) SDN.BHD. 166318-V
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20200, KUALA TERENGGANU, TERENGGANU DARUL IMAN
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FAX : (609) 6231412
EMAIL : kpt88bdh@tm.net.my
kpt88bdh@yahoo.com
WEBSITE : www.kpt88bdh.com

NOTA : Note :

Concrete works

1. ALL DIMENSIONS ARE IN mm
2. READ THIS DRAWING WITH ALL RELEVANT ARCHITECT'S AND ENGINEER'S DRAWING.
3. ALL DIMENSIONS TO BE CONFIRMED ON SITE. DISCREPANCIES TO BE REPORTED TO THE S.O BEFORE WORK COMMENCES.
4. REINFORCEMENT TO BE BS 4449 Y DENOTES HIGH TENSILE STEEL
   (CHARACTERISTIC STRENGTH fy - 460 N/mm sq.) R DENOTES MILD STEEL
   (CHARACTERISTIC STRENGTH fy - 250 N/mm sq.)
5. MINIMUM LAP LENGTH OF BARS SHALL BE 40 DIA.
6. COVER TO MAIN REINFORCEMENT UNLESS OTHERWISE STATED
   i. SLAB = 20 mm
   ii. BEAM = 25 mm
   iii. FOUNDATION = 50 mm
   iv. COLUMN = 25 mm
7. MINIMUM CONCRETE GRADE SHALL BE 25N/mm sq UNLESS OTHERWISE STATED

	TARIKH	PINDAAN

JURUTERA AWAM & STRUKTUR : civil & structural engineer :

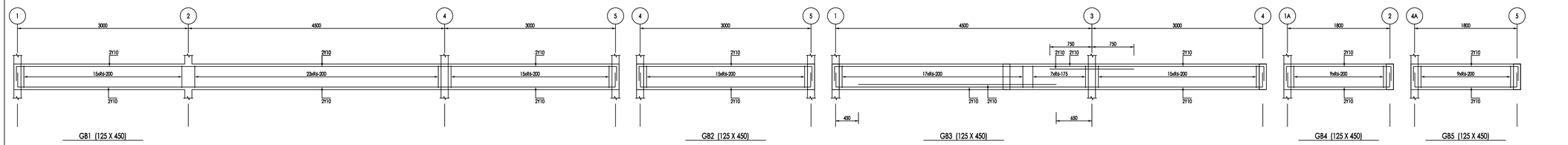
Lot 1888K, Tingkat Atas, Taman KP Perdana,
Kubang Parit, 20050,
Kuala Terengganu,
Terengganu Darul Iman.
Tel: 09-620 5027 Fax: 09-6265027
Email: swazmixconsultant@yahoo.com

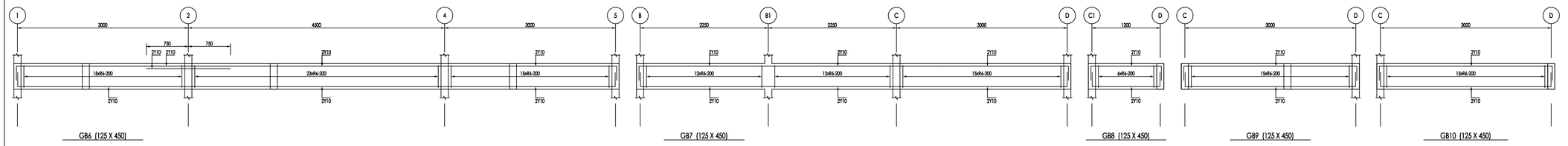
"I hereby certify that these works have been designed by me in accordance with sound engineering practice and that I take full responsibility for the design and proper performance of the same"

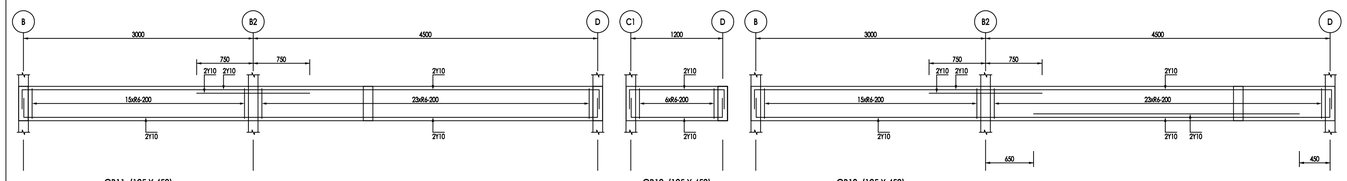
TAJUK LUKISAN : Drawing Title:

