



No. BSB/872/1/2007
(High Commission of India)
(Brunei Darussalam)

**NOTICE INVITING TENDER FOR SELECTING CONTRACTOR
FOR**

(Construction of Chancery, High Commissioner's Residence, Staff Residences and Auxiliary Facilities Building.)

The President of India acting through the **High Commission of India in Brunei Darussalam** requests proposals in sealed envelopes from appropriately qualified and adequately experienced Contractors for **Construction of Chancery, High Commissioner's Residence, Staff Residences and Auxiliary Facilities Building**. The proposal duly completed in prescribed format as per Notice Inviting Tender (NIT) along with Tender Security / Earnest Money Deposit (EMD) of (**B\$150,000.00**). The detailed tender document along with its annexure may be downloaded from Central Procurement Portal <https://eprocure.gov.in/cppp/> and also from the official website of the **High Commission of India, Brunei Darussalam** at <https://http://www.hcindiabrunei.gov.in>. Interested bidder may collect the tender drawings from the office of Head of Chancery, High Commission of India.

The objective of this Notice Inviting Tender is to select an appropriately qualified and adequately experienced Contractor by the **High Commission of India, Brunei** for **Construction of Chancery, High Commissioner's Residence, Staff Residences and Auxiliary Facilities Building**.

Location and description of Property: HCI, Brunei Darussalam at Lot 64081 and Lot 62514 at Kampong Jalan Kebangsaan in Bander Seri Begawan.

Scope of Work: Project comprises of Construction of Chancery building and High Commissioner's residence etc., associated external works and M&E services.

Period of Completion: The anticipated construction period is approximately 18 months for both Chancery building and High Commissioner's Residence.

Tender: The bidding will take place in single stage two (02) bids:

- (i) Technical Bid:** Qualification of firms as per eligibility criteria as per Notice Inviting Tender (NIT) would be assessed.
- (ii) Financial Bid:** Tender documents for submission of lump-sum financial bid.

Site visit & Bid meeting: Physical visit to the site is advisable to have a general idea about the extent of works required and the amount of involvement by the Contractor.

Submission: The proposals (bids) should be submitted in three (3) parts:

- (i) Tender Security / Earnest Money Deposit (EMD);** in the form of Bank Draft of Bank Guarantee which should be as per the format given in the tender.
- (ii) Technical Bid;** which should contain the documents establishing the technical eligibility of the applicant and other documents required establishing sound financial condition, as per terms & conditions of this tender; and
- (iii) Financial Bid;** which should contain the document establishing the Lump Sum Financial Bid of the applicants as per terms & condition of this tender. The last date of submission of sealed bids is (**2pm**) on (**21st February 2020**) in the office of **Amir Chand, Head of Chancery, High Commission of India, Baitussyifaa, Simpang 40-22, Jalan Sungai Akar, Bandar Seri Begawan BC 3915 (email ID: hoc.brunei@mea.gov.in, telephone No.: 2339947/2339685/2339751)** . Technical bids will be opened on (**2.30pm**) on (**25th February 2020**) in the (**Venue: High Commission of India, Baitussyifaa, Simpang 40-22, Jalan Sungai Akar, Bandar Seri Begawan BC 3915**). Financial Bids will be opened at notified time, date and place for qualified bidders from the Technical Bid.

Tender Documents will be issued to interested firms starting from 10th January 2020

- **Query Start Date :** 24th January 2020
- **Pre-Bid Conference :** 31st January 2020 (venue at High Commission of India, Brunei Darussalam)
- **Query End Date :** 07th February 2020
- **Submission Dateline :** 21st February 2020

From:

To

Head of Chancery
High Commission of India
Baitussyifaa
Simpang 40-22
Jalan Sungai Akar
Bandar Seri Begawan BC3915
Negara Brunei Darussalam

Dear Sir,

**PROPOSED CHANCERY, HIGH COMMISSIONER'S RESIDENCE, STAFF RESIDENCES
AND AUXILIARY FACILITIES BUILDING FOR THE HIGH COMMISSION OF INDIA,
BRUNEI DARUSSALAM**

Having examined the details given in the press notice and document for the above work / we hereby submit the eligibility application and relevant documents and information.

I / We hereby certify that all the statements made and information supplied in the enclosed forms 1 to 12 and accompanying statements are true and correct.

I / We have furnished all information and details necessary for eligibility and have no further pertinent information to supply.

I / We submit the requisite certified solvency certificate and authorize Head of Chancery, High Commission of India to approach the bank issuing the solvency certificate to confirm the correctness thereof. We also authorize The Head of Chancery to approach my / our bankers, individuals, employers, firms and corporations to verify my / our statements, competency and general reputation.

Date of submission:

Signature (s) of Bidders(s)

Enclosures:

Date of Submission:

Signature of Applicant(s)



*High Commissioner of India
Brunei Darussalam*

**PROPOSED CHANCERY, HIGH COMMISSIONER'S
RESIDENCE, STAFF RESIDENCES AND AUXILIARY
FACILITIES BUILDING FOR THE HIGH COMMISSION OF
INDIA, BRUNEI DARUSSALAM**

TECHNICAL BID DOCUMENT

ARKITEK REKAJAYA
Architects & Interior Designers

OTHMAN & ASSOCIATES
Civil & Structural Engineers

LKA KONSULT SDN BHD
Mechanical & Electrical Engineers

MRBC PARTNERSHIP
Quantity Surveyors

PTE159

JANUARY 2020

PART A

INSTRUCTIONS TO APPLICANTS

CONTENT

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1.0	Introduction	ITC/1
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1.0 Introduction

1.1 Tenderers will provide one loose bound set of technical bid document

1.2 The project comprises of Chancery building and Ambassador's residence etc., associated external works and M&E services. The anticipated construction period is approximately 18 months for Chancery, High Commissioner's Residence Staff Residences and Auxiliary Facilities Building

1.0A System of tendering:

1.01A The Bid shall be submitted in sealed envelopes as described below:-

- Envelope "A" Tender Security (Earnest Money Deposit)
- Envelope "B" Technical Bid Documents
- Envelope "C" Financial Bid Documents

And addenda or other enclosures as required in the tender.

1.02A The envelopes containing "A", "B" & "C" of offers shall be duly super scribed with Name of Work and above titles. Envelopes A, B and C to be put in another sealed envelope with the name of work written on top. The envelope "A" containing Tender Security (Earnest Money Deposit) shall be opened first. Bidders who have not submitted valid Tender Security (Earnest Money Deposit) as mentioned above shall be summarily rejected. Technical bids (Envelope B) of only those bidders who have submitted Tender Security (Earnest Money Deposit) shall be opened immediately thereafter. Both Bid Security and Technical bids envelopes shall be opened in presence of bidders or their representatives. After evaluation of Technical Bids, a list of qualified bidders will be prepared by the Employer. Qualified bidders will be informed and Financial bid (Envelope C) of qualified bidders shall then be opened at notified time, date and place in presence of bidders or their representatives.

1.0B Criteria for Eligibility: The following is the criteria for eligibility

- 1.01B** The applicant should have valid certificate of registration from the council of Registration of Contractor (Negara Brunei Darussalam) of Class Category 4, 5 or 6 for building projects. (refer also to Clause 8.1 (b)). (refer to Form 3 & 4)
- 1.02B** The applicant should have satisfactorily completed three similar works each costing not less than (B\$6.0M) or completed two similar works each costing not less than (B\$7.5M) or one similar work costing not less than (B\$12.0M) during the last 5 years ending last day of the month previous to the one in which bids were invited. The above costing is excluding VAT.
Similar work means - Building (constructed under single contract) of Reinforced Cement Concrete framed structures including all utility services such as Modern office buildings, Hotels, Shopping Malls, Embassies, apartments complex etc. Certificate for completed similar work in proforma D shall be referred. The work in which compensation has been levied for delayed completion shall not be considered for eligibility. Under the para (12) of performance report in proforma D, if any of the parameter has been graded fair or below for a work, that work shall not be considered for eligibility. (refer to Form 5)
- 1.03B** The applicant should have had average annual financial turn-over of (B\$5.0M) (excluding VAT) on Construction works during the immediate last three consecutive financial years. This should be duly audited by a Chartered Accountant. Year in which no turnover is shown would also be considered for working out the average. (refer to Form 2)
- 1.04B** Profit-Loss: The tenderer should not have suffered loss in more than two years in the previous five financial years and must not have suffered loss in the immediate preceding financial year. (refer to Form 2)
- 1.05B** The applicant should have Bank solvency of (B\$6.0M) excluding VAT certified by their banker. (refer to Form 1 & 2)
- 1.06B** The applicant should own construction equipment required for the proper and timely execution of work. Else, he should certify that he would be able to manage the equipment by hiring etc. and submit the list of firms from whom he proposes to hire. (refer to Form 8)
- 1.07B** The applicant should have sufficient number of Technical and Administrative employees for the proper execution of the contract. The applicant should submit a list of these employees who would be involved in this work. (refer to Form 7)
- 1.08B** The applicant should submit list of all completed works in the last 5 years and list of all works in hand. (refer to Form 5 & 6)
- 1.09B** Joint Venture (JV) firms formed specifically for this tender shall not be permitted. JV qualifying as a single entity i.e. JV meeting all eligibility criteria as above **1.01B** to **1.08B** like a single entity shall be permitted. JV partners meeting eligibility criteria on individual basis separately shall not be permitted.

1.0C Contract terms and conditions:

1.01C Condition of contract should be as per FIDIC Conditions of Contract 1999 first edition.

1.02C Earnest Money Deposit (EMD) – Earnest Money Deposit The applicant needs to submit Earnest Money Deposit (EMD) B\$150,000.00. This should be in the form of Bank draft or Bank Guarantee. Earnest money deposit of unsuccessful bidders would be returned on acceptance of lowest bid. The Earnest Money Deposit of successful bidder would be return on submission of performance security. Beneficiary shall be High Commission of India.

1.03C Retention Money (Refer Clause 14.3 & 14.9 of FIDIC): - This should be limited to 5% of the accepted tender amount. 5% of each Running bill will be deduct towards retention money. On completion, Retention money shall be released against Bank Guarantee of equal amount submitted by the contractor for the period of defect liability period i.e. one year.

1.04C Performance Security (Refer Clause 4.2 of FIDIC):- This will be equal to 5% of Accepted tender amount. This should be in the form of BG and should be valid up to stipulated date of completion. In case of time extension, the validity of Performance security BG should be extended up to extended date of completion.

1.05C VAT clause: The Lump sum quote from bidder to be exclusive of VAT.

1.06C Liquidated Damage (Refer Clause 8.7 & 8.4 of FIDIC):- It should be 0.5% per week limited to 10% of Accepted tender cost. This should be calculated on per day basis.

1.07C Payment against material (Secured Advance) (Refer Clause 14.5 plant and materials intended for the works) – Payment against nonperishable material brought at site but yet to be used in works should be allowed as advance payment and this should be adjusted only in Running bill of work done involving material (full or part) as consumed in works. This advance payment on material should be given without bank guarantee. In FIDIC this is 80% of the landed price of material. The FIDIC condition of payment against material up to 80% should be applicable. Also the work & payment schedule should be prepared keeping this provision in view.

1.08C Mobilisation advance / Advance payment (Refer Clause 14.2 of FIDIC):

- (i) The Mobilization advance limited to 10% of tendered amount.
- (ii) The mobilization advance shall be released only after obtaining a Bank Guarantee bond from a schedule bank for the amount of advance to be released and valid for the contract period. This shall be kept renewed time to time to cover the balance amount and likely period to complete recovery. The advance should be released in not less than two installments.
- (iii) It shall be ensured that at any point of time, valid Bank Guarantee is available for the amount of outstanding advance.
- (iv) The recovery of mobilization advance should be commenced after 10% of work is completed and the entire amount together with interest (if applicable) shall be recovered by the time 80% of the work is completed.
- (v) As per FIDIC condition the advance payment is interest free.

1.09C Arbitration / litigation (Refer Clause 20 of FIDIC): This should be as per FIDIC Condition. Jurisdiction would be of the local courts.

1.10C Delay in payment of Running Bill (Refer Clause 14.8 of FIDIC):- Employer would make payment of Running Bill (Payment of work done of all undisputed items) within the stipulated time but in case of delay no interest shall be paid by employer. Mission has been authorized to make payment of Running Bills of Contractor to avoid delay.

1.11C Escalation (Refer Clause 13.8 of FIDIC): No escalation on accepted tender cost should be permitted.

2.0 Technical Bid

2.1 The Technical Bid comprises of the following:-

PART A : INSTRUCTIONS TO APPLICANTS

PART B : REQUEST FOR APPLICANTS' INFORMATION

LETTER FROM BANK

FORM 1: Support Letter from Bank

FINANCIAL DATA

FORM 2: Financial Information

FORM 3: Particulars of Applicant's Background

FORM 4: Registration Data

TECHNICAL DATA

FORM 5: List of Similar Contracts Nature & Value B\$5 Million and above completed within the last five (5) years

FORM 6: List of Current Projects

FORM 7: Key Personnel under Present Employment

FORM 8: List of Plant/Equipments proposed for the Project

FORM 9: List of Works proposed to be sublet

FORM 10: Project Implementation Proposal

FORM 11: Dispute History

FORM 12: Quality Assurance and Health & Safety Competence

3.0 Submission of Technical Bid

3.1. Failure on the part of the Applicant to submit the original and all copies of the Technical Bid may result in his submission not to be evaluated.

3.2. In the case of the Technical Bid not being delivered by hand, the Applicant must arrange for his submission to be posted in time to reach the stipulated place not later than the closing date and time for the submission.

3.3. If the Technical Bid is received after the closing date and time for the submission as stated in Clause 3.4, it shall not be evaluated.

- 3.4 Applicants are to submit ONE (1) ORIGINAL and TWO (2) COPIES (stamped “Original” and “Copies”) of the Technical Bid duly completed including appendices and requested information. Additionally the Applicant shall provide ONE (1) ELECTRONIC COPY of the Appendices saved as Microsoft Word or Excel Formats and single PDF file in the form of a CD-ROM, and clearly marked “ELECTRONIC COPY”. In the event of discrepancy between them, the original hard copy shall prevail. Applicants are to deliver in a sealed envelope marked:-

“PRIVATE AND CONFIDENTIAL”

PROPOSED CHANCERY, HIGH COMMISSIONER’S RESIDENCE, STAFF RESIDENCES AND AUXILIARY FACILITIES BUILDING FOR THE HIGH COMMISSION OF INDIA, BRUNEI DARUSSALAM

To: Amir Chand
Head of Chancery
High Commission of India
Baitussayifaa, Simpang 40-22, Jalan Sungai Akar, Bandar Seri Begawan BC 3915

Not later than: **2.00 P.M on 21st February 2020**

4.0 Addendum

- 4.1. Prior to the date of submission, the Client may issue Addendum to clarify or modify the Technical Bid in part or in whole.
- 4.2. Every Addendum issued will be distributed to the Applicant. Receipt of each Addendum must be acknowledged on the form issued with the Addendum.

5.0 Expenses Incurred in Submission

- 5.1. The Client will not reimburse any expenses incurred by the Applicant in the preparation and submission of the Technical Bid and any subsequent interviews that may be required by the Client.

6.0 Secrecy of Information

- 6.1. All information, documents and transmittals issued or generated by the Client and / or its representative during the course shall be treated as confidential and shall not be transmitted to any third party without prior written approval of the Client and / or its representative.

7.0 Documents Submission

- 7.1 The Applicant shall fully complete and submit the Technical Bid identified in the “Request For Applicant’s Information” which shall contain the following:-

a) **Letter from Bank**

Form 1: Support Letter from Bank(s)

The Applicant shall submit a letter from their bank(s) indicating the credit facilities that would be made available to the Applicant should the Applicant be awarded the contract.

b) **Financial Data**

Form 2: Financial Information

The Applicant shall submit proof of financial capabilities to undertake the Works in the format given in Form 1, Part B, which shall include but not limited to the following:-

- i.) copies of the Applicant’s audited financial statement for the past five (5) years.
- ii.) copies of the Applicant’s bank statements for the past six (6) months.

Form 3: Particulars of Applicant’s Background

The Applicant shall give particulars of his background in the format given in Form 2 Part B.

Form 4: Registration Data

The Applicant shall attach proof of registration under the Companies Act.

c) **Technical Data**

Form 5: List of Similar Contracts Completed

The Applicant shall list similar contracts nature and value above B\$5 million completed within the last five (5) years. The Applicant shall provide documents inclusive of Letter of Award / Acceptance, Certificate of Practical Completion, testimonial letters from previous client / employer to show proof on successful completion of the said projects.

Form 6: List of Current Projects

The Applicants shall provide the list of projects currently undertaken with the following information:-

- Project name
- Location
- Client / employer
- Type of Interior
- Designer
- Contract value
- Start and Anticipated completion date
- Current progress

Form 7: Key Personnel under Present Employment

The Applicant shall provide curriculum vitae (CV) of key personnel under present employment.

Form 8: List of Plant / Equipments proposed for the Project

The Applicant shall provide a list of their plant / equipment proposed to be used for this Project and shall include the following:-

- capacity
- no of units
- owned or leased

Form 9: List of Works proposed to be sublet

The Applicant shall provide a list of works proposed to be sublet.

Form 10: Project Implementation Proposal

The Applicant shall provide proposals for the following:-

- Project organization chart for this Project including **curriculum vitae (CV)** of key personnel and **labour quota** available.
- Any other proposal relevant to this submission.

Form 11: Dispute History

The Applicant shall provide information on the history of litigation or arbitration resulting from services or projects executed in the last ten (10) years or currently in progress if any

Form 12: Quality Assurance and Health & Safety Competence

The Applicant shall attach proof of Quality Assurance and Health & Safety Competence

8.0 Minimum Requirements

8.1. Only Applicants who comply with the following requirements will be considered for further evaluation

- a) Submission of Letter of Support from the Applicant's Bank(s).
- b) Local Participation: local Bruneian construction companies registered with the Ministry of Development Brunei with Class 4, 5 and 6 registration. All copies of registration certificates shall be submitted.
- c) Submission of Financial Statement by the Applicant for proof of financial capability to support the contract.
- d) Applicant must possess the relevant experience and has successfully completed the similar works of not less than B\$12 million per single contract in the last five (5) years.

9.0 Technical and Financial Capability

9.1. Assessment of Technical Capability shall be based on the following criteria:-

- a) Organisational Set-up including **curriculum vitae (CV)** of key personnel
- b) List of Similar Contracts and nature value above B\$5 million completed
- c) List of Current Projects
- d) List of Plant / Equipments
- e) Project Implementation Proposal

9.2. Assessment of Financial Capability shall be based on the following criteria:-

- a) Net Worth / Contract Sum
- b) Current Ratio (Current Asset / Current Liabilities)
- c) Applicants Available Funds / Facilities
- d) Turnover / Contract Sum

10.0 Client's Right to Change

10.1 The Client in its absolute discretion reserves the right to:

- a) Amend the scope of the Works for which Tenders are to be invited, in which event the scope of the Works will only be tendered among those Applicants that meet the requirements of the scope as amended;
- b) Amend any timeline stated within this Technical Bid;
- c) Reject or accept any responses; and
- d) Cancel the Technical Process and reject all responses.

The Client will not be liable for any actions nor be under any obligation to inform the Applicant of the reasons for such actions.

11. Notification of Selection

11.1 Applicants will be advised by email of the results of the Technical Bid without assigning any reason for the Client's decision.

12. Disclaimer

12.1 The Client will not be held responsible for any loss, injury or damages suffered by the Applicant or their employees or their agents in preparing the Technical Bid or for any action whatsoever taken by a third party for any costs, loss, injury or damages suffered as a result of, or consequential to, the preparation of the Technical Bid.

12.2 This Technical Bid does not constitute an offer from the Client. Further, the Client is under no obligation to respond to any enquiries it receives and reserves the right not to follow up on any Technical Bid at its sole discretion and without explanation.

13. Joint Venture (JV)

13.1 Joint Venture (JV) firms formed specifically for this tender shall not be permitted. JV qualifying as a single entry i.e JV meeting all eligibility criteria as above 3.1 to 3.8 like a single entity shall be permitted. JV partners meeting eligibility criteria on individual basis separately shall not be permitted.

PART B

REQUEST FOR APPLICANTS' INFORMATION

CONTENT

ITEM	DESCRIPTION
FORM 1	Support Letter from Bank
FORM 2	Financial Information
FORM 3	Particulars of Applicant's Background
FORM 4	Registration Data
FORM 5	List of Similar Contracts and Nature Value B\$5 Million and above completed within the last five (5) years
FORM 6	List of Current Projects
FORM 7	Key Personnel under Present Employment
FORM 8	List of Plant/Equipments proposed for the Project
FORM 9	List of Works to be sublet
FORM 10	Project Implementation Proposal
FORM 11	Dispute History
FORM 12	Quality Assurance and Health & Safety Competence

FORM 1 – LETTER OF SUPPORT FROM BANK

(This format is to be typed on the Bank's official letter head)

To:

High Commission of India
Baitussyifaa
Simpang 40-22
Jalan Sungai Akar
Bandar Seri Begawan BC3915
Negara Brunei Darussalam

Dear Sir,

**PROPOSED CHANCERY, HIGH COMMISSIONER'S RESIDENCE, STAFF
RESIDENCES AND AUXILIARY FACILITIES BUILDING FOR THE HIGH
COMMISSION OF INDIA, BRUNEI DARUSSALAM**

We, [Name of Bank] are pleased to advise that [Name of Applicant] has been a customer of our bank since _____. [Name of Applicant] is currently enjoying a total credit facilities of Brunei Dollars _____ (B\$ _____). We have found [Name of Applicant] to be credit worthy and are pleased to support them in their business.

We also confirm that we will be prepared to consider any application made by [Name of Applicant] for additional credit facilities should [Name of Applicant] be awarded the contract.

Yours faithfully,

For and on behalf of

[Name of Bank]

[Name]

[Designation]

FORM 2 – FINANCIAL INFORMATION*

ITEM	DESCRIPTION	B\$ (BRUNEI DOLLARS)		
		201...	201...	201...
1.	Current Assets			
2.	Fixed and Other Assets			
3.	Current Liabilities			
4.	Other Liabilities			
5.	Authorised Capital			
6.	Paid Up Capital			
7.	Net Worth (1 + 2) – (3 + 4)			
8.	Working Capital (1-3)			
9.	Current Asset Ratio			
10.	Profit / (Loss) After Tax			
11.	Contingent Liability			
12.	Overdraft / Credit Facilities			
13.	Suppliers Credit			
14.	Facility / Fund Available (8+12+13)-11			
15.	Turnover			

NOTE*

The Applicant must submit with his Tender certified audited copies of the Applicant's financial account statements for the past three (3) years, and copies of the Applicant's bank statements for the past six (6) months.

FORM 2 – FINANCIAL INFORMATION* (Cont'd)

NAME OF INSTITUTION	CREDIT FACILITIES

Value of Contract for which the company could tender:

Maximum (B\$)

Minimum (B\$)

.....

.....

FORM 3 – PARTICULARS OF APPLICANT’S BACKGROUND

A. IDENTIFICATION

1. Company’s Name :

2. Year Organised :

3. Type of Organisation :

4. Office Address :

5. Capital :
 1. Authorised :

 2. Paid-up :

6. Telex / Telephone No. :

7. Status
(Local / International) :

8. Date of First Registration :

FORM 3 – PARTICULARS OF APPLICANT’S BACKGROUND (Cont’d)

A. IDENTIFICATION (Cont’d)

9. Details or Upgrading :
- 1. Date Class Category Specialization
 - 2. Date Class Category Specialization
 - 3. Date Class Category Specialization
 - 4. Date Class Category Specialization

10.** Names of Directors / Shareholders / Partners (state whether Chairman, Managing Director, Director, Shareholder or Partner giving address):

Name	Address	Designation	Shares %
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NOTE**
Attach Memorandum and Articles Of Association, Deeds of Partnership or other relevant document or if appropriate, excerpts from such documents.

FORM 3 – PARTICULARS OF APPLICANT’S BACKGROUND (Cont’d)

B. PERSONNEL

Number of Engineers, Quantity Surveyors, Architects and Work Supervisors employed at present. The Applicant shall provide the **curriculum vitae (CV)** of personnels

	Local	International
1. Number of:		
a) Architects :
b) Engineers :
c) Quantity Surveyors :
2. Number of Supervisory Personnel (excluding those Stated in 1 above) :
3. State or enclose any other details or information which you consider to be useful.		
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FORM 4 – REGISTRATION DATA

The Applicant shall attach proof of registration under the Companies Act.

FORM 5 – LIST OF SIMILAR CONTRACTS NATURE & VALUE B\$5 MILLION AND ABOVE COMPLETED WITHIN THE LAST FIVE (5) YEARS

Applicant shall provide below the particulars of all similar contracts completed within the last ten years.

DESCRIPTION AND LOCATION OF PROJECT	CLIENT	CONTRACT VALUE (B\$)	CONTRACT COMMENCEMENT DATE	CONTRACT COMPLETION DATE	ACTUAL COMPLETION DATE

The Applicant shall provide documents inclusive of Letter of Award / Acceptance, Certificate of Practical Completion, testimonial letters from previous client / employer to show proof on successful completion of the said projects. Please attach additional sheet if space provided is insufficient.

FORM 7 – KEY PERSONNEL UNDER PRESENT EMPLOYMENT

The Applicant shall provide the **curriculum vitae (CV)** of personnels

NAME	QUALIFICATION	PRESENT POSITION	EXPERIENCE	
			NO. OF YEARS	CAPACITY

FORM 8 – LIST OF PLANT / EQUIPMENTS PROPOSED FOR THE PROJECT

DESCRIPTION	CAPACITY	NOS	OWNED	HIRED / LEASED

FORM 9 – LIST OF WORKS PROPOSED TO BE SUBLET

DESCRIPTION OF WORKS	PROPOSED SUB-APPLICANT

FORM 10 – PROJECT IMPLEMENTATION PROPOSAL

PROJECT ORGANISATION ORGANIZATION CHART FOR THIS PROJECT – KEY PERSONNEL PROPOSED FOR THE PROJECT (INCLUDING NEW PERSONNEL INTENDED TO BE EMPLOYED)

The Applicant shall provide the organization setup chart including **curriculum vitae (CV)** of key personnels and **labour quota** available

NAME	QUALIFICATION	PRESENT POSITION	EXPERIENCE	
			NO. OF YEARS	CAPACITY

FORM 10 – PROJECT IMPLEMENTATION PROPOSAL (Cont'd)

PROPOSED LOGISTICS AND METHOD STATEMENT

ITEM	DESCRIPTION

PART B
REQUEST FOR APPLICANTS' INFORMATION

FORM 11 : DISPUTE HISTORY

YEAR	AWARD FOR OR AGAINST APPLICANT	NAME OF OWNER/ EMPLOYER, CAUSE OF LITIGATION / MATTER IN DISPUTE	DISPUTED AMOUNT B\$

PART B
REQUEST FOR APPLICANTS' INFORMATION

FORM 12 – QUALITY ASSURANCE AND HEALTH & SAFETY COMPETENCE

The Applicant shall attach proof of Quality Assurance and Health & Safety Competence.

FORM 6 - LIST OF CURRENT PROJECTS

Applicant shall provide below the particulars of all current projects being undertaken					
DESCRIPTION AND LOCATION OF PROJECT	CLIENT	CONTRACT VALUE (B\$)	CONTRACT COMMENCEMENT DATE	CONTRACT COMPLETION DATE	CURRENT PROGRESS

The Applicant shall provide documents inclusive of Letter of Award / Acceptance of the said projects. Please attach additional sheet if space provided is insufficient.

(High Commission of India)
(Brunei Darussalam)

**NOTICE INVITING TENDER FOR SELECTING CONTRACTOR
FOR
(Construction of Chancery, High Commissioner's Residence, Staff Residences and Auxiliary Facilities Building.)**

Bank Guarantee Proforma for Earnest Money Deposit

Bank Guarantee No.....

Brief description of contract: *Construction of Chancery, High Commissioner's Residence, Staff Residences and Auxiliary Facilities Building.*

Name and Address of Beneficiary: *High Commission of India, Brunei Darussalam, Baitussyifaa, Simpang 40-22, Jalan Sungai Akar, Bandar Seri Begawan BC 3915*

Date:

Whereas M/s (*Name of Contractor with address*) have submitted their tender for *Construction of Chancery, High Commissioner's Residence, Staff Residences and Auxiliary Facilities Building.* at *Bandar Seri Begawan* for **High Commission of India, Brunei Darussalam** and one of the tender conditions is for the M/s (*Name of Contractor with address*) to submit a Bank Guarantee for Earnest Money Deposit amounting **B\$ 150,000.00**. In fulfillment of the tender conditions, we, (*Name of Bank with address*) hereby irrevocably and unconditionally undertake to pay to you within three working days of receipt of your first written demand, without any demur whatsoever and without seeking any reasons, whatsoever, up to the maximum aggregate amount of **B\$ 150,000.00**.

2. This guarantee is valid for a period of 180 (One hundred and eighty) Days and any claim and statement hereunder must be received at the above mentioned office before expiry. After expiry, this guarantee shall become null and void whether returned to us for cancellation or not and any claim or statement received after expiry shall be ineffective.

3. Notwithstanding anything to the contrary contained hereinabove, the maximum liability under this guarantee is restricted to **B\$ 150,000.00**.

4. Notwithstanding anything to the contrary contained hereinabove, this guarantee is valid from (*date of issue*) up to the (*date after 180 days from date of issue*) and claims under this guarantee should be submitted not later than (*date after 180 Days from date of issue*).

5. This guarantee may not, without our prior written consent, be transferred or assigned and this guarantee is limited to the payment of a sum of money.

6. This guarantee shall be governed and construed in accordance with the laws of the **Brunei Darussalam** and is governed by the United Rule for Demand Guarantee(URDG) (ICC Publication No.758) and shall be subject to exclusive Jurisdiction of the **Brunei Darussalam** Courts.

Date:
Name:

Place:
Signature:

(High Commission of India)
(Brunei Darussalam)

**NOTICE INVITING TENDER FOR SELECTING CONTRACTOR
FOR
(Construction of Chancery, High Commissioner's Residence, Staff Residences and Auxiliary Facilities
Building.)**

Bank Guarantee Proforma for Performance Security

Bank Guarantee No.....

Brief description of contract: *Construction of Chancery, High Commissioner's Residence, Staff Residences and Auxiliary Facilities Building.*

Name and Address of Beneficiary: *High Commission of India, Brunei Darussalam, Baitussyifaa, Simpang 40-22, Jalan Sungai Akar, Bandar Seri Begawan BC 3915*

Date:

Whereas M/s (Name of Contractor with address) have submitted their tender for *Construction of Chancery, High Commissioner's Residence, Staff Residences and Auxiliary Facilities Building*. at *Bandar Seri Begawan* for **High Commission of India, Brunei Darussalam**, and one of the tender conditions is for the M/s (Name of Contractor with address) to submit a Bank Guarantee for Performance Security (5% of tendered cost) amounting to (*5% of the tendered cost*). In fulfilment of the tender conditions, we, (Name of Bank with address) hereby irrevocably and unconditionally undertake to pay to you within three working days of receipt of your first written demand, without any demur whatsoever and without seeking any reasons, whatsoever, up to the maximum aggregate amount *calculated as 5% of the tendered cost*).

2. This guarantee is valid for a period of ___ Days and upto (**date should be two months after the date of completion of work**) and any claim and statement hereunder must be received at the above mentioned office before expiry. After expiry, this guarantee shall become null and void whether returned to us for cancellation or not and any claim or statement received after expiry shall be ineffective.

3. Notwithstanding anything to the contrary contained hereinabove, the maximum liability under this guarantee is restricted to *5% of the tendered cost of B\$*)

4. Notwithstanding anything to the contrary contained hereinabove, this guarantee is valid from (**date of issue**) up to the (**date should be two months after the date of completion of work**) and claims under this guarantee should be submitted not later than (**from date of expiry**).

5. This guarantee may not, without our prior written consent, be transferred or assigned and this guarantee is limited to the payment of a sum of money.

6. This guarantee shall be governed and construed in accordance with the laws of the **Brunei Darussalam** and is governed by the United Rule for Demand Guarantee(URDG) (ICC Publication No.758) and shall be subject to exclusive Jurisdiction of the **Brunei Darussalam** Courts.

Date: Place:

Name: Signature:



*High Commissioner of India
Brunei Darussalam*

**PROPOSED CONSTRUCTION OF CHANCERY, HIGH
COMMISSIONER'S RESIDENCE, STAFF RESIDENCES AND
AUXILIARY FACILITIES BUILDINGS
FOR THE HIGH COMMISSION OF INDIA
BRUNEI DARUSSALAM**

**FINANCIAL BID DOCUMENT
(VOLUME 1 OF 2)**

ARKITEK REKAJAYA
Architects & Interior Designers

OTHMAN & ASSOCIATES
Civil & Structural Engineers

LKA KONSULT SDN BHD
Mechanical & Electrical Engineers

MRBC PARTNERSHIP
Quantity Surveyors

PTE159

January 2020

INSTRUCTIONS TO TENDERER

1. Tenderers will provide with as follows:
 - (a) One loose bound set of tender documents and,
 - (b) One set of tender drawings.
 - (i) The Earnest Money Deposit (EMD) (submitted at Technical bid) will retain as on opening of Financial Bid and will be returned for unsuccessful bidder on acceptance of lowest price.
 - (ii) For successful bidder, EMD will be returned on received of irrevocable unconditional performance bond in the form of Banker's Guarantee.
 - (iii) In case the bidder withdraw their bid before the expiry of the validity, or before issue of letter of acceptance, or makes modification in the terms & conditions of the tender, his EMD will be forfeited.
 - (iv) If the lowest bidder fails to furnish the prescribed Performance Guarantee, or fails to sign the agreement in time, or fails to respond to request, or fails to provide required information (non-responsive), his EMD will be forfeited automatically without any notice.
 - (v) In case the Contractor fails to commence the work on commencement date as specified in the contract document, the Employer without prejudice to any right or remedy, be at liberty to forfeit whole of the EMD or Performance Guarantee as the case may be.
2. Tenderers are to deliver the tender in sealed envelopes marked:-

PRIVATE AND CONFIDENTIAL

TENDER FOR :

PROPOSED CONSTRUCTION OF CHANCERY, HIGH COMMISSIONER'S RESIDENCE, STAFF RESIDENCES AND AUXILIARY FACILITIES BUILDINGS FOR THE HIGH COMMISSION OF INDIA, BRUNEI DARUSSALAM

TO :

**AMIR CHAND
HEAD OF CHANCERY
HIGH COMMISSION OF INDIA
BAIUSSAYIFAA, SIMPANG 40-22
JALAN SUNGAI AKAR
BANDAR SERI BEGAWAN BC3915
BRUNEI DARUSSALAM**

not later than 2.00 p.m. on **21st February 2020**

Instructions to Tenderer

3. The tender documents shall be Form of Tender, these instructions to Tenderer, Appendices, the Articles of Agreement and Conditions of Contract, Specifications, Bills, Schedules and Drawings.
4. All tenders submitted shall remain open for consideration for One Hundred and Eighty Days (180) days (validity period) from the final date for submission of tenders and no tenderer may withdraw his tender within that period. In Case the tender is not decided towards the end of validity period, the Employer may request the tenderer to extend the validity for another 180 days for the tender and EMD. If tenderer withdraws his offer after such extension, the Employer shall be at liberty to forfeit the EMD absolutely.
5. Tenderers are advised that amounts inserted in the Summary and rates priced in the bill section must correctly reflect the cost of the works. If during evaluation of tenders and in the Quantity Surveyor's opinion, amounts do not correctly reflect the cost of the particular section of works or rates do not correctly reflect the cost of the particular item the tender may be rejected or considered for acceptance subject to adjustment to provide a more equitable distribution of cost. **THE TOTAL TENDER SUM FOR THIS TENDER IS A LUMP SUM FIXED PRICE TENDER (Exclusive of All Taxes and Levied Duties).** No Conditional tender will be accepted.
6. Tenderers are required to acquaint themselves with all matters relating to the proposed contract prior to submitting their tenders and are advised to study / examine the drawings, bills and the scope of work carefully at his own expense and responsibility
7. Should tenderers find any discrepancy, error or omission in the tender documents, they shall notify the Architect / S.O. immediately.
8. Tenderers are to submit with their tender, detailed programmes showing their proposals for achieving the completion of this project within the specified and their proposed times, all in accordance with the requirements of the tender documents.
9. Any amendment / alteration to tender document by the bidder will not be considered valid.
10. Tenderers are instructed to treat this tender as strictly confidential and not reveal anything about this tender either to the public or to the press.
11. Tenderers are to bear all expenses incurred in the preparation of this tender.
12. The Employer is not bound to accept the lowest or any tender.
13. The tender shall be deemed to have been calculated on a firm price basis and not subject to any price fluctuation in cost of materials, labour, plant, etc. Prime Cost and Provisional Sums are subject to actual expenditure, and no claim arising from re-measurement (except for variation / instruction / provisional quantity if any).

14. The prices entered in the Bills shall, except in so far as it is otherwise provided, be deemed to cover all the contractor's obligations under the contract and all matters and things necessary for the proper execution and completion of the works.
15. Mechanical & Electrical Services installation shall be carried out by qualified Mechanical & Electrical Contractor registered with Department of Electrical Services / Ministry of Development. Certificate of Registration is to submit with the tender.
16. Measurement of the project in the form of Bills of Quantities will be included in the document as **guidance** to the tenderers only. The tenderer shall make his own assessment from all drawings issued at the time of tendering before submitting the tender to satisfy himself as to the actual quantum / value of the works required under the contract and allow accordingly. **Any discrepancies between drawing and Bill of Quantities, the drawings shall take precedence. No additional claims for misinterpretation of this clause will be entertained.** The unit rates inserted in the Bills of Quantities will however constitute rates for pricing all variations arising from Architect's Instructions. Should there be any additions, omissions or substitution of any works to which the unit rates cannot be fairly applied, this work will then be measured and valued in accordance with the conditions of contract.
17. The Bills of Quantities should be read and priced in conjunction with tender drawings and specification. Prices shall include all works shown on drawings and / or bills.
18. Tenderer is to price all items in the bills. If any item is not priced it shall be deemed to be included in the other rates / prices in the bills.
19. The 'Superintending Officer' shall be Arkitek RekaJaya.
20. Variation in the project shall be with the approval of the Employer. The rate quoted in BOQ shall be used for variations if there are any changes in Employer's requirement and scope of works and/or any items finish specified in the finalised Contract is required to be changed by the Employer. Other than this there shall not be any variation entertained whatsoever. Further variations shall be deducted / added at the rates provided in the BOQ.
21. The period of completion is 18 months from the date of works commencement.
22. Only the Engineer-in-Charge / SO has the right to award EOT on approval by the Employer (Mission / Ministry).
23. Sub-Contracting shall only be allowed for specialist works. No part of interior and civil works are allowed to be sub-contracted.
24. The Form of Tender with suitable entries made in the blank spaces must be signed by a person authorised to sign the Tender and shall be dated.