- LAYOUT & TYPICAL DETAILS
- COLUMN & FOUNDATION REINFORCEMENT SCHEDULE

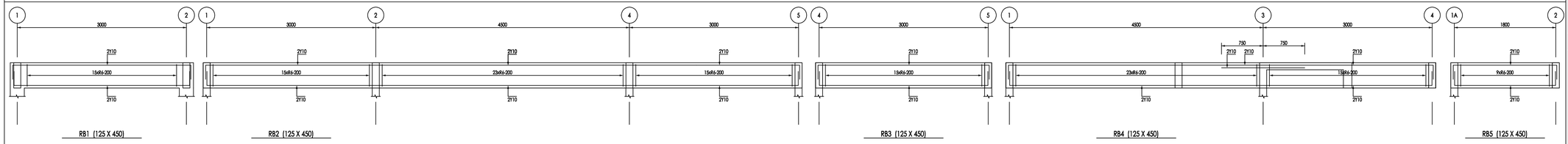
Drawing No :	SWAZMIX/ P2107/ S/ RC 01		
Drawn By	Afiq	Designed	Zainuddin
Checked	Ir. NIK MaT	Date	JAN 2022
Approved	Ir. Dr. Saffuan	Scale	1:100
REVISIONS	0 1 2 3 4 5 6 7 8 9 10		

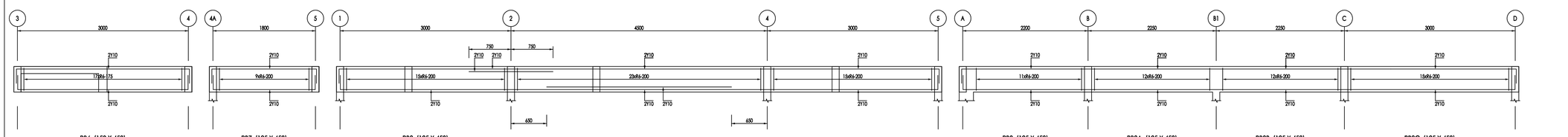


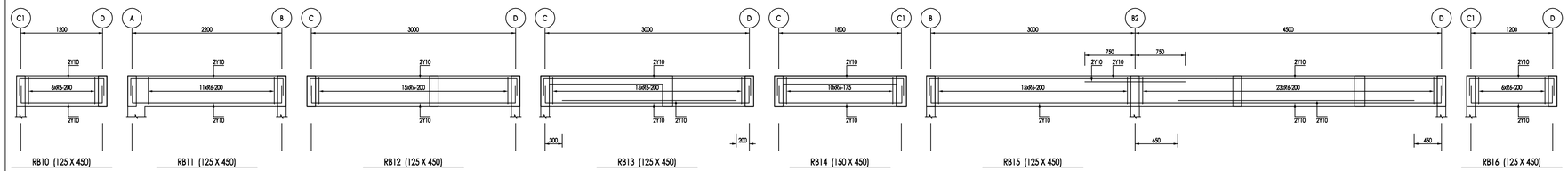


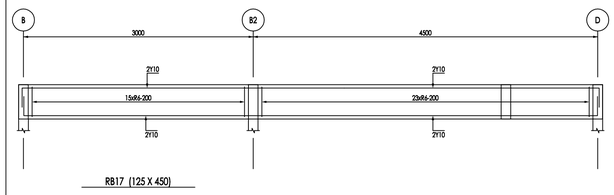


GROUND BEAM DETAILS
SCALE 1:40

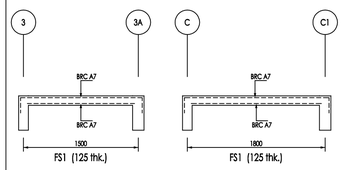








ROOF BEAM DETAILS
SCALE 1:40



ROOF LEVEL SLAB SECTIONS
SCALE 1:40

TAJUK PROJEK : Project title :

PERMOHONAN KELULUSAN PELAN BANGUNAN BAGI CADANGAN MEMBINA DAN MENYIAPKAN 1 UNIT BANGUNAN PEJABAT 1 TINGKAT DI ATAS LOT PT 6054 (HSD 9326), BANDAR SERI BANDI, MUKIM HULU CHUKAI, DAERAH KEMAMAN, TERENGGANU DARUL IMAN.

PEMILIK TANAH / BANGUNAN : Land / Building Owner :

LADANG RAKYAT TRENGGANU SDN. BHD.
KM1, JALAN CHERUL,
BANDAR CHENEH BAHARU,
24000 KEMAMAN,
TERENGGANU DARUL IMAN.

ARKITEK : Architect :

KUMPULAN PERUNDING (1988) SDN.BHD. 166318-V
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JURUTERA AWAM & STRUKTUR : civil & structural engineer :

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Email: swazmixconsultant@yahoo.com

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TAJUK LUKISAN : Drawing Title:

- BEAM DETAILS & SLAB SECTIONS

Drawing No :	SWAZMIX/ P2107/ S/ RC 02		
Drawn By	Afiq	Designed	Zainuddin
Checked	Ir. NIK MaT	Date	JAN 2022
Approved	Ir. Dr. Saffuan	Scale	1:100
REVISIONS	0 1 2 3 4 5 6 7 8 9 10		