25. Decision on bid will be taken based only on the final price quoted on the Form of Tender. Lump sum Fixed Price / Amount as quoted in the Form of Tender shall be the basis for deciding the tender quote.

If amount quoted on the Form of Tender is more than amount worked out on Schedule of Quantity, the rates on Schedule of Quantity shall not be altered / adjusted. If amount quoted on the Form of Tender is less than amount worked out on Schedule of Quantity, the rates on the Schedule of Quantity shall be adjusted in the ratio to match with quoted final price on the Form of Tender.

26. The Contractor shall maintain the irrevocable unconditional Performance Guarantee at the full amount until the completion of the works or project. If the Contractor fail to maintain the Performance Guarantee in the full amount, the Employer may be registered letter sent to the Contractor, terminate his employment under the contract without necessity for any legal or other formality or reference to judicial proceedings.
27. At any time prior to the date of opening of the tender, the Employer / Ministry may issue an addendum in writing to all tenderer deleting, varying or extending any item.

Unless it is in formal manner described above, any representation or explanation to the tenderer shall not be considered valid or binding on the Employer as to the meaning of anything connected with the Tender Document.

The date and time for submission may be differed by an official notification in writing issued by the Employer to all tenderer. Tenders received after this date will not be considered.

28. Tenderer may be disqualified for any reason including, but not limited to the following:
- a) If a tenderer sets forth any conditions which are unacceptable to the Employer
 - b) If any tender is submitted under a name other than the name of the individual firm partnership or corporation on that was issued the tender document
 - c) If there is evidence of collusion between tenderer
 - d) If tender sets forth any offer to conditionally discount, reduce or modify its tender
 - e) If tender price is disclosed before opening of the tender
29. All payment shall be released as progress payments on the basis of certificate signed by the Mission / Authorised representative of the Employer. Contractor is to furnished detailed work schedule and payment schedule to Employer for approval before forms part of the agreement. All permissible deduction shall be affected during the Progress Payment.

FORM OF TENDER

TENDER FOR

PROPOSED CONSTRUCTION OF CHANCERY, HIGH COMMISSIONER'S RESIDENCE, STAFF RESIDENCES AND AUXILIARY FACILITIES BUILDINGS FOR THE HIGH COMMISSION OF INDIA, BRUNEI DARUSSALAM

TO :

**AMIR CHAND
HEAD OF CHANCERY
HIGH COMMISSION OF INDIA
BAITUSSAYIFAA, SIMPANG 40-22
JALAN SUNGAI AKAR
BANDAR SERI BEGAWAN BC3915
BRUNEI DARUSSALAM**

Gentlemen

1. Having examine the Drawings, Articles of Agreement, Conditions of Contract, Contract Bills, Specification, Schedules and Appendices, we, the undersigned offer to contract for and perform the whole of the Works as are detailed all in accordance with the Tender Documents, for a Lump Sum Fixed Price of Brunei Dollars as stated on the MAIN SUMMARY (MS/1) for High Commissioner's Residence, Chancery, Staff Residences & Auxiliary Facilities Buildings _____
_____ (B\$ _____)

NOTE: The above Lump Sum Fixed Price tender exclusive of all taxes and all legal connection charges

2. We undertake if this Tender is accepted:
- (a) to complete and deliver into your hands the said Works for High Commissioner's Residence, Chancery, Staff Residences & Auxiliary Facilities Building for Eighteen (18) months from the date of order to commence work;
 - (b) that we will execute an Agreement in the form incorporated in these Tender Documents;
 - (c) that, notwithstanding that such Agreement shall not have been executed, we will commence work as comprised in this Contract within two weeks of the receipt by us of the order of the Architect to commence work.

3. If this Tender is accepted we will provide sufficient sureties or obtain the **IRREVOCABLE UNCONDITIONAL** guarantee of a Bank to be jointly and severally bound with us in a sum of Five Percent (5%) of the total value of the Contract for the due performance of the Contract (see Appendix A sample of document). We propose for your approval as Surety the following Bank:

Full Title of Bank

Address

who have signified their willingness to act.

4. Should any mathematical errors or pricing errors be found in our Bills resulting in either a net addition to, or a net deduction from the said Tender Amount, We agree to the method of percentage adjustment as prescribed. In any case we agree to abide by the Tender Amount as referred to in paragraph 1 above.
5. We agree to abide by this Tender for a period of 180 days from the date of submission of same and it shall remain binding upon us and may be accepted at any time before the expiration of the said period.
6. We agree that unless and until a formal agreement is prepared and executed this Tender together with your acceptance thereof, shall constitute a binding contract between us.
7. We agree that we are not entitled to claim for losses or additional expenses caused by delay beyond your control.

8. We understand that you are not bound to accept the lowest or any tender.

Date this _____ day of _____ 20 _____

Signature _____ in the capacity of _____

duly authorised to sign tenders for and on behalf of _____

(In Block Letters)

Witness's Name _____

Signature _____

Address _____

Occupation _____

APPENDIX I

(Referred to as the Appendix in the Conditions of Contract)

Particular Interpretations

Defects Liability Period
(from the day named in the
Certificate of Practical
Completion of the Works)

Twelve (12) Months

Minimum Amount of Third
Party Insurance

Limit B\$1,000,000.00 any
one accident. Number of
accidents unlimited

Date for Possession

Date for Completion

Liquidated and Ascertained
Damages

0.5% per week limited to 10%
of Accepted Tender Cost will
be computed from day to day
basis

Extension of Time

By the Engineer-in-Charge after
approval of the Employer

(Referred to as the Appendix in the Conditions of Contract)

Particular Interpretations

Advance Payment Recovery	Refer to Clause 14.2 _____
Value of Works to be done before Interim Certificates will be certified	At the discretion of the Engineer / S.O. (minimum 4% of total Contract Value) _____
Period for Honouring of Certificates	Thirty (30) Days _____
Percentage of total value of materials on site to be certified	Eighty Percent (80%) _____
Percentage of Certified value retained	Five Percent (5%) _____
Limit of Retention Fund	Five (5%) Percent of Contract Sum from each running account build up to DLP _____
Period of Final Measurement and Valuation (from the day named in the Certificate of Practical Completion of Works)	Six (6) Months _____
Banker's Guarantee	Five (5%) Percent of Contract Sum & to be release on final payment after completion of project _____

LIST OF PREVIOUS EXPERIENCE

The Tenderer shall detail below past experience on works of a similar nature.

Item	Name of Job/ Owner/ Nature of Works	Contract Sum	Scheduled Construction Time	Actual Construction Time	Architect

Note: This supplementary information is for assisting the S.O./ Architect in compiling the Contract recommendation and will be treated as a minimum requirement.

Signature of Tenderer

Signature of Witness

Address

Address

Date

Date

SCHEDULE OF TECHNICAL SITE STAFF AVAILABLE FOR THE PROJECT

Each Tenderer is to enter below his staff available for the project.

Category	Number	When Starting	When Finishing	Remarks
Engineers				
Assistants to Last				
Land Surveyors				
Quantity Surveyors				
Assistants to Last				
Site Agent				
Foreman				

Note: This supplementary information is for assisting the S.O./ Architect in compiling the Contract recommendation and will be treated as a minimum requirement. If so required the S.O./ Architect reserves the right to request for additional technical site staff from time to time at no extra cost.

Signature of Tenderer

Signature of a Witness

Address _____

Address _____

Date _____

Date _____

**SCHEDULE OF ANTICIPATED IMMIGRANT CRAFTSMEN
AND LABOUR REQUIREMENTS**

Each Tenderer shall detail below his anticipated immigrant craftsmen and labour requirements for the project. This information is required for central planning purpose only and does not bind the Contractor or the Government of Negara Brunei Darussalam in any way.

Tenderer's Current Licence to employ Immigrant Labour – Number _____

Description	Anticipated Number Required
Labourer Concretor Steel Bender Mason Drainlayer Carpenter Steelworker Welder Electrician Plumber Painter Driver Mechanic Plant Operator (Any classification not included above) _____ _____	

Note: This supplementary information is for assisting the S.O./ Architect in compiling the Contract recommendation and will be treated as a minimum requirement.

Signature

Signature of Witness

Address

Address

Date

Date

**SENARAI KERJA-KERJA YANG SEDANG DIBUAT DI-BRUNEI
DARUSSALAM
(DI-ISIKAN OLEH SEMUA PEMBORONG DAN DI-KEMBALIKAN BERSAMA
DENGAN BORANG TAWARAN)**

*List of Current Jobs in Negara Brunei Darussalam
(To be filled up by contractors and returned together with the form of tender)*

No.	Nama Projek (Name of Project)	Letak (Location)	Harga (Cost)	Tarikh Siap (Date Completed)	% Kerja yang telah diBuat (% Completed)

Tandatangan Saksi:
Signature of Witness:

Tandatangan Pemborong:
Signature of Tenderer:

Tarikh:
Date _____

Tarikh:
Date _____

SENARAI KERJA2 YANG AKAN DI-SUB-CONTRACT
(Proposed List of jobs to be Sub-Contracted)

Bil. No.	Kerja-Kerja (Works)	Kapada (To)	Ulasan (Remarks)

Tandatangan Saksi:
Signature of Witness:

Tandatangan Pemborong:
Signature of Tenderer:

Tarikh:
Date _____

Tarikh:
Date _____

MAKLUMAN MENGENAI DENGAN PENGGUNAAN QUOTA BURUH
(Information on the Distribution of Approval Labour Quota)

No. Quota Buruh yang telah di-benarkan: _____
(Quota number approved)

Tarikh: _____
(Date of approval)

Jumlah di-benarkan: _____
(Total no. approved)

Senarai kerja2 yang sedang menggunakan Quota Buruh & jumlah2-nya :
(List of current jobs on approved labour quota)

Bil. No.	Nama Projek <i>(Name of Project)</i>	Jumlah Tenaga Manusia <i>(No. of Quota used)</i>
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
	Jumlah: <i>(Total):</i>	
	Baki yang belum digunakan <i>(Balance of Labour quota not used)</i>	

Tandatangan Saksi:
Signature of Witness:

Tandatangan Pemborong:
Signature of Tenderer:

Tarikh:
Date _____

Tarikh:
Date _____

Pemborong dikira memasukkan harga bagi menyediakan wang tahanan kepada Pejabat Buruh bagi pekerja-pekerja asing mereka dan tidak ada tambahan harga akan diberi bagi perkara ini.
(Tenderers are deemed to include costs of providing deposits to Labour Department for their foreign workers and no claims will be entertained on this matter.)

**SENARAI JUMLAH TENAGA MANUSIA YANG AKAN DISERTAKAN
UNTUK PROJECT INI (JIKA BERJAYA):**

Proposed Manpower Allocation and Additional Labour quota required:

Bil: No.	Nama Jawatan (Name of Posts)	Jumlah (Total)
	Jumlah Besar: (Total)	

Jumlah quota buruh yang maseh ada:
(No. of labour quota still available): _____

Jumlah quota buruh yang dikehendaki
(Total additional labour quota required): _____

Tandatangan Saksi:
Signature of Witness:

Tandatangan Pemborong:
Signature of Tenderer:

Tarikh:
Date _____

Tarikh:
Date _____

SENARAI PERKAKAS2 & KENDERAAN YANG AKAN DI-GUNAKAN UNTOK PROJEK

Proposed list of equipment to be used for this job if successful

No.	Jenis (Type)	Jumlah (Quantity)	Model No.	Muatan (Capacity)	Ulasan (Remarks)

Tandatangan Saksi:
Signature of Witness:

Tandatangan Pemborong:
Signature of Tenderer:

Tarikh:
Date _____

Tarikh:
Date _____



Fédération Internationale des Ingénieurs-Conseils
International Federation of Consulting Engineers
Internationale Vereinigung Beratender Ingenieure
Federación Internacional de Ingenieros Consultores

Conditions of Contract for **Construction**

FOR BUILDING AND ENGINEERING WORKS DESIGNED BY THE EMPLOYER

GENERAL CONDITIONS
PARTICULAR CONDITIONS
SAMPLE FORMS



GENERAL CONDITIONS

GUIDANCE FOR THE
PREPARATION OF
PARTICULAR CONDITIONS

FORMS OF LETTER OF
TENDER, CONTRACT
AGREEMENT AND
DISPUTE ADJUDICATION
AGREEMENT

Conditions of Contract
for **CONSTRUCTION**

FOR BUILDING AND ENGINEERING WORKS
DESIGNED BY THE EMPLOYER

First Edition 1999
ISBN 2-88432-022-9

FEDERATION INTERNATIONALE DES INGENIEURS-CONSEILS
INTERNATIONAL FEDERATION OF CONSULTING ENGINEERS
INTERNATIONALE VEREINIGUNG BERATENDER INGENIEURE
FEDERACION INTERNACIONAL DE INGENIEROS CONSULTORES



ERRATA to the First Edition, 1999

The following significant errata are corrected in this reprinting of the First Edition of the Construction Contract. Several minor typographical errors and layout irregularities have also been corrected.

GENERAL PROVISIONS

- Foreword In figure “Typical sequence of Payment Events envisaged in Clause 14”, change “14.11 Contractor issues Final Statement ...” to “Contractor submits Final Statement ...”.
- Page 2 In the middle of the third line of Sub-Clause 1.1.2.9, delete “under”.
- Page 26 In the title of Sub-Clause 8.1, substitute “Works” for “Work”.
- Page 56 In the penultimate line, delete the parentheses “(“ and “)”.
- Page 60 Sub-Clause 20.3, in the line following sub-paragraph (d), delete “Particular Conditions” and substitute “Appendix to Tender”.
- Page 68 In the third line of Clause 9, delete the two words “notice to”.

GUIDANCE FOR THE PREPARATION OF PARTICULAR CONDITIONS

- Page 14 Under Sub-Clause 14.9, delete “EXEMPTION” and substitute “RETENTION”.
- Annexes Delete “© FIDIC”.

ACKNOWLEDGEMENTS

Fédération Internationale des Ingénieurs-Conseils (FIDIC) extends special thanks to the following members of its Update Task Group: Christopher Wade (Group Leader), SWECO-VBB, Sweden; Peter L Booen (Principal Drafter), GIBB Ltd, UK; Hermann Bayerlein, Fichtner, Germany; Christopher R Seppala (Legal Adviser), White & Case, France; and José F Speziale, IATASA, Argentina.

The preparation was carried out under the general direction of the FIDIC Contracts Committee which comprised John B Bowcock, Consulting Engineer, UK (Chairman); Michael Mortimer-Hawkins, SwedPower, Sweden; and Axel-Volkmar Jaeger, Schmidt Reuter Partner, Germany; together with K B (Tony) Norris as Special Adviser.

Drafts were reviewed by many persons and organisations, including those listed below. Their comments were duly studied by the Update Task Group and, where considered appropriate, have influenced the wording of the clauses. Ihab Abu-Zahra, CRC – Hassan Dorra, Egypt; Mushtaq Ahmad, NESPAK, Pakistan; Peter Batty, Post Buckley International, USA; Roeland Bertrams, Clifford Chance, Netherlands; Bosen He, Tianjin University, China; Manfred Breege, Lahmeyer International, Germany; Pablo Bueno, TYPSA, Spain; Nael G Bunni, Consulting Engineer, Ireland; Peter H J Chapman, Engineer & Barrister, UK; Ian Fraser, Beca Carter Hollings & Ferner, New Zealand; Roy Goode, Oxford University, UK; Dan W Graham, Bristows Cooke & Carpmael, UK; Mark Griffiths, Griffiths & Armour, UK; Geoffrey F Hawker, Consulting Engineer, UK; Hesse & Steinberger, VDMA, Germany; Poul E Hvilsted, Elsamprojekt, Denmark; Gordon L Jaynes, Whitman Breed Abbott & Morgan, UK; Tonny Jensen (Chairman of FIDIC Quality Management Committee), COWI, Denmark; David S Khalef, Jordan; Philip Loots & Associates, South Africa; Neil McCole, Merz and McLellan, UK; Matthew Needham-Laing, Victoria Russell & Paul J Taylor, Berrymans Lace Mawer, UK; Brian W Totterdill, Consulting Engineer, UK; David R Wightman & Gerlando Butera, Nabarro Nathanson, UK; the Association of Japanese Consulting Engineers; the Construction Industry Authority of the Philippines; European International Contractors; ORGANISME de Liaison Industries Métalliques Européennes (“ORGALIME”); the International Association of Dredging Contractors; the International Bar Association; the Asian Development Bank; and the World Bank. Acknowledgement of reviewers does not mean that such persons or organizations approve of the wording of all clauses.

FIDIC wishes to record its appreciation of the time and effort devoted by all the above.

The ultimate decision on the form and content of the document rests with FIDIC.

FOREWORD

The Fédération Internationale des Ingénieurs-Conseils (FIDIC) published, in 1999, First Editions of four new standard forms of contract:

Conditions of Contract for Construction,

which are recommended for building or engineering works designed by the Employer or by his representative, the Engineer. Under the usual arrangements for this type of contract, the Contractor constructs the works in accordance with a design provided by the Employer. However, the works may include some elements of Contractor-designed civil, mechanical, electrical and/or construction works.

Conditions of Contract for Plant and Design-Build,

which are recommended for the provision of electrical and/or mechanical plant, and for the design and execution of building or engineering works. Under the usual arrangements for this type of contract, the Contractor designs and provides, in accordance with the Employer's requirements, plant and/or other works; which may include any combination of civil, mechanical, electrical and/or construction works.

Conditions of Contract for EPC/Turnkey Projects,

which may be suitable for the provision on a turnkey basis of a process or power plant, of a factory or similar facility, or of an infrastructure project or other type of development, where (i) a higher degree of certainty of final price and time is required, and (ii) the Contractor takes total responsibility for the design and execution of the project, with little involvement of the Employer. Under the usual arrangements for turnkey projects, the Contractor carries out all the Engineering, Procurement and Construction (EPC), providing a fully-equipped facility, ready for operation (at the "turn of the key").

Short Form of Contract,

which is recommended for building or engineering works of relatively small capital value. Depending on the type of work and the circumstances, this form may also be suitable for contracts of greater value, particularly for relatively simple or repetitive work or work of short duration. Under the usual arrangements for this type of contract, the Contractor constructs the works in accordance with a design provided by the Employer or by his representative (if any), but this form may also be suitable for a contract which includes, or wholly comprises, Contractor-designed civil, mechanical, electrical and/or construction works.

The forms are recommended for general use where tenders are invited on an international basis. Modifications may be required in some jurisdictions, particularly if the Conditions are to be used on domestic contracts. FIDIC considers the official and authentic texts to be the versions in the English language.

In the preparation of these Conditions of Contract for Construction, it was recognised that, while there are many sub-clauses which will be generally applicable, there are some sub-clauses which must necessarily vary to take account of the circumstances

relevant to the particular contract. The sub-clauses which were considered to be applicable to many (but not all) contracts have been included in the General Conditions, in order to facilitate their incorporation into each contract.

The General Conditions and the Particular Conditions will together comprise the Conditions of Contract governing the rights and obligations of the parties. It will be necessary to prepare the Particular Conditions for each individual contract, and to take account of those sub-clauses in the General Conditions which mention the Particular Conditions.

For this publication, the General Conditions were prepared on the following basis:

- (i) interim and final payments will be determined by measurement, applying the rates and prices in a Bill of Quantities;
- (ii) if the wording in the General Conditions necessitates further data, then (unless it is so descriptive that it would have to be detailed in the Specification) the sub-clause makes reference to this data being contained in the Appendix to Tender, the data either being prescribed by the Employer or being inserted by the Tenderer;
- (iii) where a sub-clause in the General Conditions deals with a matter on which different contract terms are likely to be applicable for different contracts, the principles applied in writing the sub-clause were:
 - (a) users would find it more convenient if any provisions which they did not wish to apply could simply be deleted or not invoked, than if additional text had to be written (in the Particular Conditions) because the General Conditions did not cover their requirements; or
 - (b) in other cases, where the application of (a) was thought to be inappropriate, the sub-clause contains the provisions which were considered applicable to most contracts.

For example, Sub-Clause 14.2 [*Advance Payment*] is included for convenience, not because of any FIDIC policy in respect of advance payments. This Sub-Clause becomes inapplicable (even if it is not deleted) if it is disregarded by not specifying the amount of the advance. It should therefore be noted that some of the provisions contained in the General Conditions may not be appropriate for an apparently-typical contract.

Further information on these aspects, example wording for other arrangements, and other explanatory material and example wording to assist in the preparation of the Particular Conditions and the other tender documents, are included within this publication as Guidance for the Preparation of the Particular Conditions. Before incorporating any example wording, it must be checked to ensure that it is wholly suitable for the particular circumstances; if not, it must be amended.

Where example wording is amended, and in all cases where other amendments or additions are made, care must be taken to ensure that no ambiguity is created, either with the General Conditions or between the clauses in the Particular Conditions. It is essential that all these drafting tasks, and the entire preparation of the tender

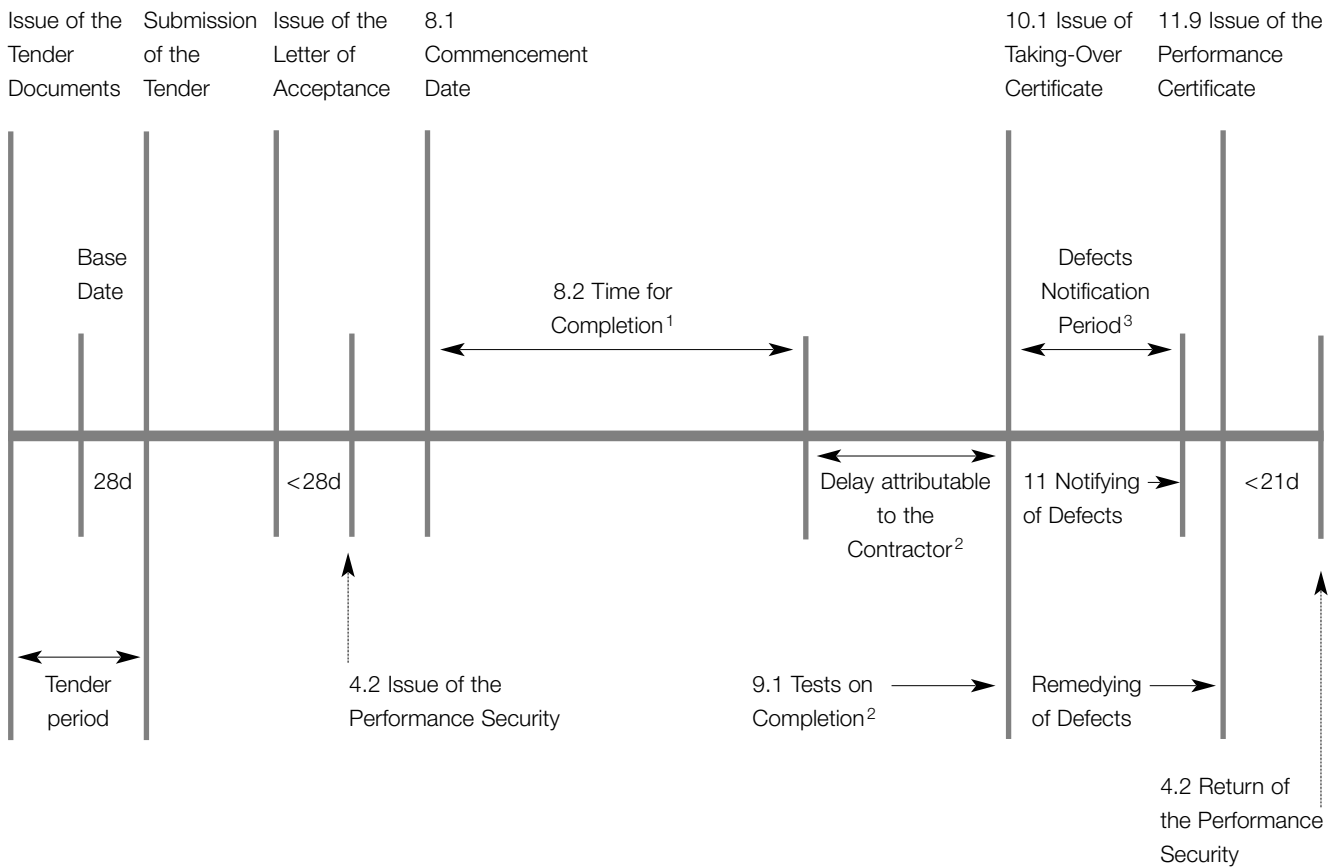
documents, are entrusted to personnel with the relevant expertise, including the contractual, technical and procurement aspects.

This publication concludes with example forms for the Letter of Tender, the Appendix to Tender (providing a check-list of the sub-clauses which refer to it), the Contract Agreement, and alternatives for the Dispute Adjudication Agreement. This Dispute Adjudication Agreement provides text for the agreement between the Employer, the Contractor and the person appointed to act either as sole adjudicator or as a member of a three-person dispute adjudication board; and incorporates (by reference) the terms in the Appendix to the General Conditions.

FIDIC intends to publish a guide to the use of its Conditions of Contract for Construction, for Plant and Design-Build, and for EPC/Turnkey Projects. Another relevant FIDIC publication is "Tendering Procedure", which presents a systematic approach to the selection of tenderers and the obtaining and evaluation of tenders.

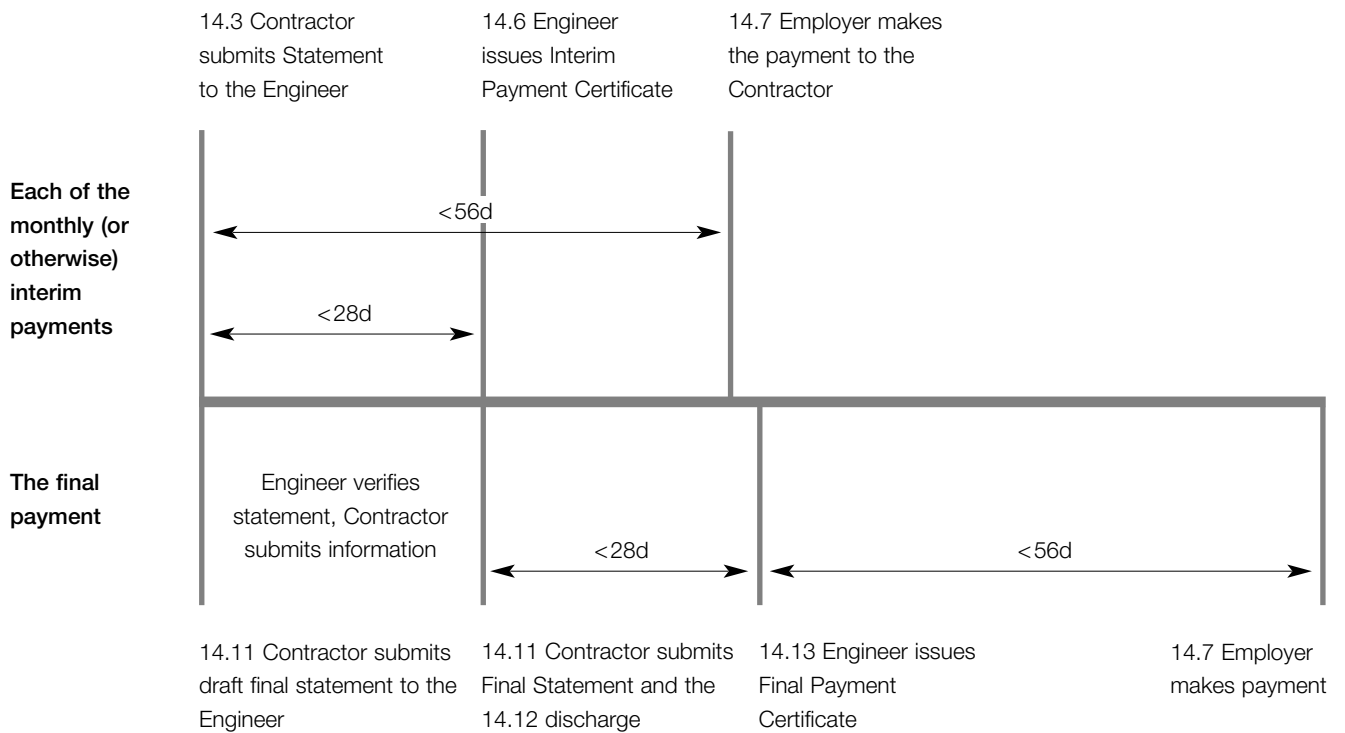
In order to clarify the sequence of Contract activities, reference may be made to the charts on the next two pages and to the Sub-Clauses listed below (some Sub-Clause numbers are also stated in the charts). The charts are illustrative and must not be taken into consideration in the interpretation of the Conditions of Contract.

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1.1.4.7	&	14.3	Interim Payment Certificate
1.1.3.3	&	8.2	Time for Completion (as extended under 8.4)
1.1.3.4	&	9.1	Tests on Completion
1.1.3.5	&	10.1	Taking-Over Certificate
1.1.3.7	&	11.1	Defects Notification Period (as extended under 11.3)
1.1.3.8	&	11.9	Performance Certificate
1.1.4.4	&	14.13	Final Payment Certificate

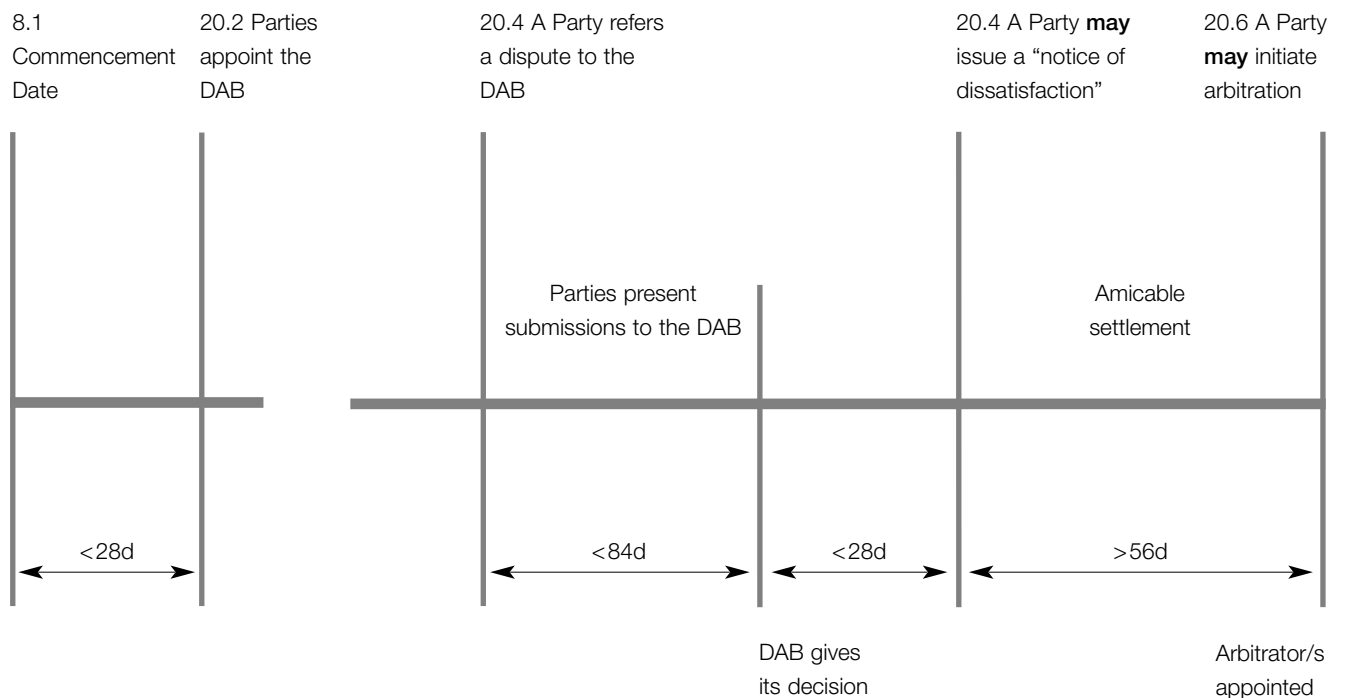


Typical sequence of Principal Events during Contracts for Construction

1. The Time for Completion is to be stated (in the Appendix to Tender) as a number of days, to which is added any extensions of time under Sub-Clause 8.4.
2. In order to indicate the sequence of events, the above diagram is based upon the example of the Contractor failing to comply with Sub-Clause 8.2.
3. The Defects Notification Period is to be stated (in the Appendix to Tender) as a number of days, to which is added any extensions under Sub-Clause 11.3



Typical sequence of Payment Events envisaged in Clause 14



Typical sequence of Dispute Events envisaged in Clause 20

GENERAL CONDITIONS

GUIDANCE FOR THE
PREPARATION OF
PARTICULAR CONDITIONS

Conditions of Contract
for **CONSTRUCTION**

FOR BUILDING AND ENGINEERING WORKS
DESIGNED BY THE EMPLOYER

FORMS OF LETTER OF
TENDER, CONTRACT
AGREEMENT AND
DISPUTE ADJUDICATION
AGREEMENT

General Conditions

FEDERATION INTERNATIONALE DES INGENIEURS-CONSEILS
INTERNATIONAL FEDERATION OF CONSULTING ENGINEERS
INTERNATIONALE VEREINIGUNG BERATENDER INGENIEURE
FEDERACION INTERNACIONAL DE INGENIEROS CONSULTORES



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General Conditions

1 General Provisions

1.1

Definitions

In the Conditions of Contract (“these Conditions”), which include Particular Conditions and these General Conditions, the following words and expressions shall have the meanings stated. Words indicating persons or parties include corporations and other legal entities, except where the context requires otherwise.

1.1.1

The Contract

1.1.1.1 “**Contract**” means the Contract Agreement, the Letter of Acceptance, the Letter of Tender, these Conditions, the Specification, the Drawings, the Schedules, and the further documents (if any) which are listed in the Contract Agreement or in the Letter of Acceptance.

1.1.1.2 “**Contract Agreement**” means the contract agreement (if any) referred to in Sub-Clause 1.6 [*Contract Agreement*].

1.1.1.3 “**Letter of Acceptance**” means the letter of formal acceptance, signed by the Employer, of the Letter of Tender, including any annexed memoranda comprising agreements between and signed by both Parties. If there is no such letter of acceptance, the expression “Letter of Acceptance” means the Contract Agreement and the date of issuing or receiving the Letter of Acceptance means the date of signing the Contract Agreement.

1.1.1.4 “**Letter of Tender**” means the document entitled letter of tender, which was completed by the Contractor and includes the signed offer to the Employer for the Works.

1.1.1.5 “**Specification**” means the document entitled specification, as included in the Contract, and any additions and modifications to the specification in accordance with the Contract. Such document specifies the Works.

1.1.1.6 “**Drawings**” means the drawings of the Works, as included in the Contract, and any additional and modified drawings issued by (or on behalf of) the Employer in accordance with the Contract.

1.1.1.7 “**Schedules**” means the document(s) entitled schedules, completed by the Contractor and submitted with the Letter of Tender, as included in the Contract. Such document may include the Bill of Quantities, data, lists, and schedules of rates and/or prices.

1.1.1.8 “**Tender**” means the Letter of Tender and all other documents which the Contractor submitted with the Letter of Tender, as included in the Contract.

1.1.1.9 “**Appendix to Tender**” means the completed pages entitled appendix to tender which are appended to and form part of the Letter of Tender.

1.1.1.10 “**Bill of Quantities**” and “**Daywork Schedule**” mean the documents so named (if any) which are comprised in the Schedules.

**1.1.2
Parties and Persons**

- 1.1.2.1 **“Party”** means the Employer or the Contractor, as the context requires.
- 1.1.2.2 **“Employer”** means the person named as employer in the Appendix to Tender and the legal successors in title to this person.
- 1.1.2.3 **“Contractor”** means the person(s) named as contractor in the Letter of Tender accepted by the Employer and the legal successors in title to this person(s).
- 1.1.2.4 **“Engineer”** means the person appointed by the Employer to act as the Engineer for the purposes of the Contract and named in the Appendix to Tender, or other person appointed from time to time by the Employer and notified to the Contractor under Sub-Clause 3.4 [*Replacement of the Engineer*].
- 1.1.2.5 **“Contractor’s Representative”** means the person named by the Contractor in the Contract or appointed from time to time by the Contractor under Sub-Clause 4.3 [*Contractor’s Representative*], who acts on behalf of the Contractor.
- 1.1.2.6 **“Employer’s Personnel”** means the Engineer, the assistants referred to in Sub-Clause 3.2 [*Delegation by the Engineer*] and all other staff, labour and other employees of the Engineer and of the Employer; and any other personnel notified to the Contractor, by the Employer or the Engineer, as Employer’s Personnel.
- 1.1.2.7 **“Contractor’s Personnel”** means the Contractor’s Representative and all personnel whom the Contractor utilises on Site, who may include the staff, labour and other employees of the Contractor and of each Subcontractor; and any other personnel assisting the Contractor in the execution of the Works.
- 1.1.2.8 **“Subcontractor”** means any person named in the Contract as a subcontractor, or any person appointed as a subcontractor, for a part of the Works; and the legal successors in title to each of these persons.
- 1.1.2.9 **“DAB”** means the person or three persons so named in the Contract, or other person(s) appointed under Sub-Clause 20.2 [*Appointment of the Dispute Adjudication Board*] or Sub-Clause 20.3 [*Failure to Agree Dispute Adjudication Board*]
- 1.1.2.10 **“FIDIC”** means the Fédération Internationale des Ingénieurs-Conseils, the international federation of consulting engineers.

**1.1.3
Dates, Tests, Periods
and Completion**

- 1.1.3.1 **“Base Date”** means the date 28 days prior to the latest date for submission of the Tender.
- 1.1.3.2 **“Commencement Date”** means the date notified under Sub-Clause 8.1 [*Commencement of Works*].
- 1.1.3.3 **“Time for Completion”** means the time for completing the Works or a Section (as the case may be) under Sub-Clause 8.2 [*Time for Completion*], as stated in the Appendix to Tender (with any extension under Sub-Clause 8.4 [*Extension of Time for Completion*]), calculated from the Commencement Date.
- 1.1.3.4 **“Tests on Completion”** means the tests which are specified in the Contract or agreed by both Parties or instructed as a Variation, and which are carried

out under Clause 9 [*Tests on Completion*] before the Works or a Section (as the case may be) are taken over by the Employer.

1.1.3.5 “**Taking-Over Certificate**” means a certificate issued under Clause 10 [*Employer’s Taking Over*].

1.1.3.6 “**Tests after Completion**” means the tests (if any) which are specified in the Contract and which are carried out in accordance with the provisions of the Particular Conditions after the Works or a Section (as the case may be) are taken over by the Employer.

1.1.3.7 “**Defects Notification Period**” means the period for notifying defects in the Works or a Section (as the case may be) under Sub-Clause 11.1 [*Completion of Outstanding Work and Remedying Defects*], as stated in the Appendix to Tender (with any extension under Sub-Clause 11.3 [*Extension of Defects Notification Period*]), calculated from the date on which the Works or Section is completed as certified under Sub-Clause 10.1 [*Taking Over of the Works and Sections*].

1.1.3.8 “**Performance Certificate**” means the certificate issued under Sub-Clause 11.9 [*Performance Certificate*].

1.1.3.9 “**day**” means a calendar day and “**year**” means 365 days.

1.1.4

Money and Payments

1.1.4.1 “**Accepted Contract Amount**” means the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects.

1.1.4.2 “**Contract Price**” means the price defined in Sub-Clause 14.1 [*The Contract Price*], and includes adjustments in accordance with the Contract.

1.1.4.3 “**Cost**” means all expenditure reasonably incurred (or to be incurred) by the Contractor, whether on or off the Site, including overhead and similar charges, but does not include profit.

1.1.4.4 “**Final Payment Certificate**” means the payment certificate issued under Sub-Clause 14.13 [*Issue of Final Payment Certificate*].

1.1.4.5 “**Final Statement**” means the statement defined in Sub-Clause 14.11 [*Application for Final Payment Certificate*].

1.1.4.6 “**Foreign Currency**” means a currency in which part (or all) of the Contract Price is payable, but not the Local Currency.

1.1.4.7 “**Interim Payment Certificate**” means a payment certificate issued under Clause 14 [*Contract Price and Payment*], other than the Final Payment Certificate.

1.1.4.8 “**Local Currency**” means the currency of the Country.

1.1.4.9 “**Payment Certificate**” means a payment certificate issued under Clause 14 [*Contract Price and Payment*].

1.1.4.10 “**Provisional Sum**” means a sum (if any) which is specified in the Contract as a provisional sum, for the execution of any part of the Works or for the supply of Plant, Materials or services under Sub-Clause 13.5 [*Provisional Sums*].

1.1.4.11 “**Retention Money**” means the accumulated retention moneys which the Employer retains under Sub-Clause 14.3 [*Application for Interim Payment Certificates*] and pays under Sub-Clause 14.9 [*Payment of Retention Money*].

1.1.4.12 “**Statement**” means a statement submitted by the Contractor as part of an application, under Clause 14 [*Contract Price and Payment*], for a payment certificate.

1.1.5

Works and Goods

1.1.5.1 “**Contractor’s Equipment**” means all apparatus, machinery, vehicles and other things required for the execution and completion of the Works and the remedying of any defects. However, Contractor’s Equipment excludes Temporary Works, Employer’s Equipment (if any), Plant, Materials and any other things intended to form or forming part of the Permanent Works.

1.1.5.2 “**Goods**” means Contractor’s Equipment, Materials, Plant and Temporary Works, or any of them as appropriate.

1.1.5.3 “**Materials**” means things of all kinds (other than Plant) intended to form or forming part of the Permanent Works, including the supply-only materials (if any) to be supplied by the Contractor under the Contract.

1.1.5.4 “**Permanent Works**” means the permanent works to be executed by the Contractor under the Contract.

1.1.5.5 “**Plant**” means the apparatus, machinery and vehicles intended to form or forming part of the Permanent Works.

1.1.5.6 “**Section**” means a part of the Works specified in the Appendix to Tender as a Section (if any).

1.1.5.7 “**Temporary Works**” means all temporary works of every kind (other than Contractor’s Equipment) required on Site for the execution and completion of the Permanent Works and the remedying of any defects.

1.1.5.8 “**Works**” mean the Permanent Works and the Temporary Works, or either of them as appropriate.

1.1.6

Other Definitions

1.1.6.1 “**Contractor’s Documents**” means the calculations, computer programs and other software, drawings, manuals, models and other documents of a technical nature (if any) supplied by the Contractor under the Contract.

1.1.6.2 “**Country**” means the country in which the Site (or most of it) is located, where the Permanent Works are to be executed.

1.1.6.3 “**Employer’s Equipment**” means the apparatus, machinery and vehicles (if any) made available by the Employer for the use of the Contractor in the execution of the Works, as stated in the Specification; but does not include Plant which has not been taken over by the Employer.

1.1.6.4 “**Force Majeure**” is defined in Clause 19 [*Force Majeure*].

1.1.6.5 “**Laws**” means all national (or state) legislation, statutes, ordinances and other laws, and regulations and by-laws of any legally constituted public authority.

- 1.1.6.6 “**Performance Security**” means the security (or securities, if any) under Sub-Clause 4.2 [*Performance Security*].
- 1.1.6.7 “**Site**” means the places where the Permanent Works are to be executed and to which Plant and Materials are to be delivered, and any other places as may be specified in the Contract as forming part of the Site.
- 1.1.6.8 “**Unforeseeable**” means not reasonably foreseeable by an experienced contractor by the date for submission of the Tender.
- 1.1.6.9 “**Variation**” means any change to the Works, which is instructed or approved as a variation under Clause 13 [*Variations and Adjustments*].

1.2

Interpretation

In the Contract, except where the context requires otherwise:

- (a) words indicating one gender include all genders;
- (b) words indicating the singular also include the plural and words indicating the plural also include the singular;
- (c) provisions including the word “agree”, “agreed” or “agreement” require the agreement to be recorded in writing, and
- (d) “written” or “in writing” means hand-written, type-written, printed or electronically made, and resulting in a permanent record.

The marginal words and other headings shall not be taken into consideration in the interpretation of these Conditions.

1.3

Communications

Wherever these Conditions provide for the giving or issuing of approvals, certificates, consents, determinations, notices and requests, these communications shall be:

- (a) in writing and delivered by hand (against receipt), sent by mail or courier, or transmitted using any of the agreed systems of electronic transmission as stated in the Appendix to Tender; and
- (b) delivered, sent or transmitted to the address for the recipient’s communications as stated in the Appendix to Tender. However:
 - (i) if the recipient gives notice of another address, communications shall thereafter be delivered accordingly; and
 - (ii) if the recipient has not stated otherwise when requesting an approval or consent, it may be sent to the address from which the request was issued.

Approvals, certificates, consents and determinations shall not be unreasonably withheld or delayed. When a certificate is issued to a Party, the certifier shall send a copy to the other Party. When a notice is issued to a Party, by the other Party or the Engineer, a copy shall be sent to the Engineer or the other Party, as the case may be.

1.4

Law and Language

The Contract shall be governed by the law of the country (or other jurisdiction) stated in the Appendix to Tender.

If there are versions of any part of the Contract which are written in more than one language, the version which is in the ruling language stated in the Appendix to Tender shall prevail.

The language for communications shall be that stated in the Appendix to Tender. If no language is stated there, the language for communications shall be the language in which the Contract (or most of it) is written.

1.5

Priority of Documents

The documents forming the Contract are to be taken as mutually explanatory of one another. For the purposes of interpretation, the priority of the documents shall be in accordance with the following sequence:

- (a) the Contract Agreement (if any),
- (b) the Letter of Acceptance,
- (c) the Letter of Tender,
- (d) the Particular Conditions,
- (e) these General Conditions,
- (f) the Specification,
- (g) the Drawings, and
- (h) the Schedules and any other documents forming part of the Contract.

If an ambiguity or discrepancy is found in the documents, the Engineer shall issue any necessary clarification or instruction.

1.6

Contract Agreement

The Parties shall enter into a Contract Agreement within 28 days after the Contractor receives the Letter of Acceptance, unless they agree otherwise. The Contract Agreement shall be based upon the form annexed to the Particular Conditions. The costs of stamp duties and similar charges (if any) imposed by law in connection with entry into the Contract Agreement shall be borne by the Employer.

1.7

Assignment

Neither Party shall assign the whole or any part of the Contract or any benefit or interest in or under the Contract. However, either Party:

- (a) may assign the whole or any part with the prior agreement of the other Party, at the sole discretion of such other Party, and
- (b) may, as security in favour of a bank or financial institution, assign its right to any moneys due, or to become due, under the Contract.

1.8

Care and Supply of Documents

The Specification and Drawings shall be in the custody and care of the Employer. Unless otherwise stated in the Contract, two copies of the Contract and of each subsequent Drawing shall be supplied to the Contractor, who may make or request further copies at the cost of the Contractor.

Each of the Contractor's Documents shall be in the custody and care of the Contractor, unless and until taken over by the Employer. Unless otherwise stated in the Contract, the Contractor shall supply to the Engineer six copies of each of the Contractor's Documents.

The Contractor shall keep, on the Site, a copy of the Contract, publications named in the Specification, the Contractor's Documents (if any), the Drawings and Variations and other communications given under the Contract. The Employer's Personnel shall have the right of access to all these documents at all reasonable times.

If a Party becomes aware of an error or defect of a technical nature in a document which was prepared for use in executing the Works, the Party shall promptly give notice to the other Party of such error or defect.

1.9 Delayed Drawings or Instructions

The Contractor shall give notice to the Engineer whenever the Works are likely to be delayed or disrupted if any necessary drawing or instruction is not issued to the Contractor within a particular time, which shall be reasonable. The notice shall include details of the necessary drawing or instruction, details of why and by when it should be issued, and details of the nature and amount of the delay or disruption likely to be suffered if it is late.

If the Contractor suffers delay and/or incurs Cost as a result of a failure of the Engineer to issue the notified drawing or instruction within a time which is reasonable and is specified in the notice with supporting details, the Contractor shall give a further notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any such Cost plus reasonable profit, which shall be included in the Contract Price.

After receiving this further notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

However, if and to the extent that the Engineer's failure was caused by any error or delay by the Contractor, including an error in, or delay in the submission of, any of the Contractor's Documents, the Contractor shall not be entitled to such extension of time, Cost or profit.

1.10 Employer's Use of Contractor's Documents

As between the Parties, the Contractor shall retain the copyright and other intellectual property rights in the Contractor's Documents and other design documents made by (or on behalf of) the Contractor.

The Contractor shall be deemed (by signing the Contract) to give to the Employer a non-terminable transferable non-exclusive royalty-free licence to copy, use and communicate the Contractor's Documents, including making and using modifications of them. This licence shall:

- (a) apply throughout the actual or intended working life (whichever is longer) of the relevant parts of the Works,
- (b) entitle any person in proper possession of the relevant part of the Works to copy, use and communicate the Contractor's Documents for the purposes of completing, operating, maintaining, altering, adjusting, repairing and demolishing the Works, and
- (c) in the case of Contractor's Documents which are in the form of computer programs and other software, permit their use on any computer on the Site and other places as envisaged by the Contract, including replacements of any computers supplied by the Contractor.

The Contractor's Documents and other design documents made by (or on behalf of) the Contractor shall not, without the Contractor's consent, be used, copied or communicated to a third party by (or on behalf of) the Employer for purposes other than those permitted under this Sub-Clause.

1.11 Contractor's Use of Employer's Documents

As between the Parties, the Employer shall retain the copyright and other intellectual property rights in the Specification, the Drawings and other documents made by (or on behalf of) the Employer. The Contractor may, at his cost, copy, use, and obtain communication of these documents for the purposes of the Contract. They shall not,

without the Employer's consent, be copied, used or communicated to a third party by the Contractor, except as necessary for the purposes of the Contract.

1.12

Confidential Details

The Contractor shall disclose all such confidential and other information as the Engineer may reasonably require in order to verify the Contractor's compliance with the Contract.

1.13

Compliance with Laws

The Contractor shall, in performing the Contract, comply with applicable Laws. Unless otherwise stated in the Particular Conditions:

- (a) the Employer shall have obtained (or shall obtain) the planning, zoning or similar permission for the Permanent Works, and any other permissions described in the Specification as having been (or being) obtained by the Employer; and the Employer shall indemnify and hold the Contractor harmless against and from the consequences of any failure to do so; and
- (b) the Contractor shall give all notices, pay all taxes, duties and fees, and obtain all permits, licences and approvals, as required by the Laws in relation to the execution and completion of the Works and the remedying of any defects; and the Contractor shall indemnify and hold the Employer harmless against and from the consequences of any failure to do so.

1.14

Joint and Several Liability

If the Contractor constitutes (under applicable Laws) a joint venture, consortium or other unincorporated grouping of two or more persons:

- (a) these persons shall be deemed to be jointly and severally liable to the Employer for the performance of the Contract;
 - (b) these persons shall notify the Employer of their leader who shall have authority to bind the Contractor and each of these persons; and
 - (c) the Contractor shall not alter its composition or legal status without the prior consent of the Employer.
-

2 The Employer

2.1

Right of Access to the Site

The Employer shall give the Contractor right of access to, and possession of, all parts of the Site within the time (or times) stated in the Appendix to Tender. The right and possession may not be exclusive to the Contractor. If, under the Contract, the Employer is required to give (to the Contractor) possession of any foundation, structure, plant or means of access, the Employer shall do so in the time and manner stated in the Specification. However, the Employer may withhold any such right or possession until the Performance Security has been received.

If no such time is stated in the Appendix to Tender, the Employer shall give the Contractor right of access to, and possession of, the Site within such times as may be required to enable the Contractor to proceed in accordance with the programme submitted under Sub-Clause 8.3 [*Programme*].

If the Contractor suffers delay and/or incurs Cost as a result of a failure by the Employer to give any such right or possession within such time, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any such Cost plus reasonable profit, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

However, if and to the extent that the Employer's failure was caused by any error or delay by the Contractor, including an error in, or delay in the submission of, any of the Contractor's Documents, the Contractor shall not be entitled to such extension of time, Cost or profit.

2.2

Permits, Licences or Approvals

The Employer shall (where he is in a position to do so) provide reasonable assistance to the Contractor at the request of the Contractor:

- (a) by obtaining copies of the Laws of the Country which are relevant to the Contract but are not readily available, and
- (b) for the Contractor's applications for any permits, licences or approvals required by the Laws of the Country:
 - (i) which the Contractor is required to obtain under Sub-Clause 1.13 [*Compliance with Laws*],
 - (ii) for the delivery of Goods, including clearance through customs, and
 - (iii) for the export of Contractor's Equipment when it is removed from the Site.

2.3

Employer's Personnel

The Employer shall be responsible for ensuring that the Employer's Personnel and the Employer's other contractors on the Site:

- (a) co-operate with the Contractor's efforts under Sub-Clause 4.6 [*Co-operation*], and
- (b) take actions similar to those which the Contractor is required to take under subparagraphs (a), (b) and (c) of Sub-Clause 4.8 [*Safety Procedures*] and under Sub-Clause 4.18 [*Protection of the Environment*].

2.4

Employer's Financial Arrangements

The Employer shall submit, within 28 days after receiving any request from the Contractor, reasonable evidence that financial arrangements have been made and are being maintained which will enable the Employer to pay the Contract Price (as estimated at that time) in accordance with Clause 14 [*Contract Price and Payment*]. If the Employer intends to make any material change to his financial arrangements, the Employer shall give notice to the Contractor with detailed particulars.

2.5

Employer's Claims

If the Employer considers himself to be entitled to any payment under any Clause of these Conditions or otherwise in connection with the Contract, and/or to any extension of the Defects Notification Period, the Employer or the Engineer shall give notice and particulars to the Contractor. However, notice is not required for payments due under Sub-Clause 4.19 [*Electricity, Water and Gas*], under Sub-Clause 4.20 [*Employer's Equipment and Free-Issue Material*], or for other services requested by the Contractor.

The notice shall be given as soon as practicable after the Employer became aware of the event or circumstances giving rise to the claim. A notice relating to any extension of the Defects Notification Period shall be given before the expiry of such period.

The particulars shall specify the Clause or other basis of the claim, and shall include substantiation of the amount and/or extension to which the Employer considers himself to be entitled in connection with the Contract. The Engineer shall then proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine (i) the amount (if any) which the Employer is entitled to be paid by the Contractor, and/or (ii) the extension (if any) of the Defects Notification Period in accordance with Sub-Clause 11.3 [*Extension of Defects Notification Period*].

This amount may be included as a deduction in the Contract Price and Payment Certificates. The Employer shall only be entitled to set off against or make any deduction from an amount certified in a Payment Certificate, or to otherwise claim against the Contractor, in accordance with this Sub-Clause.

The Engineer

3.1 Engineer's Duties and Authority

The Employer shall appoint the Engineer who shall carry out the duties assigned to him in the Contract. The Engineer's staff shall include suitably qualified engineers and other professionals who are competent to carry out these duties.

The Engineer shall have no authority to amend the Contract.

The Engineer may exercise the authority attributable to the Engineer as specified in or necessarily to be implied from the Contract. If the Engineer is required to obtain the approval of the Employer before exercising a specified authority, the requirements shall be as stated in the Particular Conditions. The Employer undertakes not to impose further constraints on the Engineer's authority, except as agreed with the Contractor.

However, whenever the Engineer exercises a specified authority for which the Employer's approval is required, then (for the purposes of the Contract) the Employer shall be deemed to have given approval.

Except as otherwise stated in these Conditions:

- (a) whenever carrying out duties or exercising authority, specified in or implied by the Contract, the Engineer shall be deemed to act for the Employer;
- (b) the Engineer has no authority to relieve either Party of any duties, obligations or responsibilities under the Contract; and
- (c) any approval, check, certificate, consent, examination, inspection, instruction, notice, proposal, request, test, or similar act by the Engineer (including absence of disapproval) shall not relieve the Contractor from any responsibility he has under the Contract, including responsibility for errors, omissions, discrepancies and non-compliances.

3.2 Delegation by the Engineer

The Engineer may from time to time assign duties and delegate authority to assistants, and may also revoke such assignment or delegation. These assistants may include a resident engineer, and/or independent inspectors appointed to inspect and/or test items of Plant and/or Materials. The assignment, delegation or revocation shall be in writing and shall not take effect until copies have been received by both Parties. However, unless otherwise agreed by both Parties, the Engineer shall not delegate the authority to determine any matter in accordance with Sub-Clause 3.5 [*Determinations*].

Assistants shall be suitably qualified persons, who are competent to carry out these

duties and exercise this authority, and who are fluent in the language for communications defined in Sub-Clause 1.4 [*Law and Language*].

Each assistant, to whom duties have been assigned or authority has been delegated, shall only be authorised to issue instructions to the Contractor to the extent defined by the delegation. Any approval, check, certificate, consent, examination, inspection, instruction, notice, proposal, request, test, or similar act by an assistant, in accordance with the delegation, shall have the same effect as though the act had been an act of the Engineer. However:

- (a) any failure to disapprove any work, Plant or Materials shall not constitute approval, and shall therefore not prejudice the right of the Engineer to reject the work, Plant or Materials;
- (b) if the Contractor questions any determination or instruction of an assistant, the Contractor may refer the matter to the Engineer, who shall promptly confirm, reverse or vary the determination or instruction.

3.3

Instructions of the Engineer

The Engineer may issue to the Contractor (at any time) instructions and additional or modified Drawings which may be necessary for the execution of the Works and the remedying of any defects, all in accordance with the Contract. The Contractor shall only take instructions from the Engineer, or from an assistant to whom the appropriate authority has been delegated under this Clause. If an instruction constitutes a Variation, Clause 13 [*Variations and Adjustments*] shall apply.

The Contractor shall comply with the instructions given by the Engineer or delegated assistant, on any matter related to the Contract. Whenever practicable, their instructions shall be given in writing. If the Engineer or a delegated assistant:

- (a) gives an oral instruction,
- (b) receives a written confirmation of the instruction, from (or on behalf of) the Contractor, within two working days after giving the instruction, and
- (c) does not reply by issuing a written rejection and/or instruction within two working days after receiving the confirmation,

then the confirmation shall constitute the written instruction of the Engineer or delegated assistant (as the case may be).

3.4

Replacement of the Engineer

If the Employer intends to replace the Engineer, the Employer shall, not less than 42 days before the intended date of replacement, give notice to the Contractor of the name, address and relevant experience of the intended replacement Engineer. The Employer shall not replace the Engineer with a person against whom the Contractor raises reasonable objection by notice to the Employer, with supporting particulars.

3.5

Determinations

Whenever these Conditions provide that the Engineer shall proceed in accordance with this Sub-Clause 3.5 to agree or determine any matter, the Engineer shall consult with each Party in an endeavour to reach agreement. If agreement is not achieved, the Engineer shall make a fair determination in accordance with the Contract, taking due regard of all relevant circumstances.

The Engineer shall give notice to both Parties of each agreement or determination, with supporting particulars. Each Party shall give effect to each agreement or determination unless and until revised under Clause 20 [*Claims, Disputes and Arbitration*].

4 The Contractor

4.1

Contractor's General Obligations

The Contractor shall design (to the extent specified in the Contract), execute and complete the Works in accordance with the Contract and with the Engineer's instructions, and shall remedy any defects in the Works.

The Contractor shall provide the Plant and Contractor's Documents specified in the Contract, and all Contractor's Personnel, Goods, consumables and other things and services, whether of a temporary or permanent nature, required in and for this design, execution, completion and remedying of defects.

The Contractor shall be responsible for the adequacy, stability and safety of all Site operations and of all methods of construction. Except to the extent specified in the Contract, the Contractor (i) shall be responsible for all Contractor's Documents, Temporary Works, and such design of each item of Plant and Materials as is required for the item to be in accordance with the Contract, and (ii) shall not otherwise be responsible for the design or specification of the Permanent Works.

The Contractor shall, whenever required by the Engineer, submit details of the arrangements and methods which the Contractor proposes to adopt for the execution of the Works. No significant alteration to these arrangements and methods shall be made without this having previously been notified to the Engineer.

If the Contract specifies that the Contractor shall design any part of the Permanent Works, then unless otherwise stated in the Particular Conditions:

- (a) the Contractor shall submit to the Engineer the Contractor's Documents for this part in accordance with the procedures specified in the Contract;
- (b) these Contractor's Documents shall be in accordance with the Specification and Drawings, shall be written in the language for communications defined in Sub-Clause 1.4 [*Law and Language*], and shall include additional information required by the Engineer to add to the Drawings for co-ordination of each Party's designs;
- (c) the Contractor shall be responsible for this part and it shall, when the Works are completed, be fit for such purposes for which the part is intended as are specified in the Contract; and
- (d) prior to the commencement of the Tests on Completion, the Contractor shall submit to the Engineer the "as-built" documents and operation and maintenance manuals in accordance with the Specification and in sufficient detail for the Employer to operate, maintain, dismantle, reassemble, adjust and repair this part of the Works. Such part shall not be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [*Taking Over of the Works and Sections*] until these documents and manuals have been submitted to the Engineer.

4.2

Performance Security

The Contractor shall obtain (at his cost) a Performance Security for proper performance, in the amount and currencies stated in the Appendix to Tender. If an amount is not stated in the Appendix to Tender, this Sub-Clause shall not apply.

The Contractor shall deliver the Performance Security to the Employer within 28 days after receiving the Letter of Acceptance, and shall send a copy to the Engineer. The Performance Security shall be issued by an entity and from within a country (or other

jurisdiction) approved by the Employer, and shall be in the form annexed to the Particular Conditions or in another form approved by the Employer.

The Contractor shall ensure that the Performance Security is valid and enforceable until the Contractor has executed and completed the Works and remedied any defects. If the terms of the Performance Security specify its expiry date, and the Contractor has not become entitled to receive the Performance Certificate by the date 28 days prior to the expiry date, the Contractor shall extend the validity of the Performance Security until the Works have been completed and any defects have been remedied.

The Employer shall not make a claim under the Performance Security, except for amounts to which the Employer is entitled under the Contract in the event of:

- (a) failure by the Contractor to extend the validity of the Performance Security as described in the preceding paragraph, in which event the Employer may claim the full amount of the Performance Security,
- (b) failure by the Contractor to pay the Employer an amount due, as either agreed by the Contractor or determined under Sub-Clause 2.5 [*Employer's Claims*] or Clause 20 [*Claims, Disputes and Arbitration*], within 42 days after this agreement or determination,
- (c) failure by the Contractor to remedy a default within 42 days after receiving the Employer's notice requiring the default to be remedied, or
- (d) circumstances which entitle the Employer to termination under Sub-Clause 15.2 [*Termination by Employer*], irrespective of whether notice of termination has been given.

The Employer shall indemnify and hold the Contractor harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from a claim under the Performance Security to the extent to which the Employer was not entitled to make the claim.

The Employer shall return the Performance Security to the Contractor within 21 days after receiving a copy of the Performance Certificate.

4.3

Contractor's Representative

The Contractor shall appoint the Contractor's Representative and shall give him all authority necessary to act on the Contractor's behalf under the Contract.

Unless the Contractor's Representative is named in the Contract, the Contractor shall, prior to the Commencement Date, submit to the Engineer for consent the name and particulars of the person the Contractor proposes to appoint as Contractor's Representative. If consent is withheld or subsequently revoked, or if the appointed person fails to act as Contractor's Representative, the Contractor shall similarly submit the name and particulars of another suitable person for such appointment.

The Contractor shall not, without the prior consent of the Engineer, revoke the appointment of the Contractor's Representative or appoint a replacement.

The whole time of the Contractor's Representative shall be given to directing the Contractor's performance of the Contract. If the Contractor's Representative is to be temporarily absent from the Site during the execution of the Works, a suitable replacement person shall be appointed, subject to the Engineer's prior consent, and the Engineer shall be notified accordingly.

The Contractor's Representative shall, on behalf of the Contractor, receive instructions under Sub-Clause 3.3 [*Instructions of the Engineer*].

The Contractor's Representative may delegate any powers, functions and authority to any competent person, and may at any time revoke the delegation. Any delegation or revocation shall not take effect until the Engineer has received prior notice signed by the Contractor's Representative, naming the person and specifying the powers, functions and authority being delegated or revoked.

The Contractor's Representative and all these persons shall be fluent in the language for communications defined in Sub-Clause 1.4 [*Law and Language*].

4.4

Subcontractors

The Contractor shall not subcontract the whole of the Works.

The Contractor shall be responsible for the acts or defaults of any Subcontractor, his agents or employees, as if they were the acts or defaults of the Contractor. Unless otherwise stated in the Particular Conditions:

- (a) the Contractor shall not be required to obtain consent to suppliers of Materials, or to a subcontract for which the Subcontractor is named in the Contract;
- (b) the prior consent of the Engineer shall be obtained to other proposed Subcontractors;
- (c) the Contractor shall give the Engineer not less than 28 days' notice of the intended date of the commencement of each Subcontractor's work, and of the commencement of such work on the Site; and
- (d) each subcontract shall include provisions which would entitle the Employer to require the subcontract to be assigned to the Employer under Sub-Clause 4.5 [*Assignment of Benefit of Subcontract*] (if or when applicable) or in the event of termination under Sub-Clause 15.2 [*Termination by Employer*].

4.5

Assignment of Benefit of Subcontract

If a Subcontractor's obligations extend beyond the expiry date of the relevant Defects Notification Period and the Engineer, prior to this date, instructs the Contractor to assign the benefit of such obligations to the Employer, then the Contractor shall do so. Unless otherwise stated in the assignment, the Contractor shall have no liability to the Employer for the work carried out by the Subcontractor after the assignment takes effect.

4.6

Co-operation

The Contractor shall, as specified in the Contract or as instructed by the Engineer, allow appropriate opportunities for carrying out work to:

- (a) the Employer's Personnel,
- (b) any other contractors employed by the Employer, and
- (c) the personnel of any legally constituted public authorities,

who may be employed in the execution on or near the Site of any work not included in the Contract.

Any such instruction shall constitute a Variation if and to the extent that it causes the Contractor to incur Unforeseeable Cost. Services for these personnel and other contractors may include the use of Contractor's Equipment, Temporary Works or access arrangements which are the responsibility of the Contractor.

If, under the Contract, the Employer is required to give to the Contractor possession of any foundation, structure, plant or means of access in accordance with Contractor's Documents, the Contractor shall submit such documents to the Engineer in the time and manner stated in the Specification.

4.7 Setting Out

The Contractor shall set out the Works in relation to original points, lines and levels of reference specified in the Contract or notified by the Engineer. The Contractor shall be responsible for the correct positioning of all parts of the Works, and shall rectify any error in the positions, levels, dimensions or alignment of the Works.

The Employer shall be responsible for any errors in these specified or notified items of reference, but the Contractor shall use reasonable efforts to verify their accuracy before they are used.

If the Contractor suffers delay and/or incurs Cost from executing work which was necessitated by an error in these items of reference, and an experienced contractor could not reasonably have discovered such error and avoided this delay and/or Cost, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any such Cost plus reasonable profit, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine (i) whether and (if so) to what extent the error could not reasonably have been discovered, and (ii) the matters described in sub-paragraphs (a) and (b) above related to this extent.

4.8 Safety Procedures

The Contractor shall:

- (a) comply with all applicable safety regulations,
- (b) take care for the safety of all persons entitled to be on the Site,
- (c) use reasonable efforts to keep the Site and Works clear of unnecessary obstruction so as to avoid danger to these persons,
- (d) provide fencing, lighting, guarding and watching of the Works until completion and taking over under Clause 10 [*Employer's Taking Over*], and
- (e) provide any Temporary Works (including roadways, footways, guards and fences) which may be necessary, because of the execution of the Works, for the use and protection of the public and of owners and occupiers of adjacent land.

4.9 Quality Assurance

The Contractor shall institute a quality assurance system to demonstrate compliance with the requirements of the Contract. The system shall be in accordance with the details stated in the Contract. The Engineer shall be entitled to audit any aspect of the system.

Details of all procedures and compliance documents shall be submitted to the Engineer for information before each design and execution stage is commenced. When any document of a technical nature is issued to the Engineer, evidence of the prior approval by the Contractor himself shall be apparent on the document itself.

Compliance with the quality assurance system shall not relieve the Contractor of any of his duties, obligations or responsibilities under the Contract.

4.10 Site Data

The Employer shall have made available to the Contractor for his information, prior to the Base Date, all relevant data in the Employer's possession on sub-surface and hydrological conditions at the Site, including environmental aspects. The Employer

shall similarly make available to the Contractor all such data which come into the Employer's possession after the Base Date. The Contractor shall be responsible for interpreting all such data.

To the extent which was practicable (taking account of cost and time), the Contractor shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Tender or Works. To the same extent, the Contractor shall be deemed to have inspected and examined the Site, its surroundings, the above data and other available information, and to have been satisfied before submitting the Tender as to all relevant matters, including (without limitation):

- (a) the form and nature of the Site, including sub-surface conditions,
- (b) the hydrological and climatic conditions,
- (c) the extent and nature of the work and Goods necessary for the execution and completion of the Works and the remedying of any defects,
- (d) the Laws, procedures and labour practices of the Country, and
- (e) the Contractor's requirements for access, accommodation, facilities, personnel, power, transport, water and other services.

4.11

Sufficiency of the Accepted Contract Amount

The Contractor shall be deemed to:

- (a) have satisfied himself as to the correctness and sufficiency of the Accepted Contract Amount, and
- (b) have based the Accepted Contract Amount on the data, interpretations, necessary information, inspections, examinations and satisfaction as to all relevant matters referred to in Sub-Clause 4.10 [*Site Data*].

Unless otherwise stated in the Contract, the Accepted Contract Amount covers all the Contractor's obligations under the Contract (including those under Provisional Sums, if any) and all things necessary for the proper execution and completion of the Works and the remedying of any defects.

4.12

Unforeseeable Physical Conditions

In this Sub-Clause, "physical conditions" means natural physical conditions and man-made and other physical obstructions and pollutants, which the Contractor encounters at the Site when executing the Works, including sub-surface and hydrological conditions but excluding climatic conditions.

If the Contractor encounters adverse physical conditions which he considers to have been Unforeseeable, the Contractor shall give notice to the Engineer as soon as practicable.

This notice shall describe the physical conditions, so that they can be inspected by the Engineer, and shall set out the reasons why the Contractor considers them to be Unforeseeable. The Contractor shall continue executing the Works, using such proper and reasonable measures as are appropriate for the physical conditions, and shall comply with any instructions which the Engineer may give. If an instruction constitutes a Variation, Clause 13 [*Variations and Adjustments*] shall apply.

If and to the extent that the Contractor encounters physical conditions which are Unforeseeable, gives such a notice, and suffers delay and/or incurs Cost due to these conditions, the Contractor shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any such Cost, which shall be included in the Contract Price.

After receiving such notice and inspecting and/or investigating these physical conditions, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine (i) whether and (if so) to what extent these physical conditions were Unforeseeable, and (ii) the matters described in sub-paragraphs (a) and (b) above related to this extent.

However, before additional Cost is finally agreed or determined under sub-paragraph (ii), the Engineer may also review whether other physical conditions in similar parts of the Works (if any) were more favourable than could reasonably have been foreseen when the Contractor submitted the Tender. If and to the extent that these more favourable conditions were encountered, the Engineer may proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine the reductions in Cost which were due to these conditions, which may be included (as deductions) in the Contract Price and Payment Certificates. However, the net effect of all adjustments under sub-paragraph (b) and all these reductions, for all the physical conditions encountered in similar parts of the Works, shall not result in a net reduction in the Contract Price.

The Engineer may take account of any evidence of the physical conditions foreseen by the Contractor when submitting the Tender, which may be made available by the Contractor, but shall not be bound by any such evidence.

4.13

Rights of Way and Facilities

The Contractor shall bear all costs and charges for special and/or temporary rights-of-way which he may require, including those for access to the Site. The Contractor shall also obtain, at his risk and cost, any additional facilities outside the Site which he may require for the purposes of the Works.

4.14

Avoidance of Interference

The Contractor shall not interfere unnecessarily or improperly with:

- (a) the convenience of the public, or
- (b) the access to and use and occupation of all roads and footpaths, irrespective of whether they are public or in the possession of the Employer or of others.

The Contractor shall indemnify and hold the Employer harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from any such unnecessary or improper interference.

4.15

Access Route

The Contractor shall be deemed to have been satisfied as to the suitability and availability of access routes to the Site. The Contractor shall use reasonable efforts to prevent any road or bridge from being damaged by the Contractor's traffic or by the Contractor's Personnel. These efforts shall include the proper use of appropriate vehicles and routes.

Except as otherwise stated in these Conditions:

- (a) the Contractor shall (as between the Parties) be responsible for any maintenance which may be required for his use of access routes;
- (b) the Contractor shall provide all necessary signs or directions along access routes, and shall obtain any permission which may be required from the relevant authorities for his use of routes, signs and directions;
- (c) the Employer shall not be responsible for any claims which may arise from the use or otherwise of any access route,

- (d) the Employer does not guarantee the suitability or availability of particular access routes, and
- (e) Costs due to non-suitability or non-availability, for the use required by the Contractor, of access routes shall be borne by the Contractor.

4.16

Transport of Goods

Unless otherwise stated in the Particular Conditions:

- (a) the Contractor shall give the Engineer not less than 21 days' notice of the date on which any Plant or a major item of other Goods will be delivered to the Site;
- (b) the Contractor shall be responsible for packing, loading, transporting, receiving, unloading, storing and protecting all Goods and other things required for the Works; and
- (c) the Contractor shall indemnify and hold the Employer harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from the transport of Goods, and shall negotiate and pay all claims arising from their transport.

4.17

Contractor's Equipment

The Contractor shall be responsible for all Contractor's Equipment. When brought on to the Site, Contractor's Equipment shall be deemed to be exclusively intended for the execution of the Works. The Contractor shall not remove from the Site any major items of Contractor's Equipment without the consent of the Engineer. However, consent shall not be required for vehicles transporting Goods or Contractor's Personnel off Site.

4.18

Protection of the Environment

The Contractor shall take all reasonable steps to protect the environment (both on and off the Site) and to limit damage and nuisance to people and property resulting from pollution, noise and other results of his operations.

The Contractor shall ensure that emissions, surface discharges and effluent from the Contractor's activities shall not exceed the values indicated in the Specification, and shall not exceed the values prescribed by applicable Laws.

4.19

Electricity, Water and Gas

The Contractor shall, except as stated below, be responsible for the provision of all power, water and other services he may require.

The Contractor shall be entitled to use for the purposes of the Works such supplies of electricity, water, gas and other services as may be available on the Site and of which details and prices are given in the Specification. The Contractor shall, at his risk and cost, provide any apparatus necessary for his use of these services and for measuring the quantities consumed.

The quantities consumed and the amounts due (at these prices) for such services shall be agreed or determined by the Engineer in accordance with Sub-Clause 2.5 [*Employer's Claims*] and Sub-Clause 3.5 [*Determinations*]. The Contractor shall pay these amounts to the Employer.

4.20

Employer's Equipment and Free-Issue Material

The Employer shall make the Employer's Equipment (if any) available for the use of the Contractor in the execution of the Works in accordance with the details, arrangements and prices stated in the Specification. Unless otherwise stated in the Specification:

- (a) the Employer shall be responsible for the Employer's Equipment, except that

- (b) the Contractor shall be responsible for each item of Employer's Equipment whilst any of the Contractor's Personnel is operating it, driving it, directing it or in possession or control of it.

The appropriate quantities and the amounts due (at such stated prices) for the use of Employer's Equipment shall be agreed or determined by the Engineer in accordance with Sub-Clause 2.5 [*Employer's Claims*] and Sub-Clause 3.5 [*Determinations*]. The Contractor shall pay these amounts to the Employer.

The Employer shall supply, free of charge, the "free-issue materials" (if any) in accordance with the details stated in the Specification. The Employer shall, at his risk and cost, provide these materials at the time and place specified in the Contract. The Contractor shall then visually inspect them, and shall promptly give notice to the Engineer of any shortage, defect or default in these materials. Unless otherwise agreed by both Parties, the Employer shall immediately rectify the notified shortage, defect or default.

After this visual inspection, the free-issue materials shall come under the care, custody and control of the Contractor. The Contractor's obligations of inspection, care, custody and control shall not relieve the Employer of liability for any shortage, defect or default not apparent from a visual inspection.

4.21

Progress Reports

Unless otherwise stated in the Particular Conditions, monthly progress reports shall be prepared by the Contractor and submitted to the Engineer in six copies. The first report shall cover the period up to the end of the first calendar month following the Commencement Date. Reports shall be submitted monthly thereafter, each within 7 days after the last day of the period to which it relates.

Reporting shall continue until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.

Each report shall include:

- (a) charts and detailed descriptions of progress, including each stage of design (if any), Contractor's Documents, procurement, manufacture, delivery to Site, construction, erection and testing; and including these stages for work by each nominated Subcontractor (as defined in Clause 5 [*Nominated Subcontractors*]),
- (b) photographs showing the status of manufacture and of progress on the Site;
- (c) for the manufacture of each main item of Plant and Materials, the name of the manufacturer, manufacture location, percentage progress, and the actual or expected dates of:
 - (i) commencement of manufacture,
 - (ii) Contractor's inspections,
 - (iii) tests, and
 - (iv) shipment and arrival at the Site;
- (d) the details described in Sub-Clause 6.10 [*Records of Contractor's Personnel and Equipment*];
- (e) copies of quality assurance documents, test results and certificates of Materials;
- (f) list of notices given under Sub-Clause 2.5 [*Employer's Claims*] and notices given under Sub-Clause 20.1 [*Contractor's Claims*];
- (g) safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations; and

- (h) comparisons of actual and planned progress, with details of any events or circumstances which may jeopardise the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome delays.

4.22

Security of the Site

Unless otherwise stated in the Particular Conditions:

- (a) the Contractor shall be responsible for keeping unauthorised persons off the Site, and
- (b) authorised persons shall be limited to the Contractor's Personnel and the Employer's Personnel; and to any other personnel notified to the Contractor, by the Employer or the Engineer, as authorised personnel of the Employer's other contractors on the Site.

4.23

Contractor's Operations on Site

The Contractor shall confine his operations to the Site, and to any additional areas which may be obtained by the Contractor and agreed by the Engineer as working areas. The Contractor shall take all necessary precautions to keep Contractor's Equipment and Contractor's Personnel within the Site and these additional areas, and to keep them off adjacent land.

During the execution of the Works, the Contractor shall keep the Site free from all unnecessary obstruction, and shall store or dispose of any Contractor's Equipment or surplus materials. The Contractor shall clear away and remove from the Site any wreckage, rubbish and Temporary Works which are no longer required.

Upon the issue of a Taking-Over Certificate, the Contractor shall clear away and remove, from that part of the Site and Works to which the Taking-Over Certificate refers, all Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works. The Contractor shall leave that part of the Site and the Works in a clean and safe condition. However, the Contractor may retain on Site, during the Defects Notification Period, such Goods as are required for the Contractor to fulfil obligations under the Contract.

4.24

Fossils

All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the Site shall be placed under the care and authority of the Employer. The Contractor shall take reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any of these findings.

The Contractor shall, upon discovery of any such finding, promptly give notice to the Engineer, who shall issue instructions for dealing with it. If the Contractor suffers delay and/or incurs Cost from complying with the instructions, the Contractor shall give a further notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any such Cost, which shall be included in the Contract Price.

After receiving this further notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

5 Nominated Subcontractors

5.1

Definition of “nominated Subcontractor”

In the Contract, “nominated Subcontractor” means a Subcontractor:

- (a) who is stated in the Contract as being a nominated Subcontractor, or
- (b) whom the Engineer, under Clause 13 [*Variations and Adjustments*], instructs the Contractor to employ as a Subcontractor.

5.2

Objection to Nomination

The Contractor shall not be under any obligation to employ a nominated Subcontractor against whom the Contractor raises reasonable objection by notice to the Engineer as soon as practicable, with supporting particulars. An objection shall be deemed reasonable if it arises from (among other things) any of the following matters, unless the Employer agrees to indemnify the Contractor against and from the consequences of the matter:

- (a) there are reasons to believe that the Subcontractor does not have sufficient competence, resources or financial strength;
- (b) the subcontract does not specify that the nominated Subcontractor shall indemnify the Contractor against and from any negligence or misuse of Goods by the nominated Subcontractor, his agents and employees; or
- (c) the subcontract does not specify that, for the subcontracted work (including design, if any), the nominated Subcontractor shall:
 - (i) undertake to the Contractor such obligations and liabilities as will enable the Contractor to discharge his obligations and liabilities under the Contract, and
 - (ii) indemnify the Contractor against and from all obligations and liabilities arising under or in connection with the Contract and from the consequences of any failure by the Subcontractor to perform these obligations or to fulfil these liabilities.

5.3

Payments to nominated Subcontractors

The Contractor shall pay to the nominated Subcontractor the amounts which the Engineer certifies to be due in accordance with the subcontract. These amounts plus other charges shall be included in the Contract Price in accordance with subparagraph (b) of Sub-Clause 13.5 [*Provisional Sums*], except as stated in Sub-Clause 5.4 [*Evidence of Payments*].

5.4

Evidence of Payments

Before issuing a Payment Certificate which includes an amount payable to a nominated Subcontractor, the Engineer may request the Contractor to supply reasonable evidence that the nominated Subcontractor has received all amounts due in accordance with previous Payment Certificates, less applicable deductions for retention or otherwise. Unless the Contractor:

- (a) submits this reasonable evidence to the Engineer, or
- (b)
 - (i) satisfies the Engineer in writing that the Contractor is reasonably entitled to withhold or refuse to pay these amounts, and
 - (ii) submits to the Engineer reasonable evidence that the nominated Subcontractor has been notified of the Contractor’s entitlement,

then the Employer may (at his sole discretion) pay, direct to the nominated Subcontractor, part or all of such amounts previously certified (less applicable

deductions) as are due to the nominated Subcontractor and for which the Contractor has failed to submit the evidence described in sub-paragraphs (a) or (b) above. The Contractor shall then repay, to the Employer, the amount which the nominated Subcontractor was directly paid by the Employer.

6 Staff and Labour

- 6.1 Engagement of Staff and Labour** Except as otherwise stated in the Specification, the Contractor shall make arrangements for the engagement of all staff and labour, local or otherwise, and for their payment, housing, feeding and transport.
- 6.2 Rates of Wages and Conditions of Labour** The Contractor shall pay rates of wages, and observe conditions of labour, which are not lower than those established for the trade or industry where the work is carried out. If no established rates or conditions are applicable, the Contractor shall pay rates of wages and observe conditions which are not lower than the general level of wages and conditions observed locally by employers whose trade or industry is similar to that of the Contractor.
- 6.3 Persons in the Service of Employer** The Contractor shall not recruit, or attempt to recruit, staff and labour from amongst the Employer's Personnel.
- 6.4 Labour Laws** The Contractor shall comply with all the relevant labour Laws applicable to the Contractor's Personnel, including Laws relating to their employment, health, safety, welfare, immigration and emigration, and shall allow them all their legal rights.
- The Contractor shall require his employees to obey all applicable Laws, including those concerning safety at work.
- 6.5 Working Hours** No work shall be carried out on the Site on locally recognised days of rest, or outside the normal working hours stated in the Appendix to Tender, unless:
- (a) otherwise stated in the Contract,
 - (b) the Engineer gives consent, or
 - (c) the work is unavoidable, or necessary for the protection of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Engineer.
- 6.6 Facilities for Staff and Labour** Except as otherwise stated in the Specification, the Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor's Personnel. The Contractor shall also provide facilities for the Employer's Personnel as stated in the Specification.
- The Contractor shall not permit any of the Contractor's Personnel to maintain any temporary or permanent living quarters within the structures forming part of the Permanent Works.
- 6.7 Health and Safety** The Contractor shall at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel. In collaboration with local health authorities,

the Contractor shall ensure that medical staff, first aid facilities, sick bay and ambulance service are available at all times at the Site and at any accommodation for Contractor's and Employer's Personnel, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics.

The Contractor shall appoint an accident prevention officer at the Site, responsible for maintaining safety and protection against accidents. This person shall be qualified for this responsibility, and shall have the authority to issue instructions and take protective measures to prevent accidents. Throughout the execution of the Works, the Contractor shall provide whatever is required by this person to exercise this responsibility and authority.

The Contractor shall send, to the Engineer, details of any accident as soon as practicable after its occurrence. The Contractor shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as the Engineer may reasonably require.

6.8

Contractor's Superintendence

Throughout the execution of the Works, and as long thereafter as is necessary to fulfil the Contractor's obligations, the Contractor shall provide all necessary superintendence to plan, arrange, direct, manage, inspect and test the work.

Superintendence shall be given by a sufficient number of persons having adequate knowledge of the language for communications (defined in Sub-Clause 1.4 [*Law and Language*]) and of the operations to be carried out (including the methods and techniques required, the hazards likely to be encountered and methods of preventing accidents), for the satisfactory and safe execution of the Works.

6.9

Contractor's Personnel

The Contractor's Personnel shall be appropriately qualified, skilled and experienced in their respective trades or occupations. The Engineer may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Contractor's Representative if applicable, who:

- (a) persists in any misconduct or lack of care,
- (b) carries out duties incompetently or negligently,
- (c) fails to conform with any provisions of the Contract, or
- (d) persists in any conduct which is prejudicial to safety, health, or the protection of the environment.

If appropriate, the Contractor shall then appoint (or cause to be appointed) a suitable replacement person.

6.10

Records of Contractor's Personnel and Equipment

The Contractor shall submit, to the Engineer, details showing the number of each class of Contractor's Personnel and of each type of Contractor's Equipment on the Site. Details shall be submitted each calendar month, in a form approved by the Engineer, until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.

6.11

Disorderly Conduct

The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst the Contractor's Personnel, and to preserve peace and protection of persons and property on and near the Site.

7 Plant, Materials and Workmanship

- 7.1 Manner of Execution** The Contractor shall carry out the manufacture of Plant, the production and manufacture of Materials, and all other execution of the Works:
- (a) in the manner (if any) specified in the Contract,
 - (b) in a proper workmanlike and careful manner, in accordance with recognised good practice, and
 - (c) with properly equipped facilities and non-hazardous Materials, except as otherwise specified in the Contract.

- 7.2 Samples** The Contractor shall submit the following samples of Materials, and relevant information, to the Engineer for consent prior to using the Materials in or for the Works:
- (a) manufacturer's standard samples of Materials and samples specified in the Contract, all at the Contractor's cost, and
 - (b) additional samples instructed by the Engineer as a Variation.

Each sample shall be labelled as to origin and intended use in the Works.

- 7.3 Inspection** The Employer's Personnel shall at all reasonable times:
- (a) have full access to all parts of the Site and to all places from which natural Materials are being obtained, and
 - (b) during production, manufacture and construction (at the Site and elsewhere), be entitled to examine, inspect, measure and test the materials and workmanship, and to check the progress of manufacture of Plant and production and manufacture of Materials.

The Contractor shall give the Employer's Personnel full opportunity to carry out these activities, including providing access, facilities, permissions and safety equipment. No such activity shall relieve the Contractor from any obligation or responsibility.

The Contractor shall give notice to the Engineer whenever any work is ready and before it is covered up, put out of sight, or packaged for storage or transport. The Engineer shall then either carry out the examination, inspection, measurement or testing without unreasonable delay, or promptly give notice to the Contractor that the Engineer does not require to do so. If the Contractor fails to give the notice, he shall, if and when required by the Engineer, uncover the work and thereafter reinstate and make good, all at the Contractor's cost.

- 7.4 Testing** This Sub-Clause shall apply to all tests specified in the Contract, other than the Tests after Completion (if any).

The Contractor shall provide all apparatus, assistance, documents and other information, electricity, equipment, fuel, consumables, instruments, labour, materials, and suitably qualified and experienced staff, as are necessary to carry out the specified tests efficiently. The Contractor shall agree, with the Engineer, the time and place for the specified testing of any Plant, Materials and other parts of the Works.

The Engineer may, under Clause 13 [*Variations and Adjustments*], vary the location or details of specified tests, or instruct the Contractor to carry out additional tests. If these varied or additional tests show that the tested Plant, Materials or workmanship is not in accordance with the Contract, the cost of carrying out this Variation shall be borne by the Contractor, notwithstanding other provisions of the Contract.

The Engineer shall give the Contractor not less than 24 hours' notice of the Engineer's intention to attend the tests. If the Engineer does not attend at the time and place agreed, the Contractor may proceed with the tests, unless otherwise instructed by the Engineer, and the tests shall then be deemed to have been made in the Engineer's presence.

If the Contractor suffers delay and/or incurs Cost from complying with these instructions or as a result of a delay for which the Employer is responsible, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any such Cost plus reasonable profit, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

The Contractor shall promptly forward to the Engineer duly certified reports of the tests. When the specified tests have been passed, the Engineer shall endorse the Contractor's test certificate, or issue a certificate to him, to that effect. If the Engineer has not attended the tests, he shall be deemed to have accepted the readings as accurate.

7.5

Rejection

If, as a result of an examination, inspection, measurement or testing, any Plant, Materials or workmanship is found to be defective or otherwise not in accordance with the Contract, the Engineer may reject the Plant, Materials or workmanship by giving notice to the Contractor, with reasons. The Contractor shall then promptly make good the defect and ensure that the rejected item complies with the Contract.

If the Engineer requires this Plant, Materials or workmanship to be retested, the tests shall be repeated under the same terms and conditions. If the rejection and retesting cause the Employer to incur additional costs, the Contractor shall subject to Sub-Clause 2.5 [*Employer's Claims*] pay these costs to the Employer.

7.6

Remedial Work

Notwithstanding any previous test or certification, the Engineer may instruct the Contractor to:

- (a) remove from the Site and replace any Plant or Materials which is not in accordance with the Contract,
- (b) remove and re-execute any other work which is not in accordance with the Contract, and
- (c) execute any work which is urgently required for the safety of the Works, whether because of an accident, unforeseeable event or otherwise.

The Contractor shall comply with the instruction within a reasonable time, which shall be the time (if any) specified in the instruction, or immediately if urgency is specified under sub-paragraph (c).

If the Contractor fails to comply with the instruction, the Employer shall be entitled to employ and pay other persons to carry out the work. Except to the extent that the Contractor would have been entitled to payment for the work, the Contractor shall subject to Sub-Clause 2.5 [*Employer's Claims*] pay to the Employer all costs arising from this failure.

7.7

Ownership of Plant and Materials

Each item of Plant and Materials shall, to the extent consistent with the Laws of the Country, become the property of the Employer at whichever is the earlier of the following times, free from liens and other encumbrances:

- (a) when it is delivered to the Site;
- (b) when the Contractor is entitled to payment of the value of the Plant and Materials under Sub-Clause 8.10 [*Payment for Plant and Materials in Event of Suspension*].

7.8

Royalties

Unless otherwise stated in the Specification, the Contractor shall pay all royalties, rents and other payments for:

- (a) natural Materials obtained from outside the Site, and
- (b) the disposal of material from demolitions and excavations and of other surplus material (whether natural or man-made), except to the extent that disposal areas within the Site are specified in the Contract.

8 Commencement, Delays and Suspension

8.1

Commencement of Works

The Engineer shall give the Contractor not less than 7 days' notice of the Commencement Date. Unless otherwise stated in the Particular Conditions, the Commencement Date shall be within 42 days after the Contractor receives the Letter of Acceptance.

The Contractor shall commence the execution of the Works as soon as is reasonably practicable after the Commencement Date, and shall then proceed with the Works with due expedition and without delay.

8.2

Time for Completion

The Contractor shall complete the whole of the Works, and each Section (if any), within the Time for Completion for the Works or Section (as the case may be), including:

- (a) achieving the passing of the Tests on Completion, and
- (b) completing all work which is stated in the Contract as being required for the Works or Section to be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [*Taking Over of the Works and Sections*].

8.3

Programme

The Contractor shall submit a detailed time programme to the Engineer within 28 days after receiving the notice under Sub-Clause 8.1 [*Commencement of Works*]. The Contractor shall also submit a revised programme whenever the previous programme is inconsistent with actual progress or with the Contractor's obligations. Each programme shall include:

- (a) the order in which the Contractor intends to carry out the Works, including the anticipated timing of each stage of design (if any), Contractor's Documents, procurement, manufacture of Plant, delivery to Site, construction, erection and testing,
- (b) each of these stages for work by each nominated Subcontractor (as defined in Clause 5 [*Nominated Subcontractors*]),
- (c) the sequence and timing of inspections and tests specified in the Contract, and
- (d) a supporting report which includes:
 - (i) a general description of the methods which the Contractor intends to adopt, and of the major stages, in the execution of the Works, and
 - (ii) details showing the Contractor's reasonable estimate of the number of each class of Contractor's Personnel and of each type of Contractor's Equipment, required on the Site for each major stage.

Unless the Engineer, within 21 days after receiving a programme, gives notice to the Contractor stating the extent to which it does not comply with the Contract, the Contractor shall proceed in accordance with the programme, subject to his other obligations under the Contract. The Employer's Personnel shall be entitled to rely upon the programme when planning their activities.

The Contractor shall promptly give notice to the Engineer of specific probable future events or circumstances which may adversely affect the work, increase the Contract Price or delay the execution of the Works. The Engineer may require the Contractor to submit an estimate of the anticipated effect of the future event or circumstances, and/or a proposal under Sub-Clause 13.3 [*Variation Procedure*].

If, at any time, the Engineer gives notice to the Contractor that a programme fails (to the extent stated) to comply with the Contract or to be consistent with actual progress and the Contractor's stated intentions, the Contractor shall submit a revised programme to the Engineer in accordance with this Sub-Clause.

8.4

Extension of Time for Completion

The Contractor shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to an extension of the Time for Completion if and to the extent that completion for the purposes of Sub-Clause 10.1 [*Taking Over of the Works and Sections*] is or will be delayed by any of the following causes:

- (a) a Variation (unless an adjustment to the Time for Completion has been agreed under Sub-Clause 13.3 [*Variation Procedure*]) or other substantial change in the quantity of an item of work included in the Contract,
- (b) a cause of delay giving an entitlement to extension of time under a Sub-Clause of these Conditions,
- (c) exceptionally adverse climatic conditions,
- (d) Unforeseeable shortages in the availability of personnel or Goods caused by epidemic or governmental actions, or
- (e) any delay, impediment or prevention caused by or attributable to the Employer, the Employer's Personnel, or the Employer's other contractors on the Site.

If the Contractor considers himself to be entitled to an extension of the Time for Completion, the Contractor shall give notice to the Engineer in accordance with Sub-Clause 20.1 [*Contractor's Claims*]. When determining each extension of time under Sub-Clause 20.1, the Engineer shall review previous determinations and may increase, but shall not decrease, the total extension of time.

**8.5
Delays Caused by
Authorities**

If the following conditions apply, namely:

- (a) the Contractor has diligently followed the procedures laid down by the relevant legally constituted public authorities in the Country,
- (b) these authorities delay or disrupt the Contractor's work, and
- (c) the delay or disruption was Unforeseeable,

then this delay or disruption will be considered as a cause of delay under subparagraph (b) of Sub-Clause 8.4 [*Extension of Time for Completion*].

**8.6
Rate of Progress**

If, at any time:

- (a) actual progress is too slow to complete within the Time for Completion, and/or
- (b) progress has fallen (or will fall) behind the current programme under Sub-Clause 8.3 [*Programme*],

other than as a result of a cause listed in Sub-Clause 8.4 [*Extension of Time for Completion*], then the Engineer may instruct the Contractor to submit, under Sub-Clause 8.3 [*Programme*], a revised programme and supporting report describing the revised methods which the Contractor proposes to adopt in order to expedite progress and complete within the Time for Completion.

Unless the Engineer notifies otherwise, the Contractor shall adopt these revised methods, which may require increases in the working hours and/or in the numbers of Contractor's Personnel and/or Goods, at the risk and cost of the Contractor. If these revised methods cause the Employer to incur additional costs, the Contractor shall subject to Sub-Clause 2.5 [*Employer's Claims*] pay these costs to the Employer, in addition to delay damages (if any) under Sub-Clause 8.7 below.

**8.7
Delay Damages**

If the Contractor fails to comply with Sub-Clause 8.2 [*Time for Completion*], the Contractor shall subject to Sub-Clause 2.5 [*Employer's Claims*] pay delay damages to the Employer for this default. These delay damages shall be the sum stated in the Appendix to Tender, which shall be paid for every day which shall elapse between the relevant Time for Completion and the date stated in the Taking-Over Certificate. However, the total amount due under this Sub-Clause shall not exceed the maximum amount of delay damages (if any) stated in the Appendix to Tender.

These delay damages shall be the only damages due from the Contractor for such default, other than in the event of termination under Sub-Clause 15.2 [*Termination by Employer*] prior to completion of the Works. These damages shall not relieve the Contractor from his obligation to complete the Works, or from any other duties, obligations or responsibilities which he may have under the Contract.

**8.8
Suspension of Work**

The Engineer may at any time instruct the Contractor to suspend progress of part or all of the Works. During such suspension, the Contractor shall protect, store and secure such part or the Works against any deterioration, loss or damage.

The Engineer may also notify the cause for the suspension. If and to the extent that the cause is notified and is the responsibility of the Contractor, the following Sub-Clauses 8.9, 8.10 and 8.11 shall not apply.

**8.9
Consequences of
Suspension**

If the Contractor suffers delay and/or incurs Cost from complying with the Engineer's instructions under Sub-Clause 8.8 [*Suspension of Work*] and/or from resuming the work, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any such Cost, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

The Contractor shall not be entitled to an extension of time for, or to payment of the Cost incurred in, making good the consequences of the Contractor's faulty design, workmanship or materials, or of the Contractor's failure to protect, store or secure in accordance with Sub-Clause 8.8 [*Suspension of Work*].

8.10

**Payment for Plant and
Materials in Event of
Suspension**

The Contractor shall be entitled to payment of the value (as at the date of suspension) of Plant and/or Materials which have not been delivered to Site, if:

- (a) the work on Plant or delivery of Plant and/or Materials has been suspended for more than 28 days, and
- (b) the Contractor has marked the Plant and/or Materials as the Employer's property in accordance with the Engineer's instructions.

8.11

Prolonged Suspension

If the suspension under Sub-Clause 8.8 [*Suspension of Work*] has continued for more than 84 days, the Contractor may request the Engineer's permission to proceed. If the Engineer does not give permission within 28 days after being requested to do so, the Contractor may, by giving notice to the Engineer, treat the suspension as an omission under Clause 13 [*Variations and Adjustments*] of the affected part of the Works. If the suspension affects the whole of the Works, the Contractor may give notice of termination under Sub-Clause 16.2 [*Termination by Contractor*].

8.12

Resumption of Work

After the permission or instruction to proceed is given, the Contractor and the Engineer shall jointly examine the Works and the Plant and Materials affected by the suspension. The Contractor shall make good any deterioration or defect in or loss of the Works or Plant or Materials, which has occurred during the suspension.

9 Tests on Completion

**9.1
Contractor's Obligations**

The Contractor shall carry out the Tests on Completion in accordance with this Clause and Sub-Clause 7.4 [*Testing*], after providing the documents in accordance with sub-paragraph (d) of Sub-Clause 4.1 [*Contractor's General Obligations*].

The Contractor shall give to the Engineer not less than 21 days' notice of the date after which the Contractor will be ready to carry out each of the Tests on Completion. Unless otherwise agreed, Tests on Completion shall be carried out within 14 days after this date, on such day or days as the Engineer shall instruct.

In considering the results of the Tests on Completion, the Engineer shall make

allowances for the effect of any use of the Works by the Employer on the performance or other characteristics of the Works. As soon as the Works, or a Section, have passed any Tests on Completion, the Contractor shall submit a certified report of the results of these Tests to the Engineer.

9.2

Delayed Tests

If the Tests on Completion are being unduly delayed by the Employer, Sub-Clause 7.4 [*Testing*] (fifth paragraph) and/or Sub-Clause 10.3 [*Interference with Tests on Completion*] shall be applicable.

If the Tests on Completion are being unduly delayed by the Contractor, the Engineer may by notice require the Contractor to carry out the Tests within 21 days after receiving the notice. The Contractor shall carry out the Tests on such day or days within that period as the Contractor may fix and of which he shall give notice to the Engineer.

If the Contractor fails to carry out the Tests on Completion within the period of 21 days, the Employer's Personnel may proceed with the Tests at the risk and cost of the Contractor. The Tests on Completion shall then be deemed to have been carried out in the presence of the Contractor and the results of the Tests shall be accepted as accurate.

9.3

Retesting

If the Works, or a Section, fail to pass the Tests on Completion, Sub-Clause 7.5 [*Rejection*] shall apply, and the Engineer or the Contractor may require the failed Tests, and Tests on Completion on any related work, to be repeated under the same terms and conditions.

9.4

Failure to Pass Tests on Completion

If the Works, or a Section, fail to pass the Tests on Completion repeated under Sub-Clause 9.3 [*Retesting*], the Engineer shall be entitled to:

- (a) order further repetition of Tests on Completion under Sub-Clause 9.3;
- (b) if the failure deprives the Employer of substantially the whole benefit of the Works or Section, reject the Works or Section (as the case may be), in which event the Employer shall have the same remedies as are provided in sub-paragraph (c) of Sub-Clause 11.4 [*Failure to Remedy Defects*]; or
- (c) issue a Taking-Over Certificate, if the Employer so requests.

In the event of sub-paragraph (c), the Contractor shall proceed in accordance with all other obligations under the Contract, and the Contract Price shall be reduced by such amount as shall be appropriate to cover the reduced value to the Employer as a result of this failure. Unless the relevant reduction for this failure is stated (or its method of calculation is defined) in the Contract, the Employer may require the reduction to be (i) agreed by both Parties (in full satisfaction of this failure only) and paid before this Taking-Over Certificate is issued, or (ii) determined and paid under Sub-Clause 2.5 [*Employer's Claims*] and Sub-Clause 3.5 [*Determinations*].

10

Employer's Taking Over

10.1

Taking Over of the Works and Sections

Except as stated in Sub-Clause 9.4 [*Failure to Pass Tests on Completion*], the Works shall be taken over by the Employer when (i) the Works have been completed in accordance with the Contract, including the matters described in Sub-Clause 8.2 [*Time for Completion*] and except as allowed in sub-paragraph (a) below, and (ii) a

Taking-Over Certificate for the Works has been issued, or is deemed to have been issued in accordance with this Sub-Clause.

The Contractor may apply by notice to the Engineer for a Taking-Over Certificate not earlier than 14 days before the Works will, in the Contractor's opinion, be complete and ready for taking over. If the Works are divided into Sections, the Contractor may similarly apply for a Taking-Over Certificate for each Section.

The Engineer shall, within 28 days after receiving the Contractor's application:

- (a) issue the Taking-Over Certificate to the Contractor, stating the date on which the Works or Section were completed in accordance with the Contract, except for any minor outstanding work and defects which will not substantially affect the use of the Works or Section for their intended purpose (either until or whilst this work is completed and these defects are remedied); or
- (b) reject the application, giving reasons and specifying the work required to be done by the Contractor to enable the Taking-Over Certificate to be issued. The Contractor shall then complete this work before issuing a further notice under this Sub-Clause.

If the Engineer fails either to issue the Taking-Over Certificate or to reject the Contractor's application within the period of 28 days, and if the Works or Section (as the case may be) are substantially in accordance with the Contract, the Taking-Over Certificate shall be deemed to have been issued on the last day of that period.

10.2

Taking Over of Parts of the Works

The Engineer may, at the sole discretion of the Employer, issue a Taking-Over Certificate for any part of the Permanent Works.

The Employer shall not use any part of the Works (other than as a temporary measure which is either specified in the Contract or agreed by both Parties) unless and until the Engineer has issued a Taking-Over Certificate for this part. However, if the Employer does use any part of the Works before the Taking-Over Certificate is issued:

- (a) the part which is used shall be deemed to have been taken over as from the date on which it is used,
- (b) the Contractor shall cease to be liable for the care of such part as from this date, when responsibility shall pass to the Employer, and
- (c) if requested by the Contractor, the Engineer shall issue a Taking-Over Certificate for this part.

After the Engineer has issued a Taking-Over Certificate for a part of the Works, the Contractor shall be given the earliest opportunity to take such steps as may be necessary to carry out any outstanding Tests on Completion. The Contractor shall carry out these Tests on Completion as soon as practicable before the expiry date of the relevant Defects Notification Period.

If the Contractor incurs Cost as a result of the Employer taking over and/or using a part of the Works, other than such use as is specified in the Contract or agreed by the Contractor, the Contractor shall (i) give notice to the Engineer and (ii) be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to payment of any such Cost plus reasonable profit, which shall be included in the Contract Price. After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine this Cost and profit.

If a Taking-Over Certificate has been issued for a part of the Works (other than a Section), the delay damages thereafter for completion of the remainder of the Works shall be reduced. Similarly, the delay damages for the remainder of the Section (if any) in which this part is included shall also be reduced. For any period of delay after the date stated in this Taking-Over Certificate, the proportional reduction in these delay damages shall be calculated as the proportion which the value of the part so certified bears to the value of the Works or Section (as the case may be) as a whole. The Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these proportions. The provisions of this paragraph shall only apply to the daily rate of delay damages under Sub-Clause 8.7 [*Delay Damages*], and shall not affect the maximum amount of these damages.

10.3

Interference with Tests on Completion

If the Contractor is prevented, for more than 14 days, from carrying out the Tests on Completion by a cause for which the Employer is responsible, the Employer shall be deemed to have taken over the Works or Section (as the case may be) on the date when the Tests on Completion would otherwise have been completed.

The Engineer shall then issue a Taking-Over Certificate accordingly, and the Contractor shall carry out the Tests on Completion as soon as practicable, before the expiry date of the Defects Notification Period. The Engineer shall require the Tests on Completion to be carried out by giving 14 days' notice and in accordance with the relevant provisions of the Contract.

If the Contractor suffers delay and/or incurs Cost as a result of this delay in carrying out the Tests on Completion, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any such Cost plus reasonable profit, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

10.4

Surfaces Requiring Reinstatement

Except as otherwise stated in a Taking-Over Certificate, a certificate for a Section or part of the Works shall not be deemed to certify completion of any ground or other surfaces requiring reinstatement.

11 Defects Liability

11.1

Completion of Outstanding Work and Remedying Defects

In order that the Works and Contractor's Documents, and each Section, shall be in the condition required by the Contract (fair wear and tear excepted) by the expiry date of the relevant Defects Notification Period or as soon as practicable thereafter, the Contractor shall:

- (a) complete any work which is outstanding on the date stated in a Taking-Over Certificate, within such reasonable time as is instructed by the Engineer, and
- (b) execute all work required to remedy defects or damage, as may be notified by (or on behalf of) the Employer on or before the expiry date of the Defects Notification Period for the Works or Section (as the case may be).

If a defect appears or damage occurs, the Contractor shall be notified accordingly, by (or on behalf of) the Employer.

11.2

Cost of Remedying Defects

All work referred to in sub-paragraph (b) of Sub-Clause 11.1 [*Completion of Outstanding Work and Remedying Defects*] shall be executed at the risk and cost of the Contractor, if and to the extent that the work is attributable to:

- (a) any design for which the Contractor is responsible,
- (b) Plant, Materials or workmanship not being in accordance with the Contract, or
- (c) failure by the Contractor to comply with any other obligation.

If and to the extent that such work is attributable to any other cause, the Contractor shall be notified promptly by (or on behalf of) the Employer, and Sub-Clause 13.3 [*Variation Procedure*] shall apply.

11.3

Extension of Defects Notification Period

The Employer shall be entitled subject to Sub-Clause 2.5 [*Employer's Claims*] to an extension of the Defects Notification Period for the Works or a Section if and to the extent that the Works, Section or a major item of Plant (as the case may be, and after taking over) cannot be used for the purposes for which they are intended by reason of a defect or damage. However, a Defects Notification Period shall not be extended by more than two years.

If delivery and/or erection of Plant and/or Materials was suspended under Sub-Clause 8.8 [*Suspension of Work*] or Sub-Clause 16.1 [*Contractor's Entitlement to Suspend Work*], the Contractor's obligations under this Clause shall not apply to any defects or damage occurring more than two years after the Defects Notification Period for the Plant and/or Materials would otherwise have expired.

11.4

Failure to Remedy Defects

If the Contractor fails to remedy any defect or damage within a reasonable time, a date may be fixed by (or on behalf of) the Employer, on or by which the defect or damage is to be remedied. The Contractor shall be given reasonable notice of this date.

If the Contractor fails to remedy the defect or damage by this notified date and this remedial work was to be executed at the cost of the Contractor under Sub-Clause 11.2 [*Cost of Remedying Defects*], the Employer may (at his option):

- (a) carry out the work himself or by others, in a reasonable manner and at the Contractor's cost, but the Contractor shall have no responsibility for this work; and the Contractor shall subject to Sub-Clause 2.5 [*Employer's Claims*] pay to the Employer the costs reasonably incurred by the Employer in remedying the defect or damage;
- (b) require the Engineer to agree or determine a reasonable reduction in the Contract Price in accordance with Sub-Clause 3.5 [*Determinations*]; or
- (c) if the defect or damage deprives the Employer of substantially the whole benefit of the Works or any major part of the Works, terminate the Contract as a whole, or in respect of such major part which cannot be put to the intended use. Without prejudice to any other rights, under the Contract or otherwise, the Employer shall then be entitled to recover all sums paid for the Works or for such part (as the case may be), plus financing costs and the cost of dismantling the same, clearing the Site and returning Plant and Materials to the Contractor.

11.5 Removal of Defective Work	If the defect or damage cannot be remedied expeditiously on the Site and the Employer gives consent, the Contractor may remove from the Site for the purposes of repair such items of Plant as are defective or damaged. This consent may require the Contractor to increase the amount of the Performance Security by the full replacement cost of these items, or to provide other appropriate security.
11.6 Further Tests	<p>If the work of remedying of any defect or damage may affect the performance of the Works, the Engineer may require the repetition of any of the tests described in the Contract. The requirement shall be made by notice within 28 days after the defect or damage is remedied.</p> <p>These tests shall be carried out in accordance with the terms applicable to the previous tests, except that they shall be carried out at the risk and cost of the Party liable, under Sub-Clause 11.2 [<i>Cost of Remedying Defects</i>], for the cost of the remedial work.</p>
11.7 Right of Access	Until the Performance Certificate has been issued, the Contractor shall have such right of access to the Works as is reasonably required in order to comply with this Clause, except as may be inconsistent with the Employer's reasonable security restrictions.
11.8 Contractor to Search	The Contractor shall, if required by the Engineer, search for the cause of any defect, under the direction of the Engineer. Unless the defect is to be remedied at the cost of the Contractor under Sub-Clause 11.2 [<i>Cost of Remedying Defects</i>], the Cost of the search plus reasonable profit shall be agreed or determined by the Engineer in accordance with Sub-Clause 3.5 [<i>Determinations</i>] and shall be included in the Contract Price.
11.9 Performance Certificate	<p>Performance of the Contractor's obligations shall not be considered to have been completed until the Engineer has issued the Performance Certificate to the Contractor, stating the date on which the Contractor completed his obligations under the Contract.</p> <p>The Engineer shall issue the Performance Certificate within 28 days after the latest of the expiry dates of the Defects Notification Periods, or as soon thereafter as the Contractor has supplied all the Contractor's Documents and completed and tested all the Works, including remedying any defects. A copy of the Performance Certificate shall be issued to the Employer.</p> <p>Only the Performance Certificate shall be deemed to constitute acceptance of the Works.</p>
11.10 Unfulfilled Obligations	After the Performance Certificate has been issued, each Party shall remain liable for the fulfilment of any obligation which remains unperformed at that time. For the purposes of determining the nature and extent of unperformed obligations, the Contract shall be deemed to remain in force.
11.11 Clearance of Site	<p>Upon receiving the Performance Certificate, the Contractor shall remove any remaining Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works from the Site.</p> <p>If all these items have not been removed within 28 days after the Employer receives a copy of the Performance Certificate, the Employer may sell or</p>

otherwise dispose of any remaining items. The Employer shall be entitled to be paid the costs incurred in connection with, or attributable to, such sale or disposal and restoring the Site.

Any balance of the moneys from the sale shall be paid to the Contractor. If these moneys are less than the Employer's costs, the Contractor shall pay the outstanding balance to the Employer.

12 Measurement and Evaluation

12.1

Works to be Measured

The Works shall be measured, and valued for payment, in accordance with this Clause.

Whenever the Engineer requires any part of the Works to be measured, reasonable notice shall be given to the Contractor's Representative, who shall:

- (a) promptly either attend or send another qualified representative to assist the Engineer in making the measurement, and
- (b) supply any particulars requested by the Engineer.

If the Contractor fails to attend or send a representative, the measurement made by (or on behalf of) the Engineer shall be accepted as accurate.

Except as otherwise stated in the Contract, wherever any Permanent Works are to be measured from records, these shall be prepared by the Engineer. The Contractor shall, as and when requested, attend to examine and agree the records with the Engineer, and shall sign the same when agreed. If the Contractor does not attend, the records shall be accepted as accurate.

If the Contractor examines and disagrees the records, and/or does not sign them as agreed, then the Contractor shall give notice to the Engineer of the respects in which the records are asserted to be inaccurate. After receiving this notice, the Engineer shall review the records and either confirm or vary them. If the Contractor does not so give notice to the Engineer within 14 days after being requested to examine the records, they shall be accepted as accurate.

12.2

Method of Measurement

Except as otherwise stated in the Contract and notwithstanding local practice:

- (a) measurement shall be made of the net actual quantity of each item of the Permanent Works, and
- (b) the method of measurement shall be in accordance with the Bill of Quantities or other applicable Schedules.

12.3

Evaluation

Except as otherwise stated in the Contract, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine the Contract Price by evaluating each item of work, applying the measurement agreed or determined in accordance with the above Sub-Clauses 12.1 and 12.2 and the appropriate rate or price for the item.

For each item of work, the appropriate rate or price for the item shall be the rate or price specified for such item in the Contract or, if there is no such item, specified for similar work. However, a new rate or price shall be appropriate for an item of work if:

- (a) (i) the measured quantity of the item is changed by more than 10% from the quantity of this item in the Bill of Quantities or other Schedule,
 - (ii) this change in quantity multiplied by such specified rate for this item exceeds 0.01% of the Accepted Contract Amount,
 - (iii) this change in quantity directly changes the Cost per unit quantity of this item by more than 1%, and
 - (iv) this item is not specified in the Contract as a “fixed rate item”;
- or
- (b) (i) the work is instructed under Clause 13 [*Variations and Adjustments*],
 - (ii) no rate or price is specified in the Contract for this item, and
 - (iii) no specified rate or price is appropriate because the item of work is not of similar character, or is not executed under similar conditions, as any item in the Contract.

Each new rate or price shall be derived from any relevant rates or prices in the Contract, with reasonable adjustments to take account of the matters described in sub-paragraph (a) and/or (b), as applicable. If no rates or prices are relevant for the derivation of a new rate or price, it shall be derived from the reasonable Cost of executing the work, together with reasonable profit, taking account of any other relevant matters.

Until such time as an appropriate rate or price is agreed or determined, the Engineer shall determine a provisional rate or price for the purposes of Interim Payment Certificates.

12.4

Omissions

Whenever the omission of any work forms part (or all) of a Variation, the value of which has not been agreed, if:

- (a) the Contractor will incur (or has incurred) cost which, if the work had not been omitted, would have been deemed to be covered by a sum forming part of the Accepted Contract Amount;
- (b) the omission of the work will result (or has resulted) in this sum not forming part of the Contract Price; and
- (c) this cost is not deemed to be included in the evaluation of any substituted work;

then the Contractor shall give notice to the Engineer accordingly, with supporting particulars. Upon receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine this cost, which shall be included in the Contract Price.

13 Variations and Adjustments

13.1

Right to Vary

Variations may be initiated by the Engineer at any time prior to issuing the Taking-Over Certificate for the Works, either by an instruction or by a request for the Contractor to submit a proposal.

The Contractor shall execute and be bound by each Variation, unless the Contractor promptly gives notice to the Engineer stating (with supporting particulars) that the Contractor cannot readily obtain the Goods required for the Variation. Upon receiving this notice, the Engineer shall cancel, confirm or vary the instruction.

Each Variation may include:

- (a) changes to the quantities of any item of work included in the Contract (however, such changes do not necessarily constitute a Variation),
- (b) changes to the quality and other characteristics of any item of work,
- (c) changes to the levels, positions and/or dimensions of any part of the Works,
- (d) omission of any work unless it is to be carried out by others,
- (e) any additional work, Plant, Materials or services necessary for the Permanent Works, including any associated Tests on Completion, boreholes and other testing and exploratory work, or
- (f) changes to the sequence or timing of the execution of the Works.

The Contractor shall not make any alteration and/or modification of the Permanent Works, unless and until the Engineer instructs or approves a Variation.

13.2

Value Engineering

The Contractor may, at any time, submit to the Engineer a written proposal which (in the Contractor's opinion) will, if adopted, (i) accelerate completion, (ii) reduce the cost to the Employer of executing, maintaining or operating the Works, (iii) improve the efficiency or value to the Employer of the completed Works, or (iv) otherwise be of benefit to the Employer.

The proposal shall be prepared at the cost of the Contractor and shall include the items listed in Sub-Clause 13.3 [*Variation Procedure*].

If a proposal, which is approved by the Engineer, includes a change in the design of part of the Permanent Works, then unless otherwise agreed by both Parties:

- (a) the Contractor shall design this part,
- (b) sub-paragraphs (a) to (d) of Sub-Clause 4.1 [*Contractor's General Obligations*] shall apply, and
- (c) if this change results in a reduction in the contract value of this part, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine a fee, which shall be included in the Contract Price. This fee shall be half (50%) of the difference between the following amounts:
 - (i) such reduction in contract value, resulting from the change, excluding adjustments under Sub-Clause 13.7 [*Adjustments for Changes in Legislation*] and Sub-Clause 13.8 [*Adjustments for Changes in Cost*], and
 - (ii) the reduction (if any) in the value to the Employer of the varied works, taking account of any reductions in quality, anticipated life or operational efficiencies.

However, if amount (i) is less than amount (ii), there shall not be a fee.

13.3

Variation Procedure

If the Engineer requests a proposal, prior to instructing a Variation, the Contractor shall respond in writing as soon as practicable, either by giving reasons why he cannot comply (if this is the case) or by submitting:

- (a) a description of the proposed work to be performed and a programme for its execution,
- (b) the Contractor's proposal for any necessary modifications to the programme according to Sub-Clause 8.3 [*Programme*] and to the Time for Completion, and
- (c) the Contractor's proposal for evaluation of the Variation.

The Engineer shall, as soon as practicable after receiving such proposal (under Sub-Clause 13.2 [*Value Engineering*] or otherwise), respond with approval, disapproval or comments. The Contractor shall not delay any work whilst awaiting a response.

Each instruction to execute a Variation, with any requirements for the recording of Costs, shall be issued by the Engineer to the Contractor, who shall acknowledge receipt.

Each Variation shall be evaluated in accordance with Clause 12 [*Measurement and Evaluation*], unless the Engineer instructs or approves otherwise in accordance with this Clause.

13.4

Payment in Applicable Currencies

If the Contract provides for payment of the Contract Price in more than one currency, then whenever an adjustment is agreed, approved or determined as stated above, the amount payable in each of the applicable currencies shall be specified. For this purpose, reference shall be made to the actual or expected currency proportions of the Cost of the varied work, and to the proportions of various currencies specified for payment of the Contract Price.

13.5

Provisional Sums

Each Provisional Sum shall only be used, in whole or in part, in accordance with the Engineer's instructions, and the Contract Price shall be adjusted accordingly. The total sum paid to the Contractor shall include only such amounts, for the work, supplies or services to which the Provisional Sum relates, as the Engineer shall have instructed. For each Provisional Sum, the Engineer may instruct:

- (a) work to be executed (including Plant, Materials or services to be supplied) by the Contractor and valued under Sub-Clause 13.3 [*Variation Procedure*]; and/or
- (b) Plant, Materials or services to be purchased by the Contractor, from a nominated Subcontractor (as defined in Clause 5 [*Nominated Subcontractors*]) or otherwise; and for which there shall be included in the Contract Price:
 - (i) the actual amounts paid (or due to be paid) by the Contractor, and
 - (ii) a sum for overhead charges and profit, calculated as a percentage of these actual amounts by applying the relevant percentage rate (if any) stated in the appropriate Schedule. If there is no such rate, the percentage rate stated in the Appendix to Tender shall be applied.

The Contractor shall, when required by the Engineer, produce quotations, invoices, vouchers and accounts or receipts in substantiation.

13.6

Daywork

For work of a minor or incidental nature, the Engineer may instruct that a Variation shall be executed on a daywork basis. The work shall then be valued in accordance with the Daywork Schedule included in the Contract, and the following procedure shall apply. If a Daywork Schedule is not included in the Contract, this Sub-Clause shall not apply.

Before ordering Goods for the work, the Contractor shall submit quotations to the Engineer. When applying for payment, the Contractor shall submit invoices, vouchers and accounts or receipts for any Goods.

Except for any items for which the Daywork Schedule specifies that payment is not due, the Contractor shall deliver each day to the Engineer accurate statements in duplicate which shall include the following details of the resources used in executing the previous day's work:

- (a) the names, occupations and time of Contractor's Personnel,
- (b) the identification, type and time of Contractor's Equipment and Temporary Works, and
- (c) the quantities and types of Plant and Materials used.

One copy of each statement will, if correct, or when agreed, be signed by the Engineer and returned to the Contractor. The Contractor shall then submit priced statements of these resources to the Engineer, prior to their inclusion in the next Statement under Sub-Clause 14.3 [*Application for Interim Payment Certificates*].

13.7

Adjustments for Changes in Legislation

The Contract Price shall be adjusted to take account of any increase or decrease in Cost resulting from a change in the Laws of the Country (including the introduction of new Laws and the repeal or modification of existing Laws) or in the judicial or official governmental interpretation of such Laws, made after the Base Date, which affect the Contractor in the performance of obligations under the Contract.

If the Contractor suffers (or will suffer) delay and/or incurs (or will incur) additional Cost as a result of these changes in the Laws or in such interpretations, made after the Base Date, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any such Cost, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

13.8

Adjustments for Changes in Cost

In this Sub-Clause, "table of adjustment data" means the completed table of adjustment data included in the Appendix to Tender. If there is no such table of adjustment data, this Sub-Clause shall not apply.

If this Sub-Clause applies, the amounts payable to the Contractor shall be adjusted for rises or falls in the cost of labour, Goods and other inputs to the Works, by the addition or deduction of the amounts determined by the formulae prescribed in this Sub-Clause. To the extent that full compensation for any rise or fall in Costs is not covered by the provisions of this or other Clauses, the Accepted Contract Amount shall be deemed to have included amounts to cover the contingency of other rises and falls in costs.

The adjustment to be applied to the amount otherwise payable to the Contractor, as valued in accordance with the appropriate Schedule and certified in Payment Certificates, shall be determined from formulae for each of the currencies in which the Contract Price is payable. No adjustment is to be applied to work valued on the basis of Cost or current prices. The formulae shall be of the following general type:

$$P_n = a + b \frac{L_n}{L_o} + c \frac{E_n}{E_o} + d \frac{M_n}{M_o} + \dots$$

where:

"P_n" is the adjustment multiplier to be applied to the estimated contract value in the relevant currency of the work carried out in period "n", this period being a month unless otherwise stated in the Appendix to Tender;

"a" is a fixed coefficient, stated in the relevant table of adjustment data, representing the non-adjustable portion in contractual payments;

"b", "c", "d", ... are coefficients representing the estimated proportion of each cost element related to the execution of the Works, as stated in the relevant

table of adjustment data; such tabulated cost elements may be indicative of resources such as labour, equipment and materials;

“Ln”, “En”, “Mn”, ... are the current cost indices or reference prices for period “n”, expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the date 49 days prior to the last day of the period (to which the particular Payment Certificate relates); and

“Lo”, “Eo”, “Mo”, ... are the base cost indices or reference prices, expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the Base Date.

The cost indices or reference prices stated in the table of adjustment data shall be used. If their source is in doubt, it shall be determined by the Engineer. For this purpose, reference shall be made to the values of the indices at stated dates (quoted in the fourth and fifth columns respectively of the table) for the purposes of clarification of the source; although these dates (and thus these values) may not correspond to the base cost indices.

In cases where the “currency of index” (stated in the table) is not the relevant currency of payment, each index shall be converted into the relevant currency of payment at the selling rate, established by the central bank of the Country, of this relevant currency on the above date for which the index is required to be applicable.

Until such time as each current cost index is available, the Engineer shall determine a provisional index for the issue of Interim Payment Certificates. When a current cost index is available, the adjustment shall be recalculated accordingly.

If the Contractor fails to complete the Works within the Time for Completion, adjustment of prices thereafter shall be made using either (i) each index or price applicable on the date 49 days prior to the expiry of the Time for Completion of the Works, or (ii) the current index or price: whichever is more favourable to the Employer.

The weightings (coefficients) for each of the factors of cost stated in the table(s) of adjustment data shall only be adjusted if they have been rendered unreasonable, unbalanced or inapplicable, as a result of Variations.

14 Contract Price and Payment

14.1

The Contract Price

Unless otherwise stated in the Particular Conditions:

- (a) the Contract Price shall be agreed or determined under Sub-Clause 12.3 [*Evaluation*] and be subject to adjustments in accordance with the Contract;
- (b) the Contractor shall pay all taxes, duties and fees required to be paid by him under the Contract, and the Contract Price shall not be adjusted for any of these costs except as stated in Sub-Clause 13.7 [*Adjustments for Changes in Legislation*];
- (c) any quantities which may be set out in the Bill of Quantities or other Schedule are estimated quantities and are not to be taken as the actual and correct quantities:
 - (i) of the Works which the Contractor is required to execute, or
 - (ii) for the purposes of Clause 12 [*Measurement and Evaluation*]; and

- (d) the Contractor shall submit to the Engineer, within 28 days after the Commencement Date, a proposed breakdown of each lump sum price in the Schedules. The Engineer may take account of the breakdown when preparing Payment Certificates, but shall not be bound by it.

14.2

Advance Payment

The Employer shall make an advance payment, as an interest-free loan for mobilisation, when the Contractor submits a guarantee in accordance with this Sub-Clause. The total advance payment, the number and timing of instalments (if more than one), and the applicable currencies and proportions, shall be as stated in the Appendix to Tender.

Unless and until the Employer receives this guarantee, or if the total advance payment is not stated in the Appendix to Tender, this Sub-Clause shall not apply.

The Engineer shall issue an Interim Payment Certificate for the first instalment after receiving a Statement (under Sub-Clause 14.3 [*Application for Interim Payment Certificates*]) and after the Employer receives (i) the Performance Security in accordance with Sub-Clause 4.2 [*Performance Security*] and (ii) a guarantee in amounts and currencies equal to the advance payment. This guarantee shall be issued by an entity and from within a country (or other jurisdiction) approved by the Employer, and shall be in the form annexed to the Particular Conditions or in another form approved by the Employer.

The Contractor shall ensure that the guarantee is valid and enforceable until the advance payment has been repaid, but its amount may be progressively reduced by the amount repaid by the Contractor as indicated in the Payment Certificates. If the terms of the guarantee specify its expiry date, and the advance payment has not been repaid by the date 28 days prior to the expiry date, the Contractor shall extend the validity of the guarantee until the advance payment has been repaid.

The advance payment shall be repaid through percentage deductions in Payment Certificates. Unless other percentages are stated in the Appendix to Tender:

- (a) deductions shall commence in the Payment Certificate in which the total of all certified interim payments (excluding the advance payment and deductions and repayments of retention) exceeds ten per cent (10%) of the Accepted Contract Amount less Provisional Sums; and
- (b) deductions shall be made at the amortisation rate of one quarter (25%) of the amount of each Payment Certificate (excluding the advance payment and deductions and repayments of retention) in the currencies and proportions of the advance payment, until such time as the advance payment has been repaid.

If the advance payment has not been repaid prior to the issue of the Taking-Over Certificate for the Works or prior to termination under Clause 15 [*Termination by Employer*], Clause 16 [*Suspension and Termination by Contractor*] or Clause 19 [*Force Majeure*] (as the case may be), the whole of the balance then outstanding shall immediately become due and payable by the Contractor to the Employer.

14.3

Application for Interim Payment Certificates

The Contractor shall submit a Statement in six copies to the Engineer after the end of each month, in a form approved by the Engineer, showing in detail the amounts to which the Contractor considers himself to be entitled, together with supporting documents which shall include the report on the progress during this month in accordance with Sub-Clause 4.21 [*Progress Reports*].

The Statement shall include the following items, as applicable, which shall be expressed in the various currencies in which the Contract Price is payable, in the sequence listed:

- (a) the estimated contract value of the Works executed and the Contractor's Documents produced up to the end of the month (including Variations but excluding items described in sub-paragraphs (b) to (g) below);
- (b) any amounts to be added and deducted for changes in legislation and changes in cost, in accordance with Sub-Clause 13.7 [*Adjustments for Changes in Legislation*] and Sub-Clause 13.8 [*Adjustments for Changes in Cost*];
- (c) any amount to be deducted for retention, calculated by applying the percentage of retention stated in the Appendix to Tender to the total of the above amounts, until the amount so retained by the Employer reaches the limit of Retention Money (if any) stated in the Appendix to Tender;
- (d) any amounts to be added and deducted for the advance payment and repayments in accordance with Sub-Clause 14.2 [*Advance Payment*];
- (e) any amounts to be added and deducted for Plant and Materials in accordance with Sub-Clause 14.5 [*Plant and Materials intended for the Works*];
- (f) any other additions or deductions which may have become due under the Contract or otherwise, including those under Clause 20 [*Claims, Disputes and Arbitration*]; and
- (g) the deduction of amounts certified in all previous Payment Certificates.

14.4

Schedule of Payments

If the Contract includes a schedule of payments specifying the instalments in which the Contract Price will be paid, then unless otherwise stated in this schedule:

- (a) the instalments quoted in this schedule of payments shall be the estimated contract values for the purposes of sub-paragraph (a) of Sub-Clause 14.3 [*Application for Interim Payment Certificates*];
- (b) Sub-Clause 14.5 [*Plant and Materials intended for the Works*] shall not apply; and
- (c) if these instalments are not defined by reference to the actual progress achieved in executing the Works, and if actual progress is found to be less than that on which this schedule of payments was based, then the Engineer may proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine revised instalments, which shall take account of the extent to which progress is less than that on which the instalments were previously based.

If the Contract does not include a schedule of payments, the Contractor shall submit non-binding estimates of the payments which he expects to become due during each quarterly period. The first estimate shall be submitted within 42 days after the Commencement Date. Revised estimates shall be submitted at quarterly intervals, until the Taking-Over Certificate has been issued for the Works.

14.5

Plant and Materials intended for the Works

If this Sub-Clause applies, Interim Payment Certificates shall include, under sub-paragraph (e) of Sub-Clause 14.3, (i) an amount for Plant and Materials which have been sent to the Site for incorporation in the Permanent Works, and (ii) a reduction when the contract value of such Plant and Materials is included as part of the Permanent Works under sub-paragraph (a) of Sub-Clause 14.3 [*Application for Interim Payment Certificates*].

If the lists referred to in sub-paragraphs (b)(i) or (c)(i) below are not included in the Appendix to Tender, this Sub-Clause shall not apply.

The Engineer shall determine and certify each addition if the following conditions are satisfied:

- (a) the Contractor has:
 - (i) kept satisfactory records (including the orders, receipts, Costs and use of Plant and Materials) which are available for inspection, and
 - (ii) submitted a statement of the Cost of acquiring and delivering the Plant and Materials to the Site, supported by satisfactory evidence;

and either:

- (b) the relevant Plant and Materials:
 - (i) are those listed in the Appendix to Tender for payment when shipped,
 - (ii) have been shipped to the Country, en route to the Site, in accordance with the Contract; and
 - (iii) are described in a clean shipped bill of lading or other evidence of shipment, which has been submitted to the Engineer together with evidence of payment of freight and insurance, any other documents reasonably required, and a bank guarantee in a form and issued by an entity approved by the Employer in amounts and currencies equal to the amount due under this Sub-Clause: this guarantee may be in a similar form to the form referred to in Sub-Clause 14.2 [*Advance Payment*] and shall be valid until the Plant and Materials are properly stored on Site and protected against loss, damage or deterioration;

or

- (c) the relevant Plant and Materials:
 - (i) are those listed in the Appendix to Tender for payment when delivered to the Site, and
 - (ii) have been delivered to and are properly stored on the Site, are protected against loss, damage or deterioration, and appear to be in accordance with the Contract.

The additional amount to be certified shall be the equivalent of eighty percent of the Engineer's determination of the cost of the Plant and Materials (including delivery to Site), taking account of the documents mentioned in this Sub-Clause and of the contract value of the Plant and Materials.

The currencies for this additional amount shall be the same as those in which payment will become due when the contract value is included under sub-paragraph (a) of Sub-Clause 14.3 [*Application for Interim Payment Certificates*]. At that time, the Payment Certificate shall include the applicable reduction which shall be equivalent to, and in the same currencies and proportions as, this additional amount for the relevant Plant and Materials.

14.6

Issue of Interim Payment Certificates

No amount will be certified or paid until the Employer has received and approved the Performance Security. Thereafter, the Engineer shall, within 28 days after receiving a Statement and supporting documents, issue to the Employer an Interim Payment Certificate which shall state the amount which the Engineer fairly determines to be due, with supporting particulars.

However, prior to issuing the Taking-Over Certificate for the Works, the Engineer shall not be bound to issue an Interim Payment Certificate in an amount which would (after retention and other deductions) be less than the minimum amount of Interim Payment Certificates (if any) stated in the Appendix to Tender. In this event, the Engineer shall give notice to the Contractor accordingly.

An Interim Payment Certificate shall not be withheld for any other reason, although:

- (a) if any thing supplied or work done by the Contractor is not in accordance with the Contract, the cost of rectification or replacement may be withheld until rectification or replacement has been completed; and/or
- (b) if the Contractor was or is failing to perform any work or obligation in accordance with the Contract, and had been so notified by the Engineer, the value of this work or obligation may be withheld until the work or obligation has been performed.

The Engineer may in any Payment Certificate make any correction or modification that should properly be made to any previous Payment Certificate. A Payment Certificate shall not be deemed to indicate the Engineer's acceptance, approval, consent or satisfaction.

14.7

Payment

The Employer shall pay to the Contractor:

- (a) the first instalment of the advance payment within 42 days after issuing the Letter of Acceptance or within 21 days after receiving the documents in accordance with Sub-Clause 4.2 [*Performance Security*] and Sub-Clause 14.2 [*Advance Payment*], whichever is later;
- (b) the amount certified in each Interim Payment Certificate within 56 days after the Engineer receives the Statement and supporting documents; and
- (c) the amount certified in the Final Payment Certificate within 56 days after the Employer receives this Payment Certificate.

Payment of the amount due in each currency shall be made into the bank account, nominated by the Contractor, in the payment country (for this currency) specified in the Contract.

14.8

Delayed Payment

If the Contractor does not receive payment in accordance with Sub-Clause 14.7 [*Payment*], the Contractor shall be entitled to receive financing charges compounded monthly on the amount unpaid during the period of delay. This period shall be deemed to commence on the date for payment specified in Sub-Clause 14.7 [*Payment*], irrespective (in the case of its sub-paragraph (b)) of the date on which any Interim Payment Certificate is issued.

Unless otherwise stated in the Particular Conditions, these financing charges shall be calculated at the annual rate of three percentage points above the discount rate of the central bank in the country of the currency of payment, and shall be paid in such currency.

The Contractor shall be entitled to this payment without formal notice or certification, and without prejudice to any other right or remedy.

14.9

Payment of Retention Money

When the Taking-Over Certificate has been issued for the Works, the first half of the Retention Money shall be certified by the Engineer for payment to the Contractor. If a Taking-Over Certificate is issued for a Section or part of the Works, a proportion of the Retention Money shall be certified and paid. This proportion shall be two-fifths (40%) of the proportion calculated by dividing the estimated contract value of the Section or part, by the estimated final Contract Price.

Promptly after the latest of the expiry dates of the Defects Notification Periods, the outstanding balance of the Retention Money shall be certified by the Engineer for payment to the Contractor. If a Taking-Over Certificate was issued for a Section, a

proportion of the second half of the Retention Money shall be certified and paid promptly after the expiry date of the Defects Notification Period for the Section. This proportion shall be two-fifths (40%) of the proportion calculated by dividing the estimated contract value of the Section by the estimated final Contract Price.

However, if any work remains to be executed under Clause 11 [*Defects Liability*], the Engineer shall be entitled to withhold certification of the estimated cost of this work until it has been executed.

When calculating these proportions, no account shall be taken of any adjustments under Sub-Clause 13.7 [*Adjustments for Changes in Legislation*] and Sub-Clause 13.8 [*Adjustments for Changes in Cost*].

14.10

Statement at Completion Within 84 days after receiving the Taking-Over Certificate for the Works, the Contractor shall submit to the Engineer six copies of a Statement at completion with supporting documents, in accordance with Sub-Clause 14.3 [*Application for Interim Payment Certificates*], showing:

- (a) the value of all work done in accordance with the Contract up to the date stated in the Taking-Over Certificate for the Works,
- (b) any further sums which the Contractor considers to be due, and
- (c) an estimate of any other amounts which the Contractor considers will become due to him under the Contract. Estimated amounts shall be shown separately in this Statement at completion.

The Engineer shall then certify in accordance with Sub-Clause 14.6 [*Issue of Interim Payment Certificates*].

14.11

Application for Final Payment Certificate Within 56 days after receiving the Performance Certificate, the Contractor shall submit, to the Engineer, six copies of a draft final statement with supporting documents showing in detail in a form approved by the Engineer:

- (a) the value of all work done in accordance with the Contract, and
- (b) any further sums which the Contractor considers to be due to him under the Contract or otherwise.

If the Engineer disagrees with or cannot verify any part of the draft final statement, the Contractor shall submit such further information as the Engineer may reasonably require and shall make such changes in the draft as may be agreed between them. The Contractor shall then prepare and submit to the Engineer the final statement as agreed. This agreed statement is referred to in these Conditions as the "Final Statement".

However if, following discussions between the Engineer and the Contractor and any changes to the draft final statement which are agreed, it becomes evident that a dispute exists, the Engineer shall deliver to the Employer (with a copy to the Contractor) an Interim Payment Certificate for the agreed parts of the draft final statement. Thereafter, if the dispute is finally resolved under Sub-Clause 20.4 [*Obtaining Dispute Adjudication Board's Decision*] or Sub-Clause 20.5 [*Amicable Settlement*], the Contractor shall then prepare and submit to the Employer (with a copy to the Engineer) a Final Statement.

14.12

Discharge When submitting the Final Statement, the Contractor shall submit a written discharge which confirms that the total of the Final Statement represents full and final settlement

of all moneys due to the Contractor under or in connection with the Contract. This discharge may state that it becomes effective when the Contractor has received the Performance Security and the outstanding balance of this total, in which event the discharge shall be effective on such date.

14.13

Issue of Final Payment Certificate

Within 28 days after receiving the Final Statement and written discharge in accordance with Sub-Clause 14.11 [*Application for Final Payment Certificate*] and Sub-Clause 14.12 [*Discharge*], the Engineer shall issue, to the Employer, the Final Payment Certificate which shall state:

- (a) the amount which is finally due, and
- (b) after giving credit to the Employer for all amounts previously paid by the Employer and for all sums to which the Employer is entitled, the balance (if any) due from the Employer to the Contractor or from the Contractor to the Employer, as the case may be.

If the Contractor has not applied for a Final Payment Certificate in accordance with Sub-Clause 14.11 [*Application for Final Payment Certificate*] and Sub-Clause 14.12 [*Discharge*], the Engineer shall request the Contractor to do so. If the Contractor fails to submit an application within a period of 28 days, the Engineer shall issue the Final Payment Certificate for such amount as he fairly determines to be due.

14.14

Cessation of Employer's Liability

The Employer shall not be liable to the Contractor for any matter or thing under or in connection with the Contract or execution of the Works, except to the extent that the Contractor shall have included an amount expressly for it:

- (a) in the Final Statement and also
- (b) (except for matters or things arising after the issue of the Taking-Over Certificate for the Works) in the Statement at completion described in Sub-Clause 14.10 [*Statement at Completion*].

However, this Sub-Clause shall not limit the Employer's liability under his indemnification obligations, or the Employer's liability in any case of fraud, deliberate default or reckless misconduct by the Employer.

14.15

Currencies of Payment

The Contract Price shall be paid in the currency or currencies named in the Appendix to Tender. Unless otherwise stated in the Particular Conditions, if more than one currency is so named, payments shall be made as follows:

- (a) if the Accepted Contract Amount was expressed in Local Currency only:
 - (i) the proportions or amounts of the Local and Foreign Currencies, and the fixed rates of exchange to be used for calculating the payments, shall be as stated in the Appendix to Tender, except as otherwise agreed by both Parties;
 - (ii) payments and deductions under Sub-Clause 13.5 [*Provisional Sums*] and Sub-Clause 13.7 [*Adjustments for Changes in Legislation*] shall be made in the applicable currencies and proportions; and
 - (iii) other payments and deductions under sub-paragraphs (a) to (d) of Sub-Clause 14.3 [*Application for Interim Payment Certificates*] shall be made in the currencies and proportions specified in sub-paragraph (a)(i) above;
- (b) payment of the damages specified in the Appendix to Tender shall be made in the currencies and proportions specified in the Appendix to Tender;

- (c) other payments to the Employer by the Contractor shall be made in the currency in which the sum was expended by the Employer, or in such currency as may be agreed by both Parties;
- (d) if any amount payable by the Contractor to the Employer in a particular currency exceeds the sum payable by the Employer to the Contractor in that currency, the Employer may recover the balance of this amount from the sums otherwise payable to the Contractor in other currencies; and
- (e) if no rates of exchange are stated in the Appendix to Tender, they shall be those prevailing on the Base Date and determined by the central bank of the Country.

15 Termination by Employer

15.1

Notice to Correct

If the Contractor fails to carry out any obligation under the Contract, the Engineer may by notice require the Contractor to make good the failure and to remedy it within a specified reasonable time.

15.2

Termination by Employer

The Employer shall be entitled to terminate the Contract if the Contractor:

- (a) fails to comply with Sub-Clause 4.2 [*Performance Security*] or with a notice under Sub-Clause 15.1 [*Notice to Correct*],
- (b) abandons the Works or otherwise plainly demonstrates the intention not to continue performance of his obligations under the Contract,
- (c) without reasonable excuse fails:
 - (i) to proceed with the Works in accordance with Clause 8 [*Commencement, Delays and Suspension*], or
 - (ii) to comply with a notice issued under Sub-Clause 7.5 [*Rejection*] or Sub-Clause 7.6 [*Remedial Work*], within 28 days after receiving it,
- (d) subcontracts the whole of the Works or assigns the Contract without the required agreement,
- (e) becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit of his creditors, or if any act is done or event occurs which (under applicable Laws) has a similar effect to any of these acts or events, or
- (f) gives or offers to give (directly or indirectly) to any person any bribe, gift, gratuity, commission or other thing of value, as an inducement or reward:
 - (i) for doing or forbearing to do any action in relation to the Contract, or
 - (ii) for showing or forbearing to show favour or disfavour to any person in relation to the Contract,

or if any of the Contractor's Personnel, agents or Subcontractors gives or offers to give (directly or indirectly) to any person any such inducement or reward as is described in this sub-paragraph (f). However, lawful inducements and rewards to Contractor's Personnel shall not entitle termination.

In any of these events or circumstances, the Employer may, upon giving 14 days' notice to the Contractor, terminate the Contract and expel the Contractor from the Site. However, in the case of sub-paragraph (e) or (f), the Employer may by notice terminate the Contract immediately.

The Employer's election to terminate the Contract shall not prejudice any other rights of the Employer, under the Contract or otherwise.

The Contractor shall then leave the Site and deliver any required Goods, all Contractor's Documents, and other design documents made by or for him, to the Engineer. However, the Contractor shall use his best efforts to comply immediately with any reasonable instructions included in the notice (i) for the assignment of any subcontract, and (ii) for the protection of life or property or for the safety of the Works.

After termination, the Employer may complete the Works and/or arrange for any other entities to do so. The Employer and these entities may then use any Goods, Contractor's Documents and other design documents made by or on behalf of the Contractor.

The Employer shall then give notice that the Contractor's Equipment and Temporary Works will be released to the Contractor at or near the Site. The Contractor shall promptly arrange their removal, at the risk and cost of the Contractor. However, if by this time the Contractor has failed to make a payment due to the Employer, these items may be sold by the Employer in order to recover this payment. Any balance of the proceeds shall then be paid to the Contractor.

15.3

Valuation at Date of Termination

As soon as practicable after a notice of termination under Sub-Clause 15.2 [*Termination by Employer*] has taken effect, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine the value of the Works, Goods and Contractor's Documents, and any other sums due to the Contractor for work executed in accordance with the Contract.

15.4

Payment after Termination

After a notice of termination under Sub-Clause 15.2 [*Termination by Employer*] has taken effect, the Employer may:

- (a) proceed in accordance with Sub-Clause 2.5 [*Employer's Claims*],
- (b) withhold further payments to the Contractor until the costs of execution, completion and remedying of any defects, damages for delay in completion (if any), and all other costs incurred by the Employer, have been established, and/or
- (c) recover from the Contractor any losses and damages incurred by the Employer and any extra costs of completing the Works, after allowing for any sum due to the Contractor under Sub-Clause 15.3 [*Valuation at Date of Termination*]. After recovering any such losses, damages and extra costs, the Employer shall pay any balance to the Contractor.

15.5

Employer's Entitlement to Termination

The Employer shall be entitled to terminate the Contract, at any time for the Employer's convenience, by giving notice of such termination to the Contractor. The termination shall take effect 28 days after the later of the dates on which the Contractor receives this notice or the Employer returns the Performance Security. The Employer shall not terminate the Contract under this Sub-Clause in order to execute the Works himself or to arrange for the Works to be executed by another contractor.

After this termination, the Contractor shall proceed in accordance with Sub-Clause 16.3 [*Cessation of Work and Removal of Contractor's Equipment*] and shall be paid in accordance with Sub-Clause 19.6 [*Optional Termination, Payment and Release*].

16

Suspension and Termination by Contractor

16.1

Contractor's Entitlement to Suspend Work

If the Engineer fails to certify in accordance with Sub-Clause 14.6 [*Issue of Interim Payment Certificates*] or the Employer fails to comply with Sub-Clause 2.4 [*Employer's Financial Arrangements*] or Sub-Clause 14.7 [*Payment*], the Contractor may, after giving not less than 21 days' notice to the Employer, suspend work (or reduce the rate of work) unless and until the Contractor has received the Payment Certificate, reasonable evidence or payment, as the case may be and as described in the notice.

The Contractor's action shall not prejudice his entitlements to financing charges under Sub-Clause 14.8 [*Delayed Payment*] and to termination under Sub-Clause 16.2 [*Termination by Contractor*].

If the Contractor subsequently receives such Payment Certificate, evidence or payment (as described in the relevant Sub-Clause and in the above notice) before giving a notice of termination, the Contractor shall resume normal working as soon as is reasonably practicable.

If the Contractor suffers delay and/or incurs Cost as a result of suspending work (or reducing the rate of work) in accordance with this Sub-Clause, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any such Cost plus reasonable profit, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

16.2

Termination by Contractor

The Contractor shall be entitled to terminate the Contract if:

- (a) the Contractor does not receive the reasonable evidence within 42 days after giving notice under Sub-Clause 16.1 [*Contractor's Entitlement to Suspend Work*] in respect of a failure to comply with Sub-Clause 2.4 [*Employer's Financial Arrangements*],
- (b) the Engineer fails, within 56 days after receiving a Statement and supporting documents, to issue the relevant Payment Certificate,
- (c) the Contractor does not receive the amount due under an Interim Payment Certificate within 42 days after the expiry of the time stated in Sub-Clause 14.7 [*Payment*] within which payment is to be made (except for deductions in accordance with Sub-Clause 2.5 [*Employer's Claims*]),
- (d) the Employer substantially fails to perform his obligations under the Contract,
- (e) the Employer fails to comply with Sub-Clause 1.6 [*Contract Agreement*] or Sub-Clause 1.7 [*Assignment*],
- (f) a prolonged suspension affects the whole of the Works as described in Sub-Clause 8.11 [*Prolonged Suspension*], or
- (g) the Employer becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the

benefit of his creditors, or if any act is done or event occurs which (under applicable Laws) has a similar effect to any of these acts or events.

In any of these events or circumstances, the Contractor may, upon giving 14 days' notice to the Employer, terminate the Contract. However, in the case of sub-paragraph (f) or (g), the Contractor may by notice terminate the Contract immediately.

The Contractor's election to terminate the Contract shall not prejudice any other rights of the Contractor, under the Contract or otherwise.

16.3

Cessation of Work and Removal of Contractor's Equipment

After a notice of termination under Sub-Clause 15.5 [*Employer's Entitlement to Termination*], Sub-Clause 16.2 [*Termination by Contractor*] or Sub-Clause 19.6 [*Optional Termination, Payment and Release*] has taken effect, the Contractor shall promptly:

- (a) cease all further work, except for such work as may have been instructed by the Engineer for the protection of life or property or for the safety of the Works,
- (b) hand over Contractor's Documents, Plant, Materials and other work, for which the Contractor has received payment, and
- (c) remove all other Goods from the Site, except as necessary for safety, and leave the Site.

16.4

Payment on Termination

After a notice of termination under Sub-Clause 16.2 [*Termination by Contractor*] has taken effect, the Employer shall promptly:

- (a) return the Performance Security to the Contractor,
- (b) pay the Contractor in accordance with Sub-Clause 19.6 [*Optional Termination, Payment and Release*], and
- (c) pay to the Contractor the amount of any loss of profit or other loss or damage sustained by the Contractor as a result of this termination.

17 Risk and Responsibility

17.1

Indemnities

The Contractor shall indemnify and hold harmless the Employer, the Employer's Personnel, and their respective agents, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of:

- (a) bodily injury, sickness, disease or death, of any person whatsoever arising out of or in the course of or by reason of the Contractor's design (if any), the execution and completion of the Works and the remedying of any defects, unless attributable to any negligence, wilful act or breach of the Contract by the Employer, the Employer's Personnel, or any of their respective agents, and
- (b) damage to or loss of any property, real or personal (other than the Works), to the extent that such damage or loss:
 - (i) arises out of or in the course of or by reason of the Contractor's design (if any), the execution and completion of the Works and the remedying of any defects, and
 - (ii) is attributable to any negligence, wilful act or breach of the Contract by the Contractor, the Contractor's Personnel, their respective agents, or anyone directly or indirectly employed by any of them.

The Employer shall indemnify and hold harmless the Contractor, the Contractor's Personnel, and their respective agents, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of (1) bodily injury, sickness, disease or death, which is attributable to any negligence, wilful act or breach of the Contract by the Employer, the Employer's Personnel, or any of their respective agents, and (2) the matters for which liability may be excluded from insurance cover, as described in sub-paragraphs (d)(i), (ii) and (iii) of Sub-Clause 18.3 [*Insurance Against Injury to Persons and Damage to Property*].

17.2

Contractor's Care of the Works

The Contractor shall take full responsibility for the care of the Works and Goods from the Commencement Date until the Taking-Over Certificate is issued (or is deemed to be issued under Sub-Clause 10.1 [*Taking Over of the Works and Sections*]) for the Works, when responsibility for the care of the Works shall pass to the Employer. If a Taking-Over Certificate is issued (or is so deemed to be issued) for any Section or part of the Works, responsibility for the care of the Section or part shall then pass to the Employer.

After responsibility has accordingly passed to the Employer, the Contractor shall take responsibility for the care of any work which is outstanding on the date stated in a Taking-Over Certificate, until this outstanding work has been completed.

If any loss or damage happens to the Works, Goods or Contractor's Documents during the period when the Contractor is responsible for their care, from any cause not listed in Sub-Clause 17.3 [*Employer's Risks*], the Contractor shall rectify the loss or damage at the Contractor's risk and cost, so that the Works, Goods and Contractor's Documents conform with the Contract.

The Contractor shall be liable for any loss or damage caused by any actions performed by the Contractor after a Taking-Over Certificate has been issued. The Contractor shall also be liable for any loss or damage which occurs after a Taking-Over Certificate has been issued and which arose from a previous event for which the Contractor was liable.

17.3

Employer's Risks

The risks referred to in Sub-Clause 17.4 below are:

- (a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,
- (b) rebellion, terrorism, revolution, insurrection, military or usurped power, or civil war, within the Country,
- (c) riot, commotion or disorder within the Country by persons other than the Contractor's Personnel and other employees of the Contractor and Subcontractors,
- (d) munitions of war, explosive materials, ionising radiation or contamination by radio-activity, within the Country, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity,
- (e) pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds,
- (f) use or occupation by the Employer of any part of the Permanent Works, except as may be specified in the Contract,
- (g) design of any part of the Works by the Employer's Personnel or by others for whom the Employer is responsible, and
- (h) any operation of the forces of nature which is Unforeseeable or against which an experienced contractor could not reasonably have been expected to have taken adequate preventative precautions.

17.4
Consequences of
Employer's Risks

If and to the extent that any of the risks listed in Sub-Clause 17.3 above results in loss or damage to the Works, Goods or Contractor's Documents, the Contractor shall promptly give notice to the Engineer and shall rectify this loss or damage to the extent required by the Engineer.

If the Contractor suffers delay and/or incurs Cost from rectifying this loss or damage, the Contractor shall give a further notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any such Cost, which shall be included in the Contract Price. In the case of sub-paragraphs (f) and (g) of Sub-Clause 17.3 [*Employer's Risks*], reasonable profit on the Cost shall also be included.

After receiving this further notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

17.5

Intellectual and Industrial
Property Rights

In this Sub-Clause, "infringement" means an infringement (or alleged infringement) of any patent, registered design, copyright, trade mark, trade name, trade secret or other intellectual or industrial property right relating to the Works; and "claim" means a claim (or proceedings pursuing a claim) alleging an infringement.

Whenever a Party does not give notice to the other Party of any claim within 28 days of receiving the claim, the first Party shall be deemed to have waived any right to indemnity under this Sub-Clause.

The Employer shall indemnify and hold the Contractor harmless against and from any claim alleging an infringement which is or was:

- (a) an unavoidable result of the Contractor's compliance with the Contract, or
- (b) a result of any Works being used by the Employer:
 - (i) for a purpose other than that indicated by, or reasonably to be inferred from, the Contract, or
 - (ii) in conjunction with any thing not supplied by the Contractor, unless such use was disclosed to the Contractor prior to the Base Date or is stated in the Contract.

The Contractor shall indemnify and hold the Employer harmless against and from any other claim which arises out of or in relation to (i) the manufacture, use, sale or import of any Goods, or (ii) any design for which the Contractor is responsible.

If a Party is entitled to be indemnified under this Sub-Clause, the indemnifying Party may (at its cost) conduct negotiations for the settlement of the claim, and any litigation or arbitration which may arise from it. The other Party shall, at the request and cost of the indemnifying Party, assist in contesting the claim. This other Party (and its Personnel) shall not make any admission which might be prejudicial to the indemnifying Party, unless the indemnifying Party failed to take over the conduct of any negotiations, litigation or arbitration upon being requested to do so by such other Party.

17.6

Limitation of Liability

Neither Party shall be liable to the other Party for loss of use of any Works, loss of profit, loss of any contract or for any indirect or consequential loss or damage which may be suffered by the other Party in connection with the Contract, other than under

Sub-Clause 16.4 [*Payment on Termination*] and Sub-Clause 17.1 [*Indemnities*].

The total liability of the Contractor to the Employer, under or in connection with the Contract other than under Sub-Clause 4.19 [*Electricity, Water and Gas*], Sub-Clause 4.20 [*Employer's Equipment and Free-Issue Material*], Sub-Clause 17.1 [*Indemnities*] and Sub-Clause 17.5 [*Intellectual and Industrial Property Rights*], shall not exceed the sum stated in the Particular Conditions or (if a sum is not so stated) the Accepted Contract Amount.

This Sub-Clause shall not limit liability in any case of fraud, deliberate default or reckless misconduct by the defaulting Party.

18 Insurance

18.1 General Requirements for Insurances

In this Clause, "insuring Party" means, for each type of insurance, the Party responsible for effecting and maintaining the insurance specified in the relevant Sub-Clause.

Wherever the Contractor is the insuring Party, each insurance shall be effected with insurers and in terms approved by the Employer. These terms shall be consistent with any terms agreed by both Parties before the date of the Letter of Acceptance. This agreement of terms shall take precedence over the provisions of this Clause.

Wherever the Employer is the insuring Party, each insurance shall be effected with insurers and in terms consistent with the details annexed to the Particular Conditions.

If a policy is required to indemnify joint insured, the cover shall apply separately to each insured as though a separate policy had been issued for each of the joint insured. If a policy indemnifies additional joint insured, namely in addition to the insured specified in this Clause, (i) the Contractor shall act under the policy on behalf of these additional joint insured except that the Employer shall act for Employer's Personnel, (ii) additional joint insured shall not be entitled to receive payments directly from the insurer or to have any other direct dealings with the insurer, and (iii) the insuring Party shall require all additional joint insured to comply with the conditions stipulated in the policy.

Each policy insuring against loss or damage shall provide for payments to be made in the currencies required to rectify the loss or damage. Payments received from insurers shall be used for the rectification of the loss or damage.

The relevant insuring Party shall, within the respective periods stated in the Appendix to Tender (calculated from the Commencement Date), submit to the other Party:

- (a) evidence that the insurances described in this Clause have been effected, and
- (b) copies of the policies for the insurances described in Sub-Clause 18.2 [*Insurance for Works and Contractor's Equipment*] and Sub-Clause 18.3 [*Insurance against Injury to Persons and Damage to Property*].

When each premium is paid, the insuring Party shall submit evidence of payment to the other Party. Whenever evidence or policies are submitted, the insuring Party shall also give notice to the Engineer.

Each Party shall comply with the conditions stipulated in each of the insurance policies. The insuring Party shall keep the insurers informed of any relevant changes

to the execution of the Works and ensure that insurance is maintained in accordance with this Clause.

Neither Party shall make any material alteration to the terms of any insurance without the prior approval of the other Party. If an insurer makes (or attempts to make) any alteration, the Party first notified by the insurer shall promptly give notice to the other Party.

If the insuring Party fails to effect and keep in force any of the insurances it is required to effect and maintain under the Contract, or fails to provide satisfactory evidence and copies of policies in accordance with this Sub-Clause, the other Party may (at its option and without prejudice to any other right or remedy) effect insurance for the relevant coverage and pay the premiums due. The insuring Party shall pay the amount of these premiums to the other Party, and the Contract Price shall be adjusted accordingly.

Nothing in this Clause limits the obligations, liabilities or responsibilities of the Contractor or the Employer, under the other terms of the Contract or otherwise. Any amounts not insured or not recovered from the insurers shall be borne by the Contractor and/or the Employer in accordance with these obligations, liabilities or responsibilities. However, if the insuring Party fails to effect and keep in force an insurance which is available and which it is required to effect and maintain under the Contract, and the other Party neither approves the omission nor effects insurance for the coverage relevant to this default, any moneys which should have been recoverable under this insurance shall be paid by the insuring Party.

Payments by one Party to the other Party shall be subject to Sub-Clause 2.5 [*Employer's Claims*] or Sub-Clause 20.1 [*Contractor's Claims*], as applicable.

18.2

Insurance for Works and Contractor's Equipment

The insuring Party shall insure the Works, Plant, Materials and Contractor's Documents for not less than the full reinstatement cost including the costs of demolition, removal of debris and professional fees and profit. This insurance shall be effective from the date by which the evidence is to be submitted under sub-paragraph (a) of Sub-Clause 18.1 [*General Requirements for Insurances*], until the date of issue of the Taking-Over Certificate for the Works.

The insuring Party shall maintain this insurance to provide cover until the date of issue of the Performance Certificate, for loss or damage for which the Contractor is liable arising from a cause occurring prior to the issue of the Taking-Over Certificate, and for loss or damage caused by the Contractor in the course of any other operations (including those under Clause 11 [*Defects Liability*]).

The insuring Party shall insure the Contractor's Equipment for not less than the full replacement value, including delivery to Site. For each item of Contractor's Equipment, the insurance shall be effective while it is being transported to the Site and until it is no longer required as Contractor's Equipment.

Unless otherwise stated in the Particular Conditions, insurances under this Sub-Clause:

- (a) shall be effected and maintained by the Contractor as insuring Party,
- (b) shall be in the joint names of the Parties, who shall be jointly entitled to receive payments from the insurers, payments being held or allocated between the Parties for the sole purpose of rectifying the loss or damage,
- (c) shall cover all loss and damage from any cause not listed in Sub-Clause 17.3 [*Employer's Risks*],

- (d) shall also cover loss or damage to a part of the Works which is attributable to the use or occupation by the Employer of another part of the Works, and loss or damage from the risks listed in sub-paragraphs (c), (g) and (h) of Sub-Clause 17.3 [*Employer's Risks*], excluding (in each case) risks which are not insurable at commercially reasonable terms, with deductibles per occurrence of not more than the amount stated in the Appendix to Tender (if an amount is not so stated, this sub-paragraph (d) shall not apply), and
- (e) may however exclude loss of, damage to, and reinstatement of:
 - (i) a part of the Works which is in a defective condition due to a defect in its design, materials or workmanship (but cover shall include any other parts which are lost or damaged as a direct result of this defective condition and not as described in sub-paragraph (ii) below),
 - (ii) a part of the Works which is lost or damaged in order to reinstate any other part of the Works if this other part is in a defective condition due to a defect in its design, materials or workmanship,
 - (iii) a part of the Works which has been taken over by the Employer, except to the extent that the Contractor is liable for the loss or damage, and
 - (iv) Goods while they are not in the Country, subject to Sub-Clause 14.5 [*Plant and Materials intended for the Works*].

If, more than one year after the Base Date, the cover described in sub-paragraph (d) above ceases to be available at commercially reasonable terms, the Contractor shall (as insuring Party) give notice to the Employer, with supporting particulars. The Employer shall then (i) be entitled subject to Sub-Clause 2.5 [*Employer's Claims*] to payment of an amount equivalent to such commercially reasonable terms as the Contractor should have expected to have paid for such cover, and (ii) be deemed, unless he obtains the cover at commercially reasonable terms, to have approved the omission under Sub-Clause 18.1 [*General Requirements for Insurances*].

18.3

Insurance against Injury to Persons and Damage to Property

The insuring Party shall insure against each Party's liability for any loss, damage, death or bodily injury which may occur to any physical property (except things insured under Sub-Clause 18.2 [*Insurance for Works and Contractor's Equipment*]) or to any person (except persons insured under Sub-Clause 18.4 [*Insurance for Contractor's Personnel*]), which may arise out of the Contractor's performance of the Contract and occurring before the issue of the Performance Certificate.

This insurance shall be for a limit per occurrence of not less than the amount stated in the Appendix to Tender, with no limit on the number of occurrences. If an amount is not stated in the Appendix to Tender, this Sub-Clause shall not apply.

Unless otherwise stated in the Particular Conditions, the insurances specified in this Sub-Clause:

- (a) shall be effected and maintained by the Contractor as insuring Party,
- (b) shall be in the joint names of the Parties,
- (c) shall be extended to cover liability for all loss and damage to the Employer's property (except things insured under Sub-Clause 18.2) arising out of the Contractor's performance of the Contract, and
- (d) may however exclude liability to the extent that it arises from:
 - (i) the Employer's right to have the Permanent Works executed on, over, under, in or through any land, and to occupy this land for the Permanent Works,
 - (ii) damage which is an unavoidable result of the Contractor's obligations to execute the Works and remedy any defects, and

- (iii) a cause listed in Sub-Clause 17.3 [*Employer's Risks*], except to the extent that cover is available at commercially reasonable terms.

18.4

Insurance for Contractor's Personnel

The Contractor shall effect and maintain insurance against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel.

The Employer and the Engineer shall also be indemnified under the policy of insurance, except that this insurance may exclude losses and claims to the extent that they arise from any act or neglect of the Employer or of the Employer's Personnel.

The insurance shall be maintained in full force and effect during the whole time that these personnel are assisting in the execution of the Works. For a Subcontractor's employees, the insurance may be effected by the Subcontractor, but the Contractor shall be responsible for compliance with this Clause.

19

Force Majeure

19.1 Definition of Force Majeure

In this Clause, "Force Majeure" means an exceptional event or circumstance:

- (a) which is beyond a Party's control,
- (b) which such Party could not reasonably have provided against before entering into the Contract,
- (c) which, having arisen, such Party could not reasonably have avoided or overcome, and
- (d) which is not substantially attributable to the other Party.

Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied:

- (i) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,
- (ii) rebellion, terrorism, revolution, insurrection, military or usurped power, or civil war,
- (iii) riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel and other employees of the Contractor and Subcontractors,
- (iv) munitions of war, explosive materials, ionising radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity, and
- (v) natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.

19.2

Notice of Force Majeure

If a Party is or will be prevented from performing any of its obligations under the Contract by Force Majeure, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within 14 days after the Party became aware, or should have become aware, of the relevant event or circumstance constituting Force Majeure.

The Party shall, having given notice, be excused performance of such obligations for so long as such Force Majeure prevents it from performing them.

Notwithstanding any other provision of this Clause, Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.

19.3

Duty to Minimise Delay

Each Party shall at all times use all reasonable endeavours to minimise any delay in the performance of the Contract as a result of Force Majeure.

A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.

19.4

Consequences of Force Majeure

If the Contractor is prevented from performing any of his obligations under the Contract by Force Majeure of which notice has been given under Sub-Clause 19.2 [*Notice of Force Majeure*], and suffers delay and/or incurs Cost by reason of such Force Majeure, the Contractor shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) if the event or circumstance is of the kind described in sub-paragraphs (i) to (iv) of Sub-Clause 19.1 [*Definition of Force Majeure*] and, in the case of sub-paragraphs (ii) to (iv), occurs in the Country, payment of any such Cost.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

19.5

Force Majeure Affecting Subcontractor

If any Subcontractor is entitled under any contract or agreement relating to the Works to relief from force majeure on terms additional to or broader than those specified in this Clause, such additional or broader force majeure events or circumstances shall not excuse the Contractor's non-performance or entitle him to relief under this Clause.

19.6

Optional Termination, Payment and Release

If the execution of substantially all the Works in progress is prevented for a continuous period of 84 days by reason of Force Majeure of which notice has been given under Sub-Clause 19.2 [*Notice of Force Majeure*], or for multiple periods which total more than 140 days due to the same notified Force Majeure, then either Party may give to the other Party a notice of termination of the Contract. In this event, the termination shall take effect 7 days after the notice is given, and the Contractor shall proceed in accordance with Sub-Clause 16.3 [*Cessation of Work and Removal of Contractor's Equipment*].

Upon such termination, the Engineer shall determine the value of the work done and issue a Payment Certificate which shall include:

- (a) the amounts payable for any work carried out for which a price is stated in the Contract;
- (b) the Cost of Plant and Materials ordered for the Works which have been delivered to the Contractor, or of which the Contractor is liable to accept delivery: this Plant and Materials shall become the property of (and be at the risk of) the Employer when paid for by the Employer, and the Contractor shall place the same at the Employer's disposal;
- (c) any other Cost or liability which in the circumstances was reasonably incurred by the Contractor in the expectation of completing the Works;

- (d) the Cost of removal of Temporary Works and Contractor's Equipment from the Site and the return of these items to the Contractor's works in his country (or to any other destination at no greater cost); and
- (e) the Cost of repatriation of the Contractor's staff and labour employed wholly in connection with the Works at the date of termination.

19.7

Release from Performance under the Law

Notwithstanding any other provision of this Clause, if any event or circumstance outside the control of the Parties (including, but not limited to, Force Majeure) arises which makes it impossible or unlawful for either or both Parties to fulfil its or their contractual obligations or which, under the law governing the Contract, entitles the Parties to be released from further performance of the Contract, then upon notice by either Party to the other Party of such event or circumstance:

- (a) the Parties shall be discharged from further performance, without prejudice to the rights of either Party in respect of any previous breach of the Contract, and
- (b) the sum payable by the Employer to the Contractor shall be the same as would have been payable under Sub-Clause 19.6 [*Optional Termination, Payment and Release*] if the Contract had been terminated under Sub-Clause 19.6.

20 Claim, Disputes and Arbitration

20.1

Contractor's Claims

If the Contractor considers himself to be entitled to any extension of the Time for Completion and/or any additional payment, under any Clause of these Conditions or otherwise in connection with the Contract, the Contractor shall give notice to the Engineer, describing the event or circumstance giving rise to the claim. The notice shall be given as soon as practicable, and not later than 28 days after the Contractor became aware, or should have become aware, of the event or circumstance.

If the Contractor fails to give notice of a claim within such period of 28 days, the Time for Completion shall not be extended, the Contractor shall not be entitled to additional payment, and the Employer shall be discharged from all liability in connection with the claim. Otherwise, the following provisions of this Sub-Clause shall apply.

The Contractor shall also submit any other notices which are required by the Contract, and supporting particulars for the claim, all as relevant to such event or circumstance.

The Contractor shall keep such contemporary records as may be necessary to substantiate any claim, either on the Site or at another location acceptable to the Engineer. Without admitting the Employer's liability, the Engineer may, after receiving any notice under this Sub-Clause, monitor the record-keeping and/or instruct the Contractor to keep further contemporary records. The Contractor shall permit the Engineer to inspect all these records, and shall (if instructed) submit copies to the Engineer.

Within 42 days after the Contractor became aware (or should have become aware) of the event or circumstance giving rise to the claim, or within such other period as may be proposed by the Contractor and approved by the Engineer, the Contractor shall send to the Engineer a fully detailed claim which includes full supporting particulars of the basis of the claim and of the extension of time and/or additional payment claimed. If the event or circumstance giving rise to the claim has a continuing effect:

- (a) this fully detailed claim shall be considered as interim;

- (b) the Contractor shall send further interim claims at monthly intervals, giving the accumulated delay and/or amount claimed, and such further particulars as the Engineer may reasonably require; and
- (c) the Contractor shall send a final claim within 28 days after the end of the effects resulting from the event or circumstance, or within such other period as may be proposed by the Contractor and approved by the Engineer.

Within 42 days after receiving a claim or any further particulars supporting a previous claim, or within such other period as may be proposed by the Engineer and approved by the Contractor, the Engineer shall respond with approval, or with disapproval and detailed comments. He may also request any necessary further particulars, but shall nevertheless give his response on the principles of the claim within such time.

Each Payment Certificate shall include such amounts for any claim as have been reasonably substantiated as due under the relevant provision of the Contract. Unless and until the particulars supplied are sufficient to substantiate the whole of the claim, the Contractor shall only be entitled to payment for such part of the claim as he has been able to substantiate.

The Engineer shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine (i) the extension (if any) of the Time for Completion (before or after its expiry) in accordance with Sub-Clause 8.4 [*Extension of Time for Completion*], and/or (ii) the additional payment (if any) to which the Contractor is entitled under the Contract.

The requirements of this Sub-Clause are in addition to those of any other Sub-Clause which may apply to a claim. If the Contractor fails to comply with this or another Sub-Clause in relation to any claim, any extension of time and/or additional payment shall take account of the extent (if any) to which the failure has prevented or prejudiced proper investigation of the claim, unless the claim is excluded under the second paragraph of this Sub-Clause.

20.2

Appointment of the Dispute Adjudication Board

Disputes shall be adjudicated by a DAB in accordance with Sub-Clause 20.4 [*Obtaining Dispute Adjudication Board's Decision*]. The Parties shall jointly appoint a DAB by the date stated in the Appendix to Tender.

The DAB shall comprise, as stated in the Appendix to Tender, either one or three suitably qualified persons ("the members"). If the number is not so stated and the Parties do not agree otherwise, the DAB shall comprise three persons.

If the DAB is to comprise three persons, each Party shall nominate one member for the approval of the other Party. The Parties shall consult both these members and shall agree upon the third member, who shall be appointed to act as chairman.

However, if a list of potential members is included in the Contract, the members shall be selected from those on the list, other than anyone who is unable or unwilling to accept appointment to the DAB.

The agreement between the Parties and either the sole member ("adjudicator") or each of the three members shall incorporate by reference the General Conditions of Dispute Adjudication Agreement contained in the Appendix to these General Conditions, with such amendments as are agreed between them.

The terms of the remuneration of either the sole member or each of the three members, including the remuneration of any expert whom the DAB consults, shall be

mutually agreed upon by the Parties when agreeing the terms of appointment. Each Party shall be responsible for paying one-half of this remuneration.

If at any time the Parties so agree, they may jointly refer a matter to the DAB for it to give its opinion. Neither Party shall consult the DAB on any matter without the agreement of the other Party.

If at any time the Parties so agree, they may appoint a suitably qualified person or persons to replace (or to be available to replace) any one or more members of the DAB. Unless the Parties agree otherwise, the appointment will come into effect if a member declines to act or is unable to act as a result of death, disability, resignation or termination of appointment.

If any of these circumstances occurs and no such replacement is available, a replacement shall be appointed in the same manner as the replaced person was required to have been nominated or agreed upon, as described in this Sub-Clause.

The appointment of any member may be terminated by mutual agreement of both Parties, but not by the Employer or the Contractor acting alone. Unless otherwise agreed by both Parties, the appointment of the DAB (including each member) shall expire when the discharge referred to in Sub-Clause 14.12 [*Discharge*] shall have become effective.

20.3

Failure to Agree Dispute Adjudication Board

If any of the following conditions apply, namely:

- (a) the Parties fail to agree upon the appointment of the sole member of the DAB by the date stated in the first paragraph of Sub-Clause 20.2, [*Appointment of the Dispute Adjudication Board*]
- (b) either Party fails to nominate a member (for approval by the other Party) of a DAB of three persons by such date,
- (c) the Parties fail to agree upon the appointment of the third member (to act as chairman) of the DAB by such date, or
- (d) the Parties fail to agree upon the appointment of a replacement person within 42 days after the date on which the sole member or one of the three members declines to act or is unable to act as a result of death, disability, resignation or termination of appointment,

then the appointing entity or official named in the Appendix to Tender shall, upon the request of either or both of the Parties and after due consultation with both Parties, appoint this member of the DAB. This appointment shall be final and conclusive. Each Party shall be responsible for paying one-half of the remuneration of the appointing entity or official.

20.4

Obtaining Dispute Adjudication Board's Decision

If a dispute (of any kind whatsoever) arises between the Parties in connection with, or arising out of, the Contract or the execution of the Works, including any dispute as to any certificate, determination, instruction, opinion or valuation of the Engineer, either Party may refer the dispute in writing to the DAB for its decision, with copies to the other Party and the Engineer. Such reference shall state that it is given under this Sub-Clause.

For a DAB of three persons, the DAB shall be deemed to have received such reference on the date when it is received by the chairman of the DAB.

Both Parties shall promptly make available to the DAB all such additional information,

further access to the Site, and appropriate facilities, as the DAB may require for the purposes of making a decision on such dispute. The DAB shall be deemed to be not acting as arbitrator(s).

Within 84 days after receiving such reference, or within such other period as may be proposed by the DAB and approved by both Parties, the DAB shall give its decision, which shall be reasoned and shall state that it is given under this Sub-Clause. The decision shall be binding on both Parties, who shall promptly give effect to it unless and until it shall be revised in an amicable settlement or an arbitral award as described below. Unless the Contract has already been abandoned, repudiated or terminated, the Contractor shall continue to proceed with the Works in accordance with the Contract.

If either Party is dissatisfied with the DAB's decision, then either Party may, within 28 days after receiving the decision, give notice to the other Party of its dissatisfaction. If the DAB fails to give its decision within the period of 84 days (or as otherwise approved) after receiving such reference, then either Party may, within 28 days after this period has expired, give notice to the other Party of its dissatisfaction.

In either event, this notice of dissatisfaction shall state that it is given under this Sub-Clause, and shall set out the matter in dispute and the reason(s) for dissatisfaction. Except as stated in Sub-Clause 20.7 [*Failure to Comply with Dispute Adjudication Board's Decision*] and Sub-Clause 20.8 [*Expiry of Dispute Adjudication Board's Appointment*], neither Party shall be entitled to commence arbitration of a dispute unless a notice of dissatisfaction has been given in accordance with this Sub-Clause.

If the DAB has given its decision as to a matter in dispute to both Parties, and no notice of dissatisfaction has been given by either Party within 28 days after it received the DAB's decision, then the decision shall become final and binding upon both Parties.

20.5

Amicable Settlement

Where notice of dissatisfaction has been given under Sub-Clause 20.4 above, both Parties shall attempt to settle the dispute amicably before the commencement of arbitration. However, unless both Parties agree otherwise, arbitration may be commenced on or after the fifty-sixth day after the day on which notice of dissatisfaction was given, even if no attempt at amicable settlement has been made.

20.6

Arbitration

Unless settled amicably, any dispute in respect of which the DAB's decision (if any) has not become final and binding shall be finally settled by international arbitration. Unless otherwise agreed by both Parties:

- (a) the dispute shall be finally settled under the Rules of Arbitration of the International Chamber of Commerce,
- (b) the dispute shall be settled by three arbitrators appointed in accordance with these Rules, and
- (c) the arbitration shall be conducted in the language for communications defined in Sub-Clause 1.4 [*Law and Language*].

The arbitrator(s) shall have full power to open up, review and revise any certificate, determination, instruction, opinion or valuation of the Engineer, and any decision of the DAB, relevant to the dispute. Nothing shall disqualify the Engineer from being called as a witness and giving evidence before the arbitrator(s) on any matter whatsoever relevant to the dispute.

Neither Party shall be limited in the proceedings before the arbitrator(s) to the evidence or arguments previously put before the DAB to obtain its decision, or to the reasons

for dissatisfaction given in its notice of dissatisfaction. Any decision of the DAB shall be admissible in evidence in the arbitration.

Arbitration may be commenced prior to or after completion of the Works. The obligations of the Parties, the Engineer and the DAB shall not be altered by reason of any arbitration being conducted during the progress of the Works.

20.7

Failure to Comply with Dispute Adjudication Board's Decision

In the event that:

- (a) neither Party has given notice of dissatisfaction within the period stated in Sub-Clause 20.4 [*Obtaining Dispute Adjudication Board's Decision*],
- (b) the DAB's related decision (if any) has become final and binding, and
- (c) a Party fails to comply with this decision,

then the other Party may, without prejudice to any other rights it may have, refer the failure itself to arbitration under Sub-Clause 20.6 [*Arbitration*]. Sub-Clause 20.4 [*Obtaining Dispute Adjudication Board's Decision*] and Sub-Clause 20.5 [*Amicable Settlement*] shall not apply to this reference.

20.8

Expiry of Dispute Adjudication Board's Appointment

If a dispute arises between the Parties in connection with, or arising out of, the Contract or the execution of the Works and there is no DAB in place, whether by reason of the expiry of the DAB's appointment or otherwise:

- (a) Sub-Clause 20.4 [*Obtaining Dispute Adjudication Board's Decision*] and Sub-Clause 20.5 [*Amicable Settlement*] shall not apply, and
 - (b) the dispute may be referred directly to arbitration under Sub-Clause 20.6 [*Arbitration*].
-

APPENDIX

General Conditions of Dispute Adjudication Agreement

- 1**
Definitions
- Each "Dispute Adjudication Agreement" is a tripartite agreement by and between:
- (a) the "Employer";
 - (b) the "Contractor"; and
 - (c) the "Member" who is defined in the Dispute Adjudication Agreement as being:
 - (i) the sole member of the "DAB" (or "adjudicator") and, where this is the case, all references to the "Other Members" do not apply, or
 - (ii) one of the three persons who are jointly called the "DAB" (or "dispute adjudication board") and, where this is the case, the other two persons are called the "Other Members".

The Employer and the Contractor have entered (or intend to enter) into a contract, which is called the "Contract" and is defined in the Dispute Adjudication Agreement, which incorporates this Appendix. In the Dispute Adjudication Agreement, words and expressions which are not otherwise defined shall have the meanings assigned to them in the Contract.

- 2**
-
- General Provisions**
- Unless otherwise stated in the Dispute Adjudication Agreement, it shall take effect on the latest of the following dates:
- (a) the Commencement Date defined in the Contract,
 - (b) when the Employer, the Contractor and the Member have each signed the Dispute Adjudication Agreement, or
 - (c) when the Employer, the Contractor and each of the Other Members (if any) have respectively each signed a dispute adjudication agreement.

When the Dispute Adjudication Agreement has taken effect, the Employer and the Contractor shall each give notice to the Member accordingly. If the Member does not receive either notice within six months after entering into the Dispute Adjudication Agreement, it shall be void and ineffective.

This employment of the Member is a personal appointment. At any time, the Member may give not less than 70 days' notice of resignation to the Employer and to the Contractor, and the Dispute Adjudication Agreement shall terminate upon the expiry of this period.

No assignment or subcontracting of the Dispute Adjudication Agreement is permitted without the prior written agreement of all the parties to it and of the Other Members (if any).

- 3**
-
- Warranties**
- The Member warrants and agrees that he/she is and shall be impartial and independent of the Employer, the Contractor and the Engineer. The Member shall promptly disclose, to each of them and to the Other Members (if any), any fact or circumstance which might appear inconsistent with his/her warranty and agreement of impartiality and independence.
- When appointing the Member, the Employer and the Contractor relied upon the Member's representations that he/she is:
- (a) experienced in the work which the Contractor is to carry out under the Contract,
 - (b) experienced in the interpretation of contract documentation, and
 - (c) fluent in the language for communications defined in the Contract.

4
**General Obligations of
the Member**

The Member shall:

- (a) have no interest financial or otherwise in the Employer, the Contractor or the Engineer, nor any financial interest in the Contract except for payment under the Dispute Adjudication Agreement;
- (b) not previously have been employed as a consultant or otherwise by the Employer, the Contractor or the Engineer, except in such circumstances as were disclosed in writing to the Employer and the Contractor before they signed the Dispute Adjudication Agreement;
- (c) have disclosed in writing to the Employer, the Contractor and the Other Members (if any), before entering into the Dispute Adjudication Agreement and to his/her best knowledge and recollection, any professional or personal relationships with any director, officer or employee of the Employer, the Contractor or the Engineer, and any previous involvement in the overall project of which the Contract forms part;
- (d) not, for the duration of the Dispute Adjudication Agreement, be employed as a consultant or otherwise by the Employer, the Contractor or the Engineer, except as may be agreed in writing by the Employer, the Contractor and the Other Members (if any);
- (e) comply with the annexed procedural rules and with Sub-Clause 20.4 of the Conditions of Contract;
- (f) not give advice to the Employer, the Contractor, the Employer's Personnel or the Contractor's Personnel concerning the conduct of the Contract, other than in accordance with the annexed procedural rules;
- (g) not while a Member enter into discussions or make any agreement with the Employer, the Contractor or the Engineer regarding employment by any of them, whether as a consultant or otherwise, after ceasing to act under the Dispute Adjudication Agreement;
- (h) ensure his/her availability for all site visits and hearings as are necessary;
- (i) become conversant with the Contract and with the progress of the Works (and of any other parts of the project of which the Contract forms part) by studying all documents received which shall be maintained in a current working file;
- (j) treat the details of the Contract and all the DAB's activities and hearings as private and confidential, and not publish or disclose them without the prior written consent of the Employer, the Contractor and the Other Members (if any); and
- (k) be available to give advice and opinions, on any matter relevant to the Contract when requested by both the Employer and the Contractor, subject to the agreement of the Other Members (if any).

5
**General Obligations of
the Employer and the
Contractor**

The Employer, the Contractor, the Employer's Personnel and the Contractor's Personnel shall not request advice from or consultation with the Member regarding the Contract, otherwise than in the normal course of the DAB's activities under the Contract and the Dispute Adjudication Agreement, and except to the extent that prior agreement is given by the Employer, the Contractor and the Other Members (if any). The Employer and the Contractor shall be responsible for compliance with this provision, by the Employer's Personnel and the Contractor's Personnel respectively.

The Employer and the Contractor undertake to each other and to the Member that the Member shall not, except as otherwise agreed in writing by the Employer, the Contractor, the Member and the Other Members (if any):

- (a) be appointed as an arbitrator in any arbitration under the Contract;
- (b) be called as a witness to give evidence concerning any dispute before arbitrator(s) appointed for any arbitration under the Contract; or
- (c) be liable for any claims for anything done or omitted in the discharge or purported discharge of the Member's functions, unless the act or omission is shown to have been in bad faith.

The Employer and the Contractor hereby jointly and severally indemnify and hold the Member harmless against and from claims from which he is relieved from liability under the preceding paragraph.

Whenever the Employer or the Contractor refers a dispute to the DAB under Sub-Clause 20.4 of the Conditions of Contract, which will require the Member to make a site visit and attend a hearing, the Employer or the Contractor shall provide appropriate security for a sum equivalent to the reasonable expenses to be incurred by the Member. No account shall be taken of any other payments due or paid to the Member.

6

Payment

The Member shall be paid as follows, in the currency named in the Dispute Adjudication Agreement:

- (a) a retainer fee per calendar month, which shall be considered as payment in full for:
 - (i) being available on 28 days' notice for all site visits and hearings;
 - (ii) becoming and remaining conversant with all project developments and maintaining relevant files;
 - (iii) all office and overhead expenses including secretarial services, photocopying and office supplies incurred in connection with his duties; and
 - (iv) all services performed hereunder except those referred to in sub-paragraphs (b) and (c) of this Clause.

The retainer fee shall be paid with effect from the last day of the calendar month in which the Dispute Adjudication Agreement becomes effective; until the last day of the calendar month in which the Taking-Over Certificate is issued for the whole of the Works.

With effect from the first day of the calendar month following the month in which Taking-Over Certificate is issued for the whole of the Works, the retainer fee shall be reduced by 50%. This reduced fee shall be paid until the first day of the calendar month in which the Member resigns or the Dispute Adjudication Agreement is otherwise terminated.

- (b) a daily fee which shall be considered as payment in full for:
 - (i) each day or part of a day up to a maximum of two days' travel time in each direction for the journey between the Member's home and the site, or another location of a meeting with the Other Members (if any);
 - (ii) each working day on site visits, hearings or preparing decisions; and
 - (iii) each day spent reading submissions in preparation for a hearing.
- (c) all reasonable expenses incurred in connection with the Member's duties, including the cost of telephone calls, courier charges, faxes and telexes, travel expenses, hotel and subsistence costs: a receipt shall be required for each item in excess of five percent of the daily fee referred to in sub-paragraph (b) of this Clause;
- (d) any taxes properly levied in the Country on payments made to the Member (unless a national or permanent resident of the Country) under this Clause 6.

The retainer and daily fees shall be as specified in the Dispute Adjudication Agreement. Unless it specifies otherwise, these fees shall remain fixed for the first 24 calendar months, and shall thereafter be adjusted by agreement between the Employer, the Contractor and the Member, at each anniversary of the date on which the Dispute Adjudication Agreement became effective.

The Member shall submit invoices for payment of the monthly retainer and air fares quarterly in advance. Invoices for other expenses and for daily fees shall be submitted following the conclusion of a site visit or hearing. All invoices shall be accompanied by a brief description of activities performed during the relevant period and shall be addressed to the Contractor.

The Contractor shall pay each of the Member's invoices in full within 56 calendar days after receiving each invoice and shall apply to the Employer (in the Statements under the Contract) for reimbursement of one-half of the amounts of these invoices. The Employer shall then pay the Contractor in accordance with the Contract.

If the Contractor fails to pay to the Member the amount to which he/she is entitled under the Dispute Adjudication Agreement, the Employer shall pay the amount due to the Member and any other amount which may be required to maintain the operation of the DAB; and without prejudice to the Employer's rights or remedies. In addition to all other rights arising from this default, the Employer shall be entitled to reimbursement of all sums paid in excess of one-half of these payments, plus all costs of recovering these sums and financing charges calculated at the rate specified in Sub-Clause 14.8 of the Conditions of Contract.

If the Member does not receive payment of the amount due within 70 days after submitting a valid invoice, the Member may (i) suspend his/her services (without notice) until the payment is received, and/or (ii) resign his/her appointment by giving notice under Clause 7.

7

Termination

At any time: (i) the Employer and the Contractor may jointly terminate the Dispute Adjudication Agreement by giving 42 days' notice to the Member; or (ii) the Member may resign as provided for in Clause 2.

If the Member fails to comply with the Dispute Adjudication Agreement, the Employer and the Contractor may, without prejudice to their other rights, terminate it by notice to the Member. The notice shall take effect when received by the Member.

If the Employer or the Contractor fails to comply with the Dispute Adjudication Agreement, the Member may, without prejudice to his other rights, terminate it by notice to the Employer and the Contractor. The notice shall take effect when received by them both.

Any such notice, resignation and termination shall be final and binding on the Employer, the Contractor and the Member. However, a notice by the Employer or the Contractor, but not by both, shall be of no effect.

8

Default of the Member

If the Member fails to comply with any obligation under Clause 4, he/she shall not be entitled to any fees or expenses hereunder and shall, without prejudice to their other rights, reimburse each of the Employer and the Contractor for any fees and expenses received by the Member and the Other Members (if any), for proceedings or decisions (if any) of the DAB which are rendered void or ineffective.

9

Disputes

Any dispute or claim arising out of or in connection with this Dispute Adjudication Agreement, or the breach, termination or invalidity thereof, shall be finally settled under the Rules of Arbitration of the International Chamber of Commerce by one arbitrator appointed in accordance with these Rules of Arbitration.

Annex PROCEDURAL RULES

- 1 Unless otherwise agreed by the Employer and the Contractor, the DAB shall visit the site at intervals of not more than 140 days, including times of critical construction events, at the request of either the Employer or the Contractor. Unless otherwise agreed by the Employer, the Contractor and the DAB, the period between consecutive visits shall not be less than 70 days, except as required to convene a hearing as described below.
- 2 The timing of and agenda for each site visit shall be as agreed jointly by the DAB, the Employer and the Contractor, or in the absence of agreement, shall be decided by the DAB. The purpose of site visits is to enable the DAB to become and remain acquainted with the progress of the Works and of any actual or potential problems or claims.
- 3 Site visits shall be attended by the Employer, the Contractor and the Engineer and shall be co-ordinated by the Employer in co-operation with the Contractor. The Employer shall ensure the provision of appropriate conference facilities and secretarial and copying services. At the conclusion of each site visit and before leaving the site, the DAB shall prepare a report on its activities during the visit and shall send copies to the Employer and the Contractor.
- 4 The Employer and the Contractor shall furnish to the DAB one copy of all documents which the DAB may request, including Contract documents, progress reports, variation instructions, certificates and other documents pertinent to the performance of the Contract. All communications between the DAB and the Employer or the Contractor shall be copied to the other Party. If the DAB comprises three persons, the Employer and the Contractor shall send copies of these requested documents and these communications to each of these persons.
- 5 If any dispute is referred to the DAB in accordance with Sub-Clause 20.4 of the Conditions of Contract, the DAB shall proceed in accordance with Sub-Clause 20.4 and these Rules. Subject to the time allowed to give notice of a decision and other relevant factors, the DAB shall:
 - (a) act fairly and impartially as between the Employer and the Contractor, giving each of them a reasonable opportunity of putting his case and responding to the other's case, and
 - (b) adopt procedures suitable to the dispute, avoiding unnecessary delay or expense.
- 6 The DAB may conduct a hearing on the dispute, in which event it will decide on the date and place for the hearing and may request that written documentation and arguments from the Employer and the Contractor be presented to it prior to or at the hearing.
- 7 Except as otherwise agreed in writing by the Employer and the Contractor, the DAB shall have power to adopt an inquisitorial procedure, to refuse admission to hearings or audience at hearings to any persons other than representatives of the Employer, the Contractor and the Engineer, and to proceed in the absence of any party who the DAB is satisfied received notice of the hearing; but shall have discretion to decide whether and to what extent this power may be exercised.

- 8 The Employer and the Contractor empower the DAB, among other things, to:
- (a) establish the procedure to be applied in deciding a dispute,
 - (b) decide upon the DAB's own jurisdiction, and as to the scope of any dispute referred to it,
 - (c) conduct any hearing as it thinks fit, not being bound by any rules or procedures other than those contained in the Contract and these Rules,
 - (d) take the initiative in ascertaining the facts and matters required for a decision,
 - (e) make use of its own specialist knowledge, if any,
 - (f) decide upon the payment of financing charges in accordance with the Contract,
 - (g) decide upon any provisional relief such as interim or conservatory measures, and
 - (h) open up, review and revise any certificate, decision, determination, instruction, opinion or valuation of the Engineer, relevant to the dispute.
- 9 The DAB shall not express any opinions during any hearing concerning the merits of any arguments advanced by the Parties. Thereafter, the DAB shall make and give its decision in accordance with Sub-Clause 20.4, or as otherwise agreed by the Employer and the Contractor in writing. If the DAB comprises three persons:
- (a) it shall convene in private after a hearing, in order to have discussions and prepare its decision;
 - (b) it shall endeavour to reach a unanimous decision: if this proves impossible the applicable decision shall be made by a majority of the Members, who may require the minority Member to prepare a written report for submission to the Employer and the Contractor; and
 - (c) if a Member fails to attend a meeting or hearing, or to fulfil any required function, the other two Members may nevertheless proceed to make a decision, unless:
 - (i) either the Employer or the Contractor does not agree that they do so, or
 - (ii) the absent Member is the chairman and he/she instructs the other Members to not make a decision.
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GENERAL CONDITIONS

GUIDANCE FOR THE
PREPARATION OF
PARTICULAR CONDITIONS

Conditions of Contract
for **CONSTRUCTION**

FOR BUILDING AND ENGINEERING WORKS
DESIGNED BY THE EMPLOYER

FORMS OF LETTER OF
TENDER, CONTRACT
AGREEMENT AND
DISPUTE ADJUDICATION
AGREEMENT

Guidance for the Preparation of Particular
Conditions

FEDERATION INTERNATIONALE DES INGENIEURS-CONSEILS
INTERNATIONAL FEDERATION OF CONSULTING ENGINEERS
INTERNATIONALE VEREINIGUNG BERATENDER INGENIEURE
FEDERACION INTERNACIONAL DE INGENIEROS CONSULTORES



Guidance for the Preparation of Particular Conditions

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Guidance for the Preparation of Particular Conditions

INTRODUCTION

The terms of the Conditions of Contract for Construction have been prepared by the Fédération Internationale des Ingénieurs-Conseils (FIDIC) and are recommended for general use for the purpose of the construction (excluding most design) of building or engineering works where tenders are invited on an international basis. Modifications to the Conditions may be required in some legal jurisdictions, particularly if they are to be used on domestic contracts.

Under the usual arrangements for this type of contract, the Contractor constructs the works in accordance with design details provided by the Employer or his representative, the Engineer. Although these Conditions allow for the possibility that the Contractor may be required to design parts of the permanent works, they are not intended for use where most of the works are designed by the Contractor. For these Works, it would be more appropriate to utilise FIDIC's Conditions of Contract for Plant and Design-Build or Conditions of Contract for EPC/Turnkey Projects.

The guidance hereafter is intended to assist writers of the Particular Conditions by giving options for various sub-clauses where appropriate. As far as possible, example wording is included, between lines. In some cases, however, only an aide-memoire is given.

Before incorporating any example wording, it must be checked to ensure that it is wholly suitable for the particular circumstances. Unless it is considered suitable, example wording should be amended before use.

Where example wording is amended, and in all cases where other amendments or additions are made, care must be taken to ensure that no ambiguity is created, either with the General Conditions or between the clauses in the Particular Conditions.

In the preparation of the Conditions of Contract to be included in the tender documents for a contract, the following text can be used:

The Conditions of Contract comprise the "General Conditions", which form part of the "Conditions of Contract for Construction" First Edition 1999 published by the Fédération Internationale des Ingénieurs-Conseils (FIDIC), and the following "Particular Conditions", which include amendments and additions to such General Conditions.

There are no Sub-Clauses in the General Conditions which require data to be included in the Particular Conditions. As noted in sub-paragraph (ii) of the Foreword, the General Conditions refer to any necessary data being contained in the Appendix to Tender or (for technical matters) in the Specification.

FIDIC has published a document entitled "Tendering Procedure" which presents a systematic approach to the selection of tenderers and the obtaining and evaluation of tenders; the second edition was published in 1994. The document is intended to assist the Employer to receive sound competitive tenders with a minimum of qualifications. FIDIC intends to update Tendering Procedure and to publish a guide to the use of these Conditions of Contract for Construction.

Notes on the Preparation of Tender Documents

The tender documents should be prepared by suitably-qualified engineers who are familiar with the technical aspects of the required works, and a review by suitably-qualified lawyers may be advisable. The tender documents issued to tenderers will consist of the Conditions of Contract, the Specification, the Drawings, and the Letter of Tender and Schedules for completion by the Tenderer. For this type of contract, where the Works are valued by measurement, the Bill of Quantities will usually be the most important Schedule. A Daywork Schedule may also be necessary, to cover minor works to be evaluated at cost. In addition, each of the Tenderers should receive the data referred to in Sub-Clause 4.10, and the Instructions to Tenderers to advise them of any special matters which the Employer wishes them to take into account when pricing the Bill of Quantities but which are not to form part of the Contract. When the Employer accepts the Letter of Tender, the Contract (which then comes into full force and effect) includes these completed Schedules.

The Specification may include the matters referred to in some or all of the following Sub-Clauses:

- 1.8 Requirements for Contractor's Documents
- 1.13 Permissions being obtained by the Employer
- 2.1 Phased possession of foundations, structures, plant or means of access
- 4.1 Contractor's designs
- 4.6 Other contractors (and others) on the Site
- 4.7 Setting-out points, lines and levels of reference
- 4.14 Third parties
- 4.18 Environmental constraints
- 4.19 Electricity, water, gas and other services available on the Site
- 4.20 Employer's Equipment and free-issue material
- 5.1 Nominated Subcontractors
- 6.6 Facilities for Personnel
- 7.2 Samples
- 7.4 Testing during manufacture and/or construction
- 9.1 Tests on Completion
- 13.5 Provisional Sums

Many Sub-Clauses in the General Conditions make reference to data being contained in the Appendix to Tender, providing a convenient location for the data which is usually required. The example form in this publication thus provides a check-list of the data required; but there is no indication, either in the General Conditions or in the example Appendix to Tender, that this data is either prescribed by the Employer or inserted by the Tenderer. The Employer should prepare the Appendix to Tender, based on this example form, with the elements completed to the extent of his requirements.

The Employer may also require other data from Tenderers, and include a questionnaire in the Schedules.

The Instructions to Tenderers may need to specify any constraints on the completion of the Appendix to Tender and/or Schedules, and/or specify the extent of other information which each Tenderer is to include with his Tender. If each Tenderer is to produce a parent company guarantee and/or a tender security, these requirements (which apply prior to the Contract becoming effective) should be included in the Instructions to Tenderers: example forms are annexed to this document as Annexes A and B. The Instructions may include matters referred to in some or all of the following Sub-Clauses:

- 4.3 Contractor's Representative (name and curriculum vitae)
- 4.9 Quality Assurance system
- 9.1 Tests on Completion
- 18 Insurances
- 20 Resolution of disputes

Clause 1 General Provisions

Sub-Clause 1.1 Definitions

It may be necessary to amend some of the definitions. For example:

- 1.1.3.1 the Base Date could be defined as a particular calendar date
- 1.1.4.6 one particular Foreign Currency may be required by the financing institution
- 1.1.4.8 a different currency may be required to be the contract Local Currency
- 1.1.6.2 the references to "Country" may be inappropriate for a cross-border Site

Sub-Clause 1.2 Interpretation

If the references to "profit" are to be more precisely specified, this Sub-Clause may be varied:

EXAMPLE At the end of Sub-Clause 1.2, insert:

In these Conditions, provisions including the expression "Cost plus reasonable profit" require this profit to be one-twentieth (5%) of this Cost.

Sub-Clause 1.5 Priority of Documents

An order of precedence is usually necessary, in case a conflict is subsequently found among the contract documents. If no order of precedence is to be prescribed, this Sub-Clause may be varied:

EXAMPLE Delete Sub-Clause 1.5 and substitute:

The documents forming the Contract are to be taken as mutually explanatory of one another. If an ambiguity or discrepancy is found, the priority shall be such as may be accorded by the governing law. The Engineer has authority to issue any instruction which he considers necessary to resolve an ambiguity or discrepancy.

Sub-Clause 1.6 Contract Agreement

The form of Agreement should be included in the tender documents as an annex to the Particular Conditions: an example form is included at the end of this publication. If lengthy tender negotiations were necessary, it may be considered advisable for the Contract Agreement to record the Accepted Contract Amount, Base Date and/or Commencement Date. Entry into an Agreement may be necessary under applicable law.

Sub-Clause 1.14 Joint and Several Liability

For a major contract, detailed requirements for the joint venture may need to be specified. For example, it may be desirable for each member to produce a parent company guarantee: an example form is annexed to this document as Annex A.

These requirements, which apply prior to the Contract becoming effective, should be included in the Instructions to Tenderers. The Employer will wish the leader of the joint venture to be appointed at an early stage, providing a single point of contact thereafter, and will not wish to be involved in a dispute between the members of a joint venture. The Employer should scrutinise the

joint venture agreement carefully, and it may have to be approved by the project's financing institutions.

Additional Sub-Clause Details to be Confidential

If confidentiality is required, an additional sub-clause may be added:

EXAMPLE SUB-CLAUSE

The Contractor shall treat the details of the Contract as private and confidential, except to the extent necessary to carry out obligations under it or to comply with applicable Laws. The Contractor shall not publish, permit to be published, or disclose any particulars of the Works in any trade or technical paper or elsewhere without the previous agreement of the Employer.

Clause 2 The Employer

Sub-Clause 2.1 Right of Access to the Site

If right of access cannot be granted, both early and thereafter exclusively, details should be given in the Specification.

Sub-Clause 2.3 Employer's Personnel

These provisions should be reflected in the Employer's contracts with any other contractors on the Site.

Clause 3 The Engineer

Sub-Clause 3.1 Engineer's Duties and Authority

Any requirements for Employer's approval should be set out in the Particular Conditions:

EXAMPLE

The Engineer shall obtain the specific approval of the Employer before taking action under the following Sub-Clauses of these Conditions:

- (a) Sub-Clause _____ **
- (b) Sub-Clause _____ **

** (insert number; describe action, unless all require approval)

This list should be extended or reduced as necessary. If the obligation to obtain the approval of the Employer only applies beyond certain limits, financial or otherwise, the example wording should be varied.

Additional Sub-Clause Management Meetings

EXAMPLE SUB-CLAUSE

The Engineer or the Contractor's Representative may require the other to attend a management meeting in order to review the arrangements for future work. The Engineer shall record the business of management meetings and supply copies of the record to those attending the meeting

and to the Employer. In the record, responsibilities for any actions to be taken shall be in accordance with the Contract.

Clause 4 The Contractor

Sub-Clause 4.1 Contractor's General Obligations

Occasionally, there may be an item of Temporary Works for which the Contractor will not be fully responsible. For example, the Contract may specify temporary arrangements for river diversion which have been designed by the Engineer. In these cases, the Sub-Clause may require amendment, taking account of the type of this item of Temporary Works, and of the extent of the Employer's responsibility.

Sub-Clause 4.2 Performance Security

The acceptable form(s) of Performance Security should be included in the tender documents, annexed to the Particular Conditions. Example forms are annexed to this document as Annex C and Annex D. They incorporate two sets of Uniform Rules published by the International Chamber of Commerce (the "ICC", which is based at 38 Cours Albert 1er, 75008 Paris, France), which also publishes guides to these Uniform Rules. These example forms and the wording of the Sub-Clause may have to be amended to comply with applicable law.

EXAMPLE

At the end of the second paragraph of Sub-Clause 4.2, insert:

If the Performance Security is in the form of a bank guarantee, it shall be issued either (a) by a bank located in the Country, or (b) directly by a foreign bank acceptable to the Employer. If the Performance Security is not in the form of a bank guarantee, it shall be furnished by a financial entity registered, or licensed to do business, in the Country.

Sub-Clause 4.3 Contractor's Representative

If the Representative is known at the time of submission of the Tender, the Tenderer may propose the Representative. The Tenderer may wish to propose alternatives, especially if the contract award seems likely to be delayed. If the ruling language is not the same as the language for day to day communications (under Sub-Clause 1.4), or if for any other reason it is necessary to stipulate that the Contractor's Representative shall be fluent in a particular language, one of the following sentences may be added.

EXAMPLE

At the end of Sub-Clause 4.3, add:

The Contractor's Representative and all these persons shall also be fluent in _____ (insert name of language)

EXAMPLE

At the end of Sub-Clause 4.3, add:

If the Contractor's Representative, or these persons, is not fluent in _____ (insert name of language), the Contractor shall make a competent interpreter available during all working hours.

Sub-Clause 4.4 Subcontractors

The wording in the General Conditions includes the conditions which will usually be applicable. If less (or no) consent is required, some (or all) of sub-paragraphs (a) to (d) may be deleted, or qualified in the Particular Conditions:

EXAMPLE

Prior consent shall not be required if the value of the subcontract is less than 0.01% of the Accepted Contract Amount.

A sentence may be added to increase the extent to which consent is required:

EXAMPLE

The prior consent of the Engineer shall be obtained to the suppliers of the following Materials:

(insert details: for example, specific manufactured or prefabricated items)

A sentence may be added in order to encourage the Contractor to use local contractors:

EXAMPLE

Where practicable, the Contractor shall give a fair and reasonable opportunity for contractors from the Country to be appointed as Sub-contractors.

Sub-Clause 4.8 Safety Procedures

If the Contractor is sharing occupation of the Site with others, it may not be appropriate for him to provide some of the listed items. In these circumstances, the Employer's obligations should be specified.

Sub-Clause 4.9 Quality Assurance

The wording in the General Conditions imposes the requirement of a quality assurance system in accordance with details specified in the Contract. If inappropriate, this Sub-Clause may be deleted.

Sub-Clause 4.12 Unforeseeable Physical Conditions

In the case of major sub-surface works, the allocation of the risk of sub-surface conditions is an aspect which should be considered when tender documents are being prepared. If this risk is to be shared between the parties, the Sub-Clause may be amended:

EXAMPLE

Delete sub-paragraph (b) of Sub-Clause 4.12 and substitute:

(b) payment for any such Cost, _____ per cent (_____ %) of which shall be included in the Contract Price (the balance _____ percent of the Cost shall be borne by the Contractor).

Sub-Clause 4.17 Contractor's Equipment

If the Contractor is not to provide all the Contractor's Equipment necessary to complete the Works, the Employer's obligations should be specified: see Sub-Clause 4.20. If vesting of Contractor's Equipment is required, further paragraphs may be added, subject to their being consistent with applicable laws:

EXAMPLE

At the end of Sub-Clause 4.17, add the following paragraphs:

Contractor's Equipment which is owned by the Contractor (either directly or indirectly) shall be deemed to be the property of the Employer with effect from its arrival on the Site. This vesting of property shall not:

- (a) affect the responsibility or liability of the Employer,
- (b) prejudice the right of the Contractor to the sole use of the vested Contractor's Equipment for the purpose of the Works, or
- (c) affect the Contractor's responsibility to operate and maintain Contractor's Equipment.

The property in each item shall be deemed to revert in the Contractor when he is entitled either to remove it from the Site or to receive the Taking-Over Certificate for the Works, whichever occurs first.

Sub-Clause 4.19 Electricity, Water and Gas

If services are to be available for the Contractor to use, the Specification should give details, including locations and prices.

Sub-Clause 4.20 Employer's Equipment and Free-Issue Material

For this Sub-Clause to apply, the Specification should describe each item which the Employer will provide and/or operate and should specify all necessary details. With some types of facilities, further provisions may be necessary, in order to clarify aspects such as liability and insurance.

Sub-Clause 4.22 Security of the Site

If the Contractor is sharing occupation of the Site with others, it may not be appropriate for him to be responsible for its security. In these circumstances, the Employer's obligations should be specified.

Clause 5 Nominated Subcontractors

In most cases under Sub-Clause 4.4, the Contractor selects Subcontractors, subject to any constraints specified in the Contract. Clause 5 provides for the particular situation whereby the Employer may select a Subcontractor, although the second sentence of Sub-Clause 4.4 should still apply.

The sub-paragraphs of Sub-Clause 5.2 indicate some of the problems which may have to be overcome.

If a nominated Subcontractor is to be required, full details should be included in the tender documents. If the Employer anticipates that a Subcontractor is to be instructed under Clause 13 but is not to be a nominated Subcontractor, Clause 5 should be amended, describing the particular circumstances.

Clause 6 Staff and Labour

Sub-Clause 6.5 Working Hours

If the Employer does not wish to specify working hours in the Appendix to Tender, or to restrict them to the times specified by the Tenderer (in order to plan the Engineer's supervision, for example), this Sub-Clause may be deleted.

Sub-Clause 6.6 Facilities for Staff and Labour

If the Employer will make some accommodation available, his obligations to do so should be specified.

Sub-Clause 6.8 Contractor's Superintendence

If the ruling language is not the same as the language for day to day communications (under Sub-Clause 1.4), or if for any other reason it is necessary to stipulate that the Contractor's superintending staff shall be fluent in a particular language, the following sentence may be added.

EXAMPLE

Insert at the end of Sub-Clause 6.8:

A reasonable proportion of the Contractor's superintending staff shall have a working knowledge of

(insert name of language),

or the Contractor shall have a sufficient number of competent interpreters available on Site during all working hours.

Additional Sub-Clauses

It may be necessary to add a few sub-clauses to take account of the circumstances and locality of the Site:

EXAMPLE SUB-CLAUSE

Foreign Staff and Labour

The Contractor may import any personnel who are necessary for the execution of the Works. The Contractor must ensure that these personnel are provided with the required residence visas and work permits. The Contractor shall be responsible for the return to the place where they were recruited or to their domicile of imported Contractor's Personnel. In the event of the death in the Country of any of these personnel or members of their families, the Contractor shall similarly be responsible for making the appropriate arrangements for their return or burial.

EXAMPLE SUB-CLAUSE

Measures against Insect and Pest Nuisance

The Contractor shall at all times take the necessary precautions to protect all staff and labour employed on the Site from insect and pest nuisance, and to reduce their danger to health. The Contractor shall provide suitable prophylactics for the Contractor's Personnel and shall comply with all the regulations of the local health authorities, including use of appropriate insecticide.

EXAMPLE SUB-CLAUSE

Alcoholic Liquor or Drugs

The Contractor shall not, otherwise than in accordance with the Laws of the Country, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift, barter or disposal by Contractor's Personnel.

EXAMPLE SUB-CLAUSE

Arms and Ammunition

The Contractor shall not give, barter or otherwise dispose of to any person, any arms or ammunition of any kind, or allow Contractor's Personnel to do so.

EXAMPLE SUB-CLAUSE

Festivals and Religious Customs

The Contractor shall respect the Country's recognised festivals, days of rest and religious or other customs.

Clause 7 Plant, Materials and Workmanship

Additional Sub-Clause

If the Contract is being financed by an institution whose rules or policies require a restriction on the use of its funds, a further sub-clause may be added:

EXAMPLE SUB-CLAUSE

All Goods shall have their origin in eligible source countries as defined in

(insert name of published guidelines for procurement).

Goods shall be transported by carriers from these eligible source countries, unless exempted by the Employer in writing on the basis of potential excessive costs or delays. Surety, insurance and banking services shall be provided by insurers and bankers from the eligible source countries.

Clause 8 Commencement, Delays and Suspension

Sub-Clause 8.2 Time for Completion

If the Works are to be taken-over in stages, these stages should be defined as Sections, in the Appendix to Tender.

Sub-Clause 8.7 Delay Damages

Under many legal systems, the amount of these pre-defined damages must represent a reasonable pre-estimate of the Employer's probable loss in the event of delay. If the Accepted Contract Amount is to be quoted as the sum of figures in more than one currency, it may be preferable to define these damages (per day) as the percentage reduction which would be applied to each of these figures. If the Accepted Contract Amount is expressed in the Local Currency, the damages per day may either be defined as a percentage or be defined as a figure in Local Currency: see Sub-Clause 14.15(b).

Additional Sub-Clause

Incentives for early completion may be included in the tender documents (although Sub-Clause 13.2 refers to accelerated completion):

EXAMPLE SUB-CLAUSE

Sections are required to be completed by the dates given in the Appendix to Tender in order that these Sections may be occupied and used by the Employer in advance of the completion of the whole of the Works. Details of the work required to be executed to entitle the Contractor to bonus payments and the amount of the bonuses are stated in the Specification.

For the purposes of calculating bonus payments, the dates given in the Appendix to Tender for completion of Sections are fixed. No adjustments of the dates by reason of granting an extension of the Time for Completion will be allowed.

Clause 9 Tests on Completion

Sub-Clause 9.1 Contractor's Obligations

The Specification should describe the tests which the Contractor is to carry out before being entitled to a Taking-Over Certificate. If the Works are to be tested and taken-over in stages, the tests requirements may have to take account of the effect of some parts of the Works being incomplete.

Clause 10 Employer's Taking Over

Sub-Clause 10.1 Taking-Over Certificate

If the Works are to be taken-over in stages, these stages should to be defined as Sections, in the Appendix to Tender. Precise geographical definitions are advisable, and the Appendix should include a table, so as to define the Time for Completion and delay damages: the table is shown in the example Appendix.

Clause 11 Defects Liability

Sub-Clause 11.10 Unfulfilled Obligations

It may be necessary to review this Sub-Clause for the period of liability imposed by the applicable law.

Clause 12 Measurement and Evaluation

Sub-Clause 12.1 Works to be Measured

If any part of the Permanent Works is to be measured according to records of its construction, details should be specified in the tender documents, including any records for which the Contractor is to be responsible.

Clause 13 Variations and Adjustments

Variations can be initiated by any of three ways:

- (a) the Engineer may instruct the variation under Sub-Clause 13.1, without prior agreement as to feasibility or price;

- (b) the Contractor may initiate his own proposals under Sub-Clause 13.2, which are intended to benefit both Parties; or
- (c) the Engineer may request a proposal under Sub-Clause 13.3, seeking prior agreement so as to minimise dispute.

Sub-Clause 13.8 Adjustments for Changes in Cost

These provisions for adjustments may be required if it would be unreasonable for the Contractor to bear the risk of escalating costs due to inflation. Unless this Sub-Clause is not to apply, the Appendix to Tender should include a table for each of the currencies of payment: the appropriate table is shown in the example Appendix. Particular care should be taken in the calculation of the weightings/coefficients ("a", "b", "c", ..., the total of which must not exceed unity) and in the selection and verification of cost indices. Expert advice may be appropriate.

Clause 14 Contract Price and Payment

Sub-Clause 14.1 The Contract Price

When writing the Particular Conditions, consideration should be given to the amount and timing of payment(s) to the Contractor. A positive cash flow is clearly of benefit to the Contractor, and tenderers will take account of the interim payment procedures when preparing their tenders.

Additional Sub-Clauses may be required to cover any exceptions to the options set out in Sub-Clause 14.1, and any other matters relating to payment.

Cost-plus contracts, under which the actual Costs are determined and paid, are unusual and only used when (for reasons of urgency or otherwise) the Employer is willing to accept the risks involved. If the Contractor is to be paid actual Costs, Clause 12 should be replaced by provisions describing the method of determining the Costs and Contract Price. As a result, the provisions in the General Conditions which entitle the Contractor to payment of additional Costs will generally be of no effect.

Sub-Clause 14.1(a) would not apply if payment is to be made on a lump sum basis.

Lump sum contracts may be suitable if the tender documents include details which are sufficiently complete for construction and for Variations to be unlikely. From the information supplied in the tender documents, the Contractor can prepare any other details necessary, and construct the Works, without having to refer back to the Engineer for clarification or further information.

Further design by the Contractor (under sub-paragraphs (a) to (d) of Sub-Clause 4.1) is not precluded. However, these Conditions would be inappropriate if significant design input by the Contractor is required. In those cases, FIDIC's other forms may be more appropriate: see FIDIC's Conditions of Contract for Plant and Design-Build or Conditions of Contract for EPC/Turnkey Projects.

For a lump sum contract, the tender documents should include a schedule of payments (see Sub-Clause 14.4), and any drawings required for construction may be specified as being Contractor's Documents. The Specification should describe the procedures under which the Contractor submits these Documents for the Engineer to approve.

EXAMPLE PROVISIONS FOR A LUMP SUM CONTRACT

Delete Clause 12.
Delete the last sentence of Sub-Clause 13.3 and substitute:

Upon instructing or approving a Variation, the Engineer shall proceed in accordance with Sub-Clause 3.5 to agree or determine adjustments to the Contract Price and to the schedule of payments under Sub-Clause 14.4. These adjustments shall include reasonable profit, and shall take account of the Contractor's submissions under Sub-Clause 13.2 if applicable.

Delete sub-paragraph (a) of Sub-Clause 14.1 and substitute:

- (a) the Contract Price shall be the lump sum Accepted Contract Amount and be subject to adjustments in accordance with the Contract;

If Sub-Clause 14.1(b) is not to apply, additional Sub-Clause(s) should be added.

EXAMPLE SUB-CLAUSE ON EXEMPTION FROM DUTIES

All Goods imported by the Contractor into the Country shall be exempt from customs and other import duties, if the Employer's prior written approval is obtained for import. The Employer shall endorse the necessary exemption documents prepared by the Contractor for presentation in order to clear the Goods through Customs, and shall also provide the following exemption documents:

(describe the necessary documents, which the Contractor will be unable to prepare)

If exemption is not then granted, the customs duties payable and paid shall be reimbursed by the Employer.

All imported Goods, which are not incorporated in or expended in connection with the Works, shall be exported on completion of the Contract. If not exported, the Goods will be assessed for duties as applicable to the Goods involved in accordance with the Laws of the Country.

However, exemption may not available for:

- (a) Goods which are similar to those locally produced, unless they are not available in sufficient quantities or are of a different standard to that which is necessary for the Works; and
- (b) any element of duty or tax inherent in the price of goods or services procured in the Country, which shall be deemed to be included in the Accepted Contract Amount.

Port dues, quay dues and, except as set out above, any element of tax or duty inherent in the price of goods or services shall be deemed to be included in the Accepted Contract Amount.

EXAMPLE SUB-CLAUSE ON EXEMPTION FROM TAXES

Expatriate (foreign) personnel shall not be liable for income tax levied in the Country on earnings paid in any foreign currency, or for income tax levied on subsistence, rentals and similar services directly furnished by the Contractor to Contractor's Personnel, or for allowances in lieu. If any

Contractor's Personnel have part of their earnings paid in the Country in a foreign currency, they may export (after the conclusion of their term of service on the Works) any balance remaining of their earnings paid in foreign currencies.

The Employer shall seek exemption for the purposes of this Sub-Clause. If it is not granted, the relevant taxes paid shall be reimbursed by the Employer.

Sub-Clause 14.2 Advance Payment

When writing the Particular Conditions, consideration should be given to the benefits of advance payment(s). Unless this Sub-Clause is not to apply, the total advance payment (and the number of instalments if more than one) must be specified in the Appendix to Tender. The rate of deduction for the repayments should be checked to ensure that repayment is achieved before completion. The typical figures in sub-paragraphs (a) and (b) of the General Conditions Sub-Clause are based on the assumption that the total advance payment is less than 22% of the Accepted Contract Amount.

The acceptable form(s) of guarantee should be included in the tender documents, annexed to the Particular Conditions: an example form is annexed to this document, as Annex E.

Sub-Clause 14.7 Payment

If a different period for payment is to apply, the Sub-Clause may be amended:

EXAMPLE In sub-paragraph (b) of Sub-Clause 14.7, delete "56" and substitute "42"

If the country/countries of payment need to be specified, details may be included in a Schedule.

Sub-Clause 14.8 Delayed Payment

If the discount rate of the central bank in the country of the currency of payment is not a reasonable basis for assessing the Contractor's financing costs, a new rate may have to be defined. Alternatively, the actual financing Costs could be paid, taking account of local financing arrangements.

Sub-Clause 14.9 Payment of Retention Money

If part of the Retention Money is to be released and substituted by an appropriate guarantee, an additional Sub-Clause may be added. The acceptable form(s) of guarantee should be included in the tender documents, annexed to the Particular Conditions: an example form is annexed to this document, as Annex F.

EXAMPLE SUB-CLAUSE FOR RELEASE OF RETENTION

When the Retention Money has reached three-fifths (60%) of the limit of Retention Money stated in the Appendix to Tender, the Engineer shall certify and the Employer shall make payment of half (50%) of the limit of Retention Money to the Contractor if he obtains a guarantee, in a form and provided by an entity approved by the Employer, in amounts and currencies equal to the payment.

The Contractor shall ensure that the guarantee is valid and

enforceable until the Contractor has executed and completed the Works and remedied any defects, as specified for the Performance Security in Sub-Clause 4.2, and shall be returned to the Contractor accordingly. This release of retention shall be in lieu of the release of the second half of the Retention Money under the second paragraph of Sub-Clause 14.9.

Sub-Clause 14.15 Currencies of Payment

If all payments are to be made in Local Currency, it must be named in the Letter of Tender, and only the first sentence of this Sub-Clause will apply. Alternatively, the Sub-Clause may then be replaced:

EXAMPLE SUB-CLAUSE FOR A SINGLE CURRENCY CONTRACT

The currency of account shall be the Local Currency and all payments made in accordance with the Contract shall be in Local Currency. The Local Currency payments shall be fully convertible, except those for local costs. The percentage attributed to local costs shall be as stated in the Appendix to Tender.

Financing Arrangements

For major contracts in some markets, there may be a need to secure finance from entities such as aid agencies, development banks, export credit agencies, or other international financing institutions. If financing is to be procured from any of these sources, the Particular Conditions may need to incorporate its special requirements. The exact wording will depend on the relevant institution, so reference will need to be made to them to ascertain their requirements, and to seek approval of the draft tender documents.

These requirements may include tendering procedures which need to be adopted in order to render the eventual contract eligible for financing, and/or special Sub-Clauses which may need to be incorporated into the Particular Conditions. The following examples indicate some of the topics which the institution's requirements may cover:

- (a) prohibition from discrimination against the shipping companies of any one country;
- (b) ensuring that the Contract is subject to a widely-accepted neutral law;
- (c) provision for arbitration under recognised international rules and at a neutral location;
- (d) giving the Contractor the right to suspend/terminate in the event of default under the financing arrangements;
- (e) restricting the right to reject Plant;
- (f) specifying the payments due in the event of termination;
- (g) specifying that the Contract does not become effective until certain conditions precedent have been satisfied, including pre-disbursement conditions for the financing arrangements; and
- (h) obliging the Employer to make payments from his own resources if, for any reason, the funds under the financing arrangements are insufficient to meet the payments due to the Contractor, whether due to a default under the financing arrangements or otherwise.

In addition, the financing institution or bank may wish the Contract to include references to the financing arrangements, especially if funding from more than one source is to be arranged to

finance different elements of supply. It is not unusual for the Particular Conditions to include special provisions identifying different categories of Plant and specifying the documents to be presented to the relevant financing institution to obtain payment. If the financing institution's requirements are not met, it may be difficult (or even impossible) to secure suitable financing for the project, and/or the institution may decline to provide finance for part or all of the Contract.

However, where the financing is not tied to the export of goods and services from any particular country but is simply provided by commercial banks lending to the Employer, those banks may be concerned to ensure that the Contractor's rights are very restricted. These banks may wish the Contract to exclude any reference to the financing arrangements, and/or to restrict the Contractor's rights under Clause 16.

FORM OF SUB-CLAUSE WHICH A FINANCING INSTITUTION MAY REQUIRE

The Accepted Contract Amount is made up as follows:

(breakdown into items and/or into supply/delivery/etc)

and shall be payable by the Employer to the Contractor as set out below.

- (a) _____ % of the Accepted Contract Amount shall be payable by a direct payment from the Employer to the Contractor within 28 days of receipt by the Employer of the following documents:
- (i) commercial invoice addressed to the Employer specifying the amount of the payment now due,
 - (ii) advance payment security guarantee issued by _____ Bank in the form annexed,
 - (iii) performance security guarantee issued by _____ Bank in the form annexed, and
 - (iv) Interim Payment Certificate confirming the payment due and specifying the amount.
- (b) _____ % of the contract price for the supply of Plant shall be payable as follows:
- (i) _____ % of the estimated contract value of the Plant supplied, by direct payment from the Employer to the Contractor on shipment of each item, against the following documents:
 - (original) commercial invoice,
 - (original) shipping documents,
 - (original) certificate of origin,
 - (original) insurance certificate, and
 - (original) Interim Payment Certificate confirming the payment due and specifying the amount.
 - (ii) _____ % of the estimated contract value of the Plant supplied, by disbursement from the Loan Agreement to the Contractor on shipment of each item, on presentation of a Qualifying Certificate in the form annexed and copies of the documents listed in sub-paragraph (b)(i) above.
- (c) the balance of the Contract Price shall be payable as follows:
- (i) _____ % of the estimated contract value of the services

rendered, by direct payment from the Employer to the Contractor on execution of the relevant service, against the following documents:

- (original) commercial invoice, and
- (original) Interim Payment Certificate confirming the payment due and specifying the amount.

(ii) _____ % of the estimated contract value of the services rendered, by disbursement from the Loan Agreement to the Contractor, on presentation of a Qualifying Certificate in the form annexed and copies of the documents listed in sub-paragraph (c)(i) above.

(d) The direct payments by the Employer specified in sub-paragraph (b) shall be made by an irrevocable letter of credit established by the Employer in favour of the Contractor and confirmed by a bank acceptable to the Contractor.

The above arrangements (involving financing institution(s), Employer and Contractor) may be initiated by the Employer; or by the Contractor, before submitting the Tender. Alternatively, the Contractor may be prepared to initiate financing arrangements and retain responsibility for them, although he would probably be unable or unwilling to provide finance from his own resources. His financing bank's requirements would then affect his attitude in contract negotiations. They might well require the Employer to make interim payments, although a large proportion of the Contract Price might be withheld until the Works are complete.

This payment arrangement can be achieved either by a high Percentage of Retention; or by a suitably completed schedule of payments (see Sub-Clause 14.4), with the Instructions to Tenderers specifying the criteria with which the Tenderer should comply. Since the Contractor would then have to arrange his own financing to cover the shortfall between the payments and his outgoings, he (and his financing bank) would probably require some form of security, guaranteeing payment when due.

It may be appropriate for the Employer, when preparing the tender documents, to anticipate the latter requirement by undertaking to provide a guarantee for the element of payment which the Contractor is to receive when the Works are complete. The acceptable form(s) of guarantee should be included in the tender documents, annexed to the Particular Conditions: an example form is annexed to this document, as Annex G. The following Sub-Clause may be added.

EXAMPLE PROVISIONS FOR CONTRACTOR FINANCE

The Employer shall obtain (at his cost) a payment guarantee in the amount and currencies, and provided by an entity, as stated in the Appendix to Tender. The Employer shall deliver the guarantee to the Contractor within 28 days after both Parties have entered into the Contract Agreement. The guarantee shall be in the form annexed to these Particular Conditions, or in another form acceptable to the Contractor. Unless and until the Contractor receives the guarantee, the Engineer shall not give the notice under Sub-Clause 8.1.

The guarantee shall be returned to the Employer at the earliest of the following dates:

- (a) when the Contractor has been paid the Accepted Contract Amount;
- (b) when obligations under the guarantee expire or have been discharged; or

(c) when the Employer has performed all obligations under the Contract.

Clause 15 Termination by Employer

Sub-Clause 15.2 Termination by Employer

Before inviting tenders, the Employer should verify that the wording of this Sub-Clause, and each anticipated ground for termination, is consistent with the law governing the Contract.

Sub-Clause 15.5 Employer's Entitlement to Termination

Unless inconsistent with the requirements of the Employer and/or financing institutions, a further sentence may be added.

EXAMPLE

Insert at the end of Sub-Clause 15.5:

The Employer shall also pay to the Contractor the amount of any other loss or damage resulting from this termination.

Clause 16 Suspension and Termination by Contractor

Sub-Clause 16.2 Termination by Contractor

Before inviting tenders, the Employer should verify that the wording of this Sub-Clause is consistent with the law governing the Contract. The Contractor should verify that each anticipated ground for termination is consistent with such law.

Clause 17 Risk and Responsibility

Sub-Clause 17.6 Limitation of Liability

EXAMPLE

In Sub-Clause 17.6, the sum referred to in the penultimate sentence shall be _____

Additional Sub-Clause Use of Employer's Accommodation/Facilities

If the Contractor is to occupy the Employer's facilities temporarily, an additional sub-clause may be added:

EXAMPLE SUB-CLAUSE

The Contractor shall take full responsibility for the care of the items detailed below, from the respective dates of use or occupation by the Contractor, up to the respective dates of hand-over or cessation of occupation (where hand-over or cessation of occupation may take place after the date stated in the Taking-Over Certificate for the Works):

(insert details)

If any loss or damage happens to any of the above items while the Contractor is responsible for their care, arising from any cause whatsoever other than those for which the Employer is liable, the Contractor shall, at his own cost, rectify the loss or damage to the

Clause 18 Insurance

The wording in the General Conditions describes the insurances which are to be arranged by the "insuring Party", who is to be the Contractor unless otherwise stated in the Particular Conditions. Insurances so provided by the Contractor are to be consistent with the general terms agreed with the Employer. The Instructions to Tenderers may therefore require tenderers to provide details of the proposed terms.

If the Employer is to arrange any of the insurances under this Clause, the tender documents should include details as an annex to the Particular Conditions (so that tenderers can estimate what other insurances they wish to have for their own protection), including the conditions, limits, exceptions and deductibles; preferably in the form of a copy of each policy. The Employer may find it difficult to effect the insurances described in the third paragraph of Sub-Clause 18.2 (for Contractor's Equipment, which includes Subcontractor's equipment), because the Employer may not know the amount or value of these items of equipment. The following sentence may be included in the Particular Conditions:

EXAMPLE	Delete the final paragraph of Sub-Clause 18.2 and substitute: However, the insurances described in the first two paragraphs of Sub-Clause 18.2 shall be effected and maintained by the Employer as insuring Party, and not by the Contractor.
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Clause 19 Force Majeure

Before inviting tenders, the Employer should verify that the wording of this Clause is compatible with the law governing the Contract.

Clause 20 Claims, Disputes and Arbitration

Sub-Clause 20.2 Appointment of the Dispute Adjudication Board

Unless the Engineer (although appointed by the Employer) is to make the pre-arbitral decisions under this Clause 20, in accordance with the alternative option described below, the Contract should include the provisions under Clause 20 which, whilst not discouraging the Parties from reaching agreement on disputes as the works proceed, allow them to refer contentious matters to an impartial dispute adjudication board ("DAB").

The adjudication procedure depends for its success on, amongst other things, the Parties' confidence in the agreed individual(s) who will serve on the DAB. Therefore, it is essential that candidates for this position are not imposed by either Party on the other Party; and that, if the individual is selected under Sub-Clause 20.3, the selection is made by a wholly impartial entity. FIDIC is prepared to perform this role, if this authority has been delegated in accordance with the example wording in the Appendix to Tender.

It is preferable, but not essential, for the individual(s) to be agreed before the Letter of Acceptance is issued, and for the DAB to visit the Site on a regular basis. Under the example text in the Appendix to Tender, the Parties may either so agree before the Letter of Acceptance is issued or agree the appointment within the specified period thereafter. Alternatively, the Parties may prefer to defer the appointment until a dispute has arisen, in which case Sub-Clause 20.2 plus the Appendix - General Conditions of Dispute Adjudication Agreement with its Annex (Procedural Rules) and the Dispute Adjudication Agreement should be amended to comply with the wording

contained in the corresponding sections of FIDIC's Conditions of Contract for Plant and Design - Build.

Sub-Clause 20.2 provides for two alternative arrangements for the DAB:

- (a) one person, who acts as the sole member of the DAB, having entered into a tripartite agreement with both Parties; or
- (b) a DAB of three persons, each of whom has entered into a tripartite agreement with both Parties.

The form of this tripartite agreement could be one of the two alternatives shown at the end of this publication, as appropriate to the arrangement adopted. Both of these forms incorporate (by reference) the General Conditions of Dispute Adjudication Agreement, which are included as the Appendix to the General Conditions because they are also referred to in Sub-Clause 20.2. Under either of these alternative forms of Dispute Adjudication Agreement, each individual person is referred to as a Member.

At an early stage, consideration should be given as to whether a one-person or three-person DAB is preferable for a particular project, taking account of its size, duration and the fields of expertise which will be involved. For some projects, it may be considered appropriate to appoint a one-person DAB for each major field of expertise relevant to the Works; however, this may give rise to problems if, when a dispute arises, the Parties cannot agree which field is applicable and, therefore, to whom the dispute should be referred.

For a one-person DAB to be mutually agreed, the Employer (or the tenderer) could propose the names and curriculum vitae of suitable persons, for the tenderer (or the Employer) to accept. It may be advisable to propose alternates in case some subsequently decline the appointment, assuming that they have not previously indicated their willingness to accept. Each Party may be reluctant to choose names from a list of people who have already been contacted by the other Party.

For a three-person DAB, the Employer and the tenderer may each propose one member, similar to the above procedure, for the tenderer and the Employer respectively to accept. For the chairman, the Employer (or the tenderer) could similarly propose suitable persons for the tenderer (or the Employer) to accept. It may be appropriate for the chairman's retainer fee to be more than that of the other two members, reflecting the additional administrative tasks which a chairman will have to perform.

The appointment of the DAB may be facilitated, especially if the members are not to be appointed at the commencement of the Contract, by including an agreed list of potential members in the Contract: in a Schedule.

Alternatively, the Engineer may make these pre-arbitral decisions. This alternative, which has been the Engineer's traditional role in common law countries, may be appropriate if the Engineer is an independent professional consulting engineer with the experience and resources required for the administration of all aspects of the contract. The Employer should recognise that, although the Engineer generally acts for the Employer as specified in Sub-Clause 3.1(a), the Engineer will make these pre-arbitral decisions impartially and the Employer must not prejudice this impartiality. If this alternative is considered appropriate, the Sub-Clause may be varied:

EXAMPLE SUB-CLAUSE FOR PRE-ARBITRAL DECISIONS BY THE ENGINEER

Delete Sub-Clauses 20.2 and 20.3.

Delete the second paragraph of Sub-Clause 20.4 and substitute:

The Engineer shall act as the DAB in accordance with this Sub-Clause 20.4, acting fairly, impartially and at the cost of the Employer. In the event that the Employer intends to replace the Engineer, the Employer's notice under Sub-Clause 3.4 shall include detailed proposals for the

appointment of a replacement DAB.

Sub-Clause 20.5 Amicable Settlement

The provisions of this Sub-Clause are intended to encourage the parties to settle a dispute amicably, without the need for arbitration: for example, by direct negotiation, conciliation, mediation, or other forms of alternative dispute resolution. Amicable settlement procedures often depend, for their success, on confidentiality and on both Parties' acceptance of the procedure. Therefore, neither Party should seek to impose the procedure on the other Party.

Sub-Clause 20.6 Arbitration

The Contract should include provisions for the resolution by international arbitration of any disputes which are not resolved amicably. In international contracts, international commercial arbitration has numerous advantages over litigation in national courts, and may be more acceptable to the Parties.

Careful consideration should be given to ensuring that the international arbitration rules chosen are compatible with the provisions of Clause 20 and with the other elements to be set out in the Appendix to Tender. The Rules of Arbitration of the International Chamber of Commerce (the "ICC", which is based at 38 Cours Albert 1^{er}, 75008 Paris, France) are frequently included in international contracts. In the absence of specific stipulations as to the number of arbitrators and the place of arbitration, the International Court of Arbitration of the ICC will decide on the number of arbitrators (typically three in any substantial construction dispute) and on the place of arbitration.

If the UNCITRAL (or other non-ICC) arbitration rules are preferred, it may be necessary to designate, in the Appendix to Tender, an institution to appoint the arbitrators or to administer the arbitration, unless the institution is named (and their role specified) in the arbitration rules. It may also be necessary to ensure, before so designating an institution in the Appendix to Tender, that it is prepared to appoint or administer.

For major projects tendered internationally, it is desirable that the place of arbitration be situated in a country other than that of the Employer or Contractor. This country should have a modern and liberal arbitration law and should have ratified a bilateral or multilateral convention (such as the 1958 New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards), or both, that would facilitate the enforcement of an arbitral award in the states of the Parties.

It may be considered desirable in some cases for other Parties to be joined into any arbitration between the Parties, thereby creating a multi-party arbitration. While this may be feasible, multi-party arbitration clauses require skilful drafting, and usually need to be prepared on a case-by-case basis. No satisfactory standard form of multi-party arbitration clause for international use has yet been developed.

Annexes FORMS OF SECURITIES

Acceptable form(s) of security should be included in the tender documents: for Annex A and/or B, in the Instructions to Tenderers; and for Annexes C to G, annexed to the Particular Conditions. The following example forms, which (except for Annex A) incorporate Uniform Rules published by the International Chamber of Commerce (the "ICC", which is based at 38 Cours Albert 1er, 75008 Paris, France), may have to be amended to comply with the applicable law. Although the ICC publishes guides to these Uniform Rules, legal advice should be taken before the securities are written. Note that the guaranteed amounts should be quoted in all the currencies, as specified in the Contract, in which the guarantor pays the beneficiary.

Annex A EXAMPLE FORM OF PARENT COMPANY GUARANTEE

[See page 3, and the comments on Sub-Clause 1.14]

Brief description of Contract _____

Name and address of Employer _____

_____ (together with successors and assigns).

We have been informed that _____ (hereinafter called the "Contractor") is submitting an offer for such Contract in response to your invitation, and that the conditions of your invitation require his offer to be supported by a parent company guarantee.

In consideration of you, the Employer, awarding the Contract to the Contractor, we (*name of parent company*) _____ irrevocably and unconditionally guarantee to you, as a primary obligation, the due performance of all the Contractor's obligations and liabilities under the Contract, including the Contractor's compliance with all its terms and conditions according to their true intent and meaning.

If the Contractor fails to so perform his obligations and liabilities and comply with the Contract, we will indemnify the Employer against and from all damages, losses and expenses (including legal fees and expenses) which arise from any such failure for which the Contractor is liable to the Employer under the Contract.

This guarantee shall come into full force and effect when the Contract comes into full force and effect. If the Contract does not come into full force and effect within a year of the date of this guarantee, or if you demonstrate that you do not intend to enter into the Contract with the Contractor, this guarantee shall be void and ineffective. This guarantee shall continue in full force and effect until all the Contractor's obligations and liabilities under the Contract have been discharged, when this guarantee shall expire and shall be returned to us, and our liability hereunder shall be discharged absolutely.

This guarantee shall apply and be supplemental to the Contract as amended or varied by the Employer and the Contractor from time to time. We hereby authorise them to agree any such amendment or variation, the due performance of which and compliance with which by the Contractor are likewise guaranteed hereunder. Our obligations and liabilities under this guarantee shall not be discharged by any allowance of time or other indulgence whatsoever by the Employer to the Contractor, or by any variation or suspension of the works to be executed under the Contract, or by any amendments to the Contract or to the constitution of the Contractor or the Employer, or by any other matters, whether with or without our knowledge or consent.

This guarantee shall be governed by the law of the same country (or other jurisdiction) as that which governs the Contract and any dispute under this guarantee shall be finally settled under the Rules of Arbitration of the International Chamber of Commerce by one or more arbitrators appointed in accordance with such Rules. We confirm that the benefit of this guarantee may be assigned subject only to the provisions for assignment of the Contract.

Date _____ Signature(s) _____

Annex B EXAMPLE FORM OF TENDER SECURITY

[See page 4]

Brief description of Contract _____

Name and address of Beneficiary _____

_____ (whom the tender documents define as the Employer).

We have been informed that _____ (hereinafter called the "Principal") is submitting an offer for such Contract in response to your invitation, and that the conditions of your invitation (the "conditions of invitation", which are set out in a document entitled Instructions to Tenderers) require his offer to be supported by a tender security.

At the request of the Principal, we (*name of bank*) _____ hereby irrevocably undertake to pay you, the Beneficiary/Employer, any sum or sums not exceeding in total the amount of _____ (say: _____) upon receipt by us of your demand in writing and your written statement (in the demand) stating that:

- (a) the Principal has, without your agreement, withdrawn his offer after the latest time specified for its submission and before the expiry of its period of validity, or
- (b) the Principal has refused to accept the correction of errors in his offer in accordance with such conditions of invitation, or
- (c) you awarded the Contract to the Principal and he has failed to comply with sub-clause 1.6 of the conditions of the Contract, or
- (d) you awarded the Contract to the Principal and he has failed to comply with sub-clause 4.2 of the conditions of the Contract.

Any demand for payment must contain your signature(s) which must be authenticated by your bankers or by a notary public. The authenticated demand and statement must be received by us at this office on or before (*the date 35 days after the expiry of the validity of the Letter of Tender*) _____, when this guarantee shall expire and shall be returned to us.

This guarantee is subject to the Uniform Rules for Demand Guarantees, published as number 458 by the International Chamber of Commerce, except as stated above.

Date _____ Signature(s) _____

Annex C: EXAMPLE FORM OF PERFORMANCE SECURITY - DEMAND GUARANTEE

[See comments on Sub-Clause 4.2]

Brief description of Contract _____

Name and address of Beneficiary _____

_____ (whom the Contract defines as the Employer).

We have been informed that _____ (hereinafter called the "Principal") is your contractor under such Contract, which requires him to obtain a performance security.

At the request of the Principal, we (*name of bank*) _____ hereby irrevocably undertake to pay you, the Beneficiary/Employer, any sum or sums not exceeding in total the amount of _____ (the "guaranteed amount", say: _____) upon receipt by us of your demand in writing and your written statement stating:

- (a) that the Principal is in breach of his obligation(s) under the Contract, and
- (b) the respect in which the Principal is in breach.

[Following the receipt by us of an authenticated copy of the taking-over certificate for the whole of the works under clause 10 of the conditions of the Contract, such guaranteed amount shall be reduced by ____ % and we shall promptly notify you that we have received such certificate and have reduced the guaranteed amount accordingly.] ⁽¹⁾

Any demand for payment must contain your [minister's/directors'] ⁽¹⁾ signature(s) which must be authenticated by your bankers or by a notary public. The authenticated demand and statement must be received by us at this office on or before (*the date 70 days after the expected expiry of the Defects Notification Period for the Works*) _____ (the "expiry date"), when this guarantee shall expire and shall be returned to us.

We have been informed that the Beneficiary may require the Principal to extend this guarantee if the performance certificate under the Contract has not been issued by the date 28 days prior to such expiry date. We undertake to pay you such guaranteed amount upon receipt by us, within such period of 28 days, of your demand in writing and your written statement that the performance certificate has not been issued, for reasons attributable to the Principal, and that this guarantee has not been extended.

This guarantee shall be governed by the laws of _____ and shall be subject to the Uniform Rules for Demand Guarantees, published as number 458 by the International Chamber of Commerce, except as stated above.

Date _____ Signature(s) _____

⁽¹⁾ When writing the tender documents, the writer should ascertain whether to include the optional text, shown in parentheses []

Annex D EXAMPLE FORM OF PERFORMANCE SECURITY - SURETY BOND

[See comments on Sub-Clause 4.2]

Brief description of Contract _____

Name and address of Beneficiary _____

_____ (together with successors and assigns, all as defined in the Contract as the Employer).

By this Bond, (*name and address of contractor*) _____
(who is the contractor under such Contract) as Principal and (*name and address of guarantor*)
_____ as Guarantor are irrevocably held and firmly bound
to the Beneficiary in the total amount of _____ (the "Bond Amount", say:
_____) for the due performance of all such Principal's obligations and liabilities
under the Contract. [Such Bond Amount shall be reduced by _____ % upon the issue of the taking-
over certificate for the whole of the works under clause 10 of the conditions of the Contract.](¹)

This Bond shall become effective on the Commencement Date defined in the Contract.

Upon Default by the Principal to perform any Contractual Obligation, or upon the occurrence of any of the events and circumstances listed in sub-clause 15.2 of the conditions of the Contract, the Guarantor shall satisfy and discharge the damages sustained by the Beneficiary due to such Default, event or circumstances.⁽²⁾ However, the total liability of the Guarantor shall not exceed the Bond Amount.

The obligations and liabilities of the Guarantor shall not be discharged by any allowance of time or other indulgence whatsoever by the Beneficiary to the Principal, or by any variation or suspension of the works to be executed under the Contract, or by any amendments to the Contract or to the constitution of the Principal or the Beneficiary, or by any other matters, whether with or without the knowledge or consent of the Guarantor.

Any claim under this Bond must be received by the Guarantor on or before (*the date six months after the expected expiry of the Defects Notification Period for the Works*) _____ (the "Expiry Date"), when this Bond shall expire and shall be returned to the Guarantor.

The benefit of this Bond may be assigned subject to the provisions for assignment of the Contract, and subject to the receipt by the Guarantor of evidence of full compliance with such provisions.

This Bond shall be governed by the law of the same country (or other jurisdiction) as that which governs the Contract. This Bond incorporates and shall be subject to the Uniform Rules for Contract Bonds, published as number 524 by the International Chamber of Commerce, and words used in this Bond shall bear the meanings set out in such Rules.

Wherefore this Bond has been issued by the Principal and the Guarantor on (*date*) _____

Signature(s) for and on behalf of the Principal _____

Signature(s) for and on behalf of the Guarantor _____

⁽¹⁾ *When writing the tender documents, the writer should ascertain whether to include the optional text, shown in parentheses []*

⁽²⁾ *Insert:* [and shall not be entitled to perform the Principal's obligations under the Contract.]
Or: [or at the option of the Guarantor (to be exercised in writing within 42 days of receiving the claim specifying such Default) perform the Principal's obligations under the Contract.]

Annex E EXAMPLE FORM OF ADVANCE PAYMENT GUARANTEE

[See comments on Sub-Clause 14.2]

Brief description of Contract _____

Name and address of Beneficiary _____

_____ (whom the Contract defines as the Employer).

We have been informed that _____ (hereinafter called the "Principal") is your contractor under such Contract and wishes to receive an advance payment, for which the Contract requires him to obtain a guarantee.

At the request of the Principal, we (*name of bank*) _____ hereby irrevocably undertake to pay you, the Beneficiary/Employer, any sum or sums not exceeding in total the amount of _____ (the "guaranteed amount", say: _____) upon receipt by us of your demand in writing and your written statement stating:

- (a) that the Principal has failed to repay the advance payment in accordance with the conditions of the Contract, and
- (b) the amount which the Principal has failed to repay.

This guarantee shall become effective upon receipt [of the first instalment] of the advance payment by the Principal. Such guaranteed amount shall be reduced by the amounts of the advance payment repaid to you, as evidenced by your notices issued under sub-clause 14.6 of the conditions of the Contract. Following receipt (from the Principal) of a copy of each purported notice, we shall promptly notify you of the revised guaranteed amount accordingly.

Any demand for payment must contain your signature(s) which must be authenticated by your bankers or by a notary public. The authenticated demand and statement must be received by us at this office on or before (*the date 70 days after the expected expiry of the Time for Completion*) _____ (the "expiry date"), when this guarantee shall expire and shall be returned to us.

We have been informed that the Beneficiary may require the Principal to extend this guarantee if the advance payment has not been repaid by the date 28 days prior to such expiry date. We undertake to pay you such guaranteed amount upon receipt by us, within such period of 28 days, of your demand in writing and your written statement that the advance payment has not been repaid and that this guarantee has not been extended.

This guarantee shall be governed by the laws of _____ and shall be subject to the Uniform Rules for Demand Guarantees, published as number 458 by the International Chamber of Commerce, except as stated above.

Date _____ Signature(s) _____

Annex F EXAMPLE FORM OF RETENTION MONEY GUARANTEE

[See comments on Sub-Clause 14.9]

Brief description of Contract _____

Name and address of Beneficiary _____

_____ (whom the Contract defines as the Employer).

We have been informed that _____ (hereinafter called the "Principal") is your contractor under such Contract and wishes to receive early payment of [part of] the retention money, for which the Contract requires him to obtain a guarantee.

At the request of the Principal, we (*name of bank*) _____ hereby irrevocably undertake to pay you, the Beneficiary/Employer, any sum or sums not exceeding in total the amount of _____ (the "guaranteed amount", say: _____) upon receipt by us of your demand in writing and your written statement stating:

- (a) that the Principal has failed to carry out his obligation(s) to rectify certain defect(s) for which he is responsible under the Contract, and
- (b) the nature of such defect(s).

At any time, our liability under this guarantee shall not exceed the total amount of retention money released to the Principal by you, as evidenced by your notices issued under sub-clause 14.6 of the conditions of the Contract with a copy being passed to us.

Any demand for payment must contain your signature(s) which must be authenticated by your bankers or by a notary public. The authenticated demand and statement must be received by us at this office on or before (*the date 70 days after the expected expiry of the Defects Notification Period for the Works*) _____ (the "expiry date"), when this guarantee shall expire and shall be returned to us.

We have been informed that the Beneficiary may require the Principal to extend this guarantee if the performance certificate under the Contract has not been issued by the date 28 days prior to such expiry date. We undertake to pay you such guaranteed amount upon receipt by us, within such period of 28 days, of your demand in writing and your written statement that the performance certificate has not been issued, for reasons attributable to the Principal, and that this guarantee has not been extended.

This guarantee shall be governed by the laws of _____ and shall be subject to the Uniform Rules for Demand Guarantees, published as number 458 by the International Chamber of Commerce, except as stated above.

Date _____ Signature(s) _____

Annex G EXAMPLE FORM OF PAYMENT GUARANTEE BY EMPLOYER

[See page 18: Contractor Finance]

Brief description of Contract _____

Name and address of Beneficiary _____

_____ (whom the Contract defines as the Contractor).

We have been informed that _____ (whom the Contract defines as the Employer and who is hereinafter called the "Principal") is required to obtain a bank guarantee.

At the request of the Principal, we (*name of bank*) _____ hereby irrevocably undertake to pay you, the Beneficiary/Contractor, any sum or sums not exceeding in total the amount of _____ (say: _____) upon receipt by us of your demand in writing and your written statement stating:

- (a) that, in respect of a payment due under the Contract, the Principal has failed to make payment in full by the date fourteen days after the expiry of the period specified in the Contract as that within which such payment should have been made, and
- (b) the amount(s) which the Principal has failed to pay.

Any demand for payment must be accompanied by a copy of [*list of documents evidencing entitlement to payment*] _____ , in respect of which the Principal has failed to make payment in full.

Any demand for payment must contain your signature(s) which must be authenticated by your bankers or by a notary public. The authenticated demand and statement must be received by us at this office on or before (*the date six months after the expected expiry of the Defects Notification Period for the Works*) _____ when this guarantee shall expire and shall be returned to us.

This guarantee shall be governed by the laws of _____ and shall be subject to the Uniform Rules for Demand Guarantees, published as number 458 by the International Chamber of Commerce, except as stated above.

Date _____ Signature(s) _____

GENERAL CONDITIONS

GUIDANCE FOR THE
PREPARATION OF
PARTICULAR CONDITIONS

Conditions of Contract
for **CONSTRUCTION**

FOR BUILDING AND ENGINEERING WORKS
DESIGNED BY THE EMPLOYER

FORMS OF LETTER OF
TENDER, CONTRACT
AGREEMENT AND
DISPUTE ADJUDICATION
AGREEMENT

Forms of Letter of Tender, Contract Agreement
and Dispute Adjudication Agreement

FEDERATION INTERNATIONALE DES INGENIEURS-CONSEILS
INTERNATIONAL FEDERATION OF CONSULTING ENGINEERS
INTERNATIONALE VEREINIGUNG BERATENDER INGENIEURE
FEDERACION INTERNACIONAL DE INGENIEROS CONSULTORES



LETTER OF TENDER

NAME OF CONTRACT:

TO:

We have examined the Conditions of Contract, Specification, Drawings, Bill of Quantities, the other Schedules, the attached Appendix and Addenda Nos _____ for the execution of the above-named Works. We offer to execute and complete the Works and remedy any defects therein in conformity with this Tender which includes all these documents, for the sum of (in currencies of payment) _____

_____ or such other sum as may be determined in accordance with the Conditions of Contract.

We accept your suggestions for the appointment of the DAB, as set out in Schedule _____

*[We have completed the Schedule by adding our suggestions for the other Member of the DAB, but these suggestions are not conditions of this offer].**

We agree to abide by this Tender until _____ and it shall remain binding upon us and may be accepted at any time before that date. We acknowledge that the Appendix forms part of this Letter of Tender.

If this offer is accepted, we will provide the specified Performance Security, commence the Works as soon as is reasonably practicable after the Commencement Date, and complete the Works in accordance with the above-named documents within the Time for Completion.

Unless and until a formal Agreement is prepared and executed this Letter of Tender, together with your written acceptance thereof, shall constitute a binding contract between us.

We understand that you are not bound to accept the lowest or any tender you may receive.

Signature _____ in the capacity of _____

duly authorised to sign tenders for and on behalf of _____

Address: _____

Date: _____

* If the Tenderer does not accept, this paragraph may be deleted and replaced by:

We do not accept your suggestions for the appointment of the DAB. We have included our suggestions in the Schedule, but these suggestions are not conditions of this offer. If these suggestions are not acceptable to you, we propose that the DAB be jointly appointed in accordance with Sub-Clause 20.2 of the Conditions of Contract.

APPENDIX TO TENDER

[Note: with the exception of the items for which the Employer's requirements have been inserted, the following information must be completed before the Tender is submitted]

Item	Sub-Clause	Data
Employer's name and address	1.1.2.2 & 1.3	_____ _____ _____
Contractor's name and address	1.1.2.3 & 1.3	_____ _____ _____
Engineer's name and address	1.1.2.4 & 1.3	_____ _____ _____
Time for Completion of the Works	1.1.3.3	____ days
Defects Notification Period	1.1.3.7	365 days
Electronic transmission systems	1.3	_____
Governing Law	1.4	_____
Ruling language	1.4	_____
Language for communications	1.4	_____
Time for access to the Site	2.1	____ days after Commencement Date
Amount of Performance Security	4.2	_____ % of the Accepted Contract Amount, in the currencies and proportions in which the Contract Price is payable
Normal working hours	6.5	_____
Delay damages for the Works	8.7 & 14.15(b)	____ % of the final Contract Price per day, in the currencies and proportions in which the Contract Price is payable
Maximum amount of delay damages	8.7	_____ % of the final Contract Price
<i>If there are Provisional Sums:</i>		
Percentage for adjustment of Provisional Sums	13.5(b)	_____ %

Initials of signatory of Tender _____

If Sub-Clause 13.8 applies:

Adjustments for Changes in Cost;

Table(s) of adjustment data 13.8

Coefficient; scope of index	Country of origin; currency of index	Source of index; Title/definition	Value on stated date(s)*	
			Value	Date
a= 0.10 Fixed				
b= ___ Labour				
c= _____				
d= _____				
e= _____				

* These values and dates confirm the definition of each index, but do not define Base Date indices

Total advance payment	14.2	
Number and timing of instalments	14.2	
Currencies and proportions	14.2	for payments each month/[YEAR] in _____ (currency) ___ % of the Accepted Contract Amount
Start repayment of advance payment	14.2(a)	_____
Repayment amortisation of advance payment	14.2(b)	___ % in _____ ___ % in _____
Percentage of retention	14.3	when payments are _____ % of the Accepted Contract Amount
Limit of Retention Money	14.3	less Provisional Sums _____ %
<i>If Sub-Clause 14.5 applies:</i>		
Plant and Materials for payment when shipped en route to the Site	14.5(b)	_____ % _____ %
Plant and Materials for payment when delivered to the Site	14.5(c)	_____ % of the Accepted Contract Amount
Minimum amount of Interim Payment Certificates	14.6	_____ [list] _____ [list]

If payments are only to be made in a currency/currencies named on the first page of the Letter of Tender:

Currency/currencies of payment 14.15 [list]

Initials of signatory of Tender _____

If some payments are to be made in a currency/currencies not named on the first page of the Letter of Tender:

Currencies of payment 14.15 _____ [list]

Currency Unit	Percentage payable in the Currency	Rate of exchange: number of Local per unit of Foreign
Local: _____ [name]	_____	1.000
Foreign: _____ [name]	_____	_____
_____ [name]	_____	_____

Periods for submission of insurance:

(a) evidence of insurance 18.1 ___ % of the Accepted Contract Amount
 (b) relevant policies 18.1 _____ as named in the Letters of Tender

Maximum amount of deductibles for insurance of the Employer's risks 18.2(d)

Minimum amount of third party insurance 18.3 ___ days
 ___ days

Date by which the DAB shall be appointed 20.2

The DAB shall be 20.2

28 days after the Commencement Date

Appointment (if not agreed) to be made by 20.3 *Either:*
 _____ One sole Member/adjudicator
Or:

If there are Sections:

Definition of Sections:

Description (Sub-Clause 1.1.5.6)	Time for Completion (Sub-Clause 1.1.3.3)	Delay Damages (Sub-Clause 8.7)
_____	_____	_____
_____	_____	_____
_____	_____	_____

[In the above Appendix, the text shown in italics is intended to assist the drafter of a particular contract by providing guidance on which provisions are relevant to the particular contract. This italicised text should not be included in the tender documents, as it will generally appear inappropriate to tenderers.]

Initials of signatory of Tender _____

CONTRACT AGREEMENT

This Agreement made the _____ day of _____ 19 _____

Between _____ of _____ (hereinafter called "the Employer") of the one part
a _____ r _____ t _____ ,
and _____ of _____ (hereinafter called "the Contractor") of the other part

Whereas the Employer desires that the Works known as _____ should be executed by the Contractor, and has accepted a Tender by the Contractor for the execution and completion of these Works and the remedying of any defects therein,

The Employer and the Contractor agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement:
 - (a) The Letter of Acceptance dated _____
 - (b) The Letter of Tender dated _____
 - (c) The Addenda nos _____
 - (d) The Conditions of Contract
 - (e) The Specification
 - (f) The Drawings, and
 - (g) The completed Schedules.
3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein, in conformity with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor, in consideration of the execution and completion of the Works and the remedying of defects therein, the Contract Price at the times and in the manner prescribed by the Contract.

In Witness whereof the parties hereto have caused this Agreement to be executed the day and

SIGNED by: _____ SIGNED by: _____

for and on behalf of the Employer in the presence of _____ for and on behalf of the Contractor in the presence of _____

Witness: _____ Witness: _____
Name: _____ Name: _____
Address: _____ Address: _____
Date: _____ Date: _____

DISPUTE ADJUDICATION AGREEMENT

[for a one-person DAB]

Name and details of Contract _____
Name and address of Employer _____
Name and address of Contractor _____
Name and address of Member _____

Whereas the Employer and the Contractor have entered into the Contract and desire jointly to appoint the Member to act as sole adjudicator who is also called the "DAB".

The Employer, Contractor and Member jointly agree as follows:

1. The conditions of this Dispute Adjudication Agreement comprise the "General Conditions of Dispute Adjudication Agreement", which is appended to the General Conditions of the "Conditions of Contract for Construction" First Edition 1999 published by the Fédération Internationale des Ingénieurs-Conseils (FIDIC), and the following provisions. In these provisions, which include amendments and additions to the General Conditions of Dispute Adjudication Agreement, words and expressions shall have the same meanings as are assigned to them in the General Conditions of Dispute Adjudication Agreement.
2. [*Details of amendments to the General Conditions of Dispute Adjudication Agreement, if any. For example:*

In the procedural rules annexed to the General Conditions of Dispute Adjudication Agreement, Rule _ is deleted and replaced by: " ... "]
3. In accordance with Clause 6 of the General Conditions of Dispute Adjudication Agreement, the Member shall be paid as follows:

A retainer fee of _____ per calendar month,
plus a daily fee of _____ per day.
4. In consideration of these fees and other payments to be made by the Employer and the Contractor in accordance with Clause 6 of the General Conditions of Dispute Adjudication Agreement, the Member undertakes to act as the DAB (as adjudicator) in accordance with this Dispute Adjudication Agreement.
5. The Employer and the Contractor jointly and severally undertake to pay the Member, in consideration of the carrying out of these services, in accordance with Clause 6 of the General Conditions of Dispute Adjudication Agreement.
6. This Dispute Adjudication Agreement shall be governed by the law of _____

SIGNED by: _____ SIGNED by: _____ SIGNED by: _____

for and on behalf of the Employer for and on behalf of the Contractor The Member in the presence of
in the presence of in the presence of

Witness: _____ Witness: _____ Witness _____
Name: _____ Name: _____ Name: _____
Address: _____ Address: _____ Address: _____
Date: _____ Date: _____ Date: _____

DISPUTE ADJUDICATION AGREEMENT

[for each member of a three-person DAB]

Name and details of Contract _____
Name and address of Employer _____
Name and address of Contractor _____
Name and address of Member _____

Whereas the Employer and the Contractor have entered into the Contract and desire jointly to appoint the Member to act as one of the three persons who are jointly called the "DAB" [*and desire the Member to act as chairman of the DAB*].

The Employer, Contractor and Member jointly agree as follows:

1. The conditions of this Dispute Adjudication Agreement comprise the "General Conditions of Dispute Adjudication Agreement", which is appended to the General Conditions of the "Conditions of Contract for Construction" First Edition 1999 published by the Fédération Internationale des Ingénieurs-Conseils (FIDIC), and the following provisions. In these provisions, which include amendments and additions to the General Conditions of Dispute Adjudication Agreement, words and expressions shall have the same meanings as are assigned to them in the General Conditions of Dispute Adjudication Agreement.

2. [*Details of amendments to the General Conditions of Dispute Adjudication Agreement, if any. For example:*

In the procedural rules annexed to the General Conditions of Dispute Adjudication Agreement, Rule _ is deleted and replaced by: " ... "]

3. In accordance with Clause 6 of the General Conditions of Dispute Adjudication Agreement, the Member shall be paid as follows:

A retainer fee of _____ per calendar month,
plus a daily fee of _____ per day.

4. In consideration of these fees and other payments to be made by the Employer and the Contractor in accordance with Clause 6 of the General Conditions of Dispute Adjudication Agreement, the Member undertakes to serve, as described in this Dispute Adjudication Agreement, as one of the three persons who are jointly to act as the DAB.

5. The Employer and the Contractor jointly and severally undertake to pay the Member, in consideration of the carrying out of these services, in accordance with Clause 6 of the General Conditions of Dispute Adjudication Agreement.

6. This Dispute Adjudication Agreement shall be governed by the law of _____

SIGNED by: _____ SIGNED by: _____ SIGNED by: _____

for and on behalf of the Employer for and on behalf of the Contractor for and on behalf of the Employer
in the presence of in the presence of in the presence of

Witness: _____ Witness: _____ Witness _____
Name: _____ Name: _____ Name: _____
Address: _____ Address: _____ Address: _____
Date: _____ Date: _____ Date: _____

SPECIFICATION

Note:

1. Unless otherwise shown on drawings or described in bills, the materials and workmanship shall be in accordance with the Standard Specification for Building and Construction Works prepared by the Public Works Department.
2. The Standard Specification prepared by the Public Works Department may not supply to the tenderer, but can be inspected at the office of the Quantity Surveyors and will be included in the contract.
3. Unless otherwise shown on drawings or described in bills, all Mechanical and Electrical materials and workmanship shall be as described in the latest standard specification prepared by the Consulting Engineers / issued by the Department of Electrical Services.
4. The contractor shall be responsible to liaise with the Department of Electrical Services Brunei Darussalam for the connection of electrical supply to the building and to arrange the inspection and testing of the installation if applicable.
5. Standard of Electrical Installation shall comply with the latest issue of B.S. Standard and I.E.E. wiring regulations unless otherwise stated.

INDEX TO SPECIFICATION

INDEX

1. GENERAL CLAUSES
2. PILING
3. EXCAVATION AND EARTHWORKS
4. CONCRETE WORK
5. BRICKWORK AND BLOCKWORK
6. ROOFING
7. CARPENTRY AND JOINERY
8. IRONMONGERY
9. STRUCTURAL STEELWORK
10. METALWORK
11. WALL, FLOOR AND CEILING FINISHES
12. PLUMBING
13. GLAZING
14. PAINTING AND DECORATING
15. ROADWORKS AND CARPARKS
16. SEWERAGE AND DRAINAGE WORKS
17. FENCING AND GATES
18. LANDSCAPING AND TURFING
19. EXTERNAL WATER SUPPLY

SPECIFICATION

- A Descriptions in the Specification shall apply to the whole of the works regardless of the trade or work headings under which they occur and shall be read in conjunction with all other parts of the Contract Documents.
- B The Specification is a Standard Specification and where items of materials and workmanship are not specified herein, the Contractor shall also refer to the Drawings for details and for locations of finishes, and to the Schedule of Works. Specification clauses that are not applicable to this Contract should be disregarded.
- C Where there are no details of a particular finishing material or other material or standard of workmanship, this shall be taken as being in accordance with the manufacturer's recommendations and accepted practice for good quality workmanship.
- D Materials for Finishes, methods of constructions and details of workmanship, where shown on the drawings, superseded details contained in the Standard Specification.
- E In the Specification the letters B.S. refer to the British Standard as published by the British Standards Institution, London. The letters C.P. refer to the British Standard Code of Practice issued by the Council for Codes of Practice. The latest amendment is implied in each case.
- F All materials incorporated in the permanent work and all workmanship employed in its construction shall be consistent with good practice and, where applicable and unless otherwise stated in the Contract, shall comply with any relevant British Standard and British Standard Code of Practice current at the date of tender.
- G Where works are ordered to be performed by the Contractor but such works are not specified in the Specification, the Contractor must nevertheless carry them out with full diligence and expedience.
- H Manufacturers' and catalogue references quoted in the Specification are indicative of type and quality only. Other manufacturers' products may be accepted provided they are equivalent to those specified and approved by the Superintending Officer.
- I The Specification sets out the standards of the workmanship and materials required generally in building projects in Negara Brunei Darussalam. It may be accompanied by a Particular Specification defining requirements of any specific items or works in which case the details of the Particular Specification shall take priority over the General Specification, as shall any detailed specification included in the drawings and/or Bills which form part of the Contract.

PRICE PREAMBLES

GENERAL PRINCIPLES

- A The following preambles shall be read in conjunction with their respective trades and the tenderer shall make allowance in his unit rates for complying with the following preambles where applicable.
- B All rates submitted in the Bills hereafter shall be deemed to include for executing the Works in batches or in small quantities, narrow widths and confined areas, joining new to existing works including all labour in connection therewith and any sundry items of a like nature.
- C All rates shall include for all freight charges, landing charges, custom duties, sales taxes, etc.
- D All items are measured nett and rates shall include for laps, cutting and waste.
- E The Bills are to be read in conjunction with the Conditions of Contract, the Specifications and the Drawings.
- F The general directions and descriptions of works and materials given in the Specifications and Drawings are not necessarily repeated in the Bills and reference shall be made to the Specifications and the Drawings for this information.
- G The rates and prices entered in the Bills shall provide for compliance with all provisions of the Conditions of Contract, Drawings and the Specifications.
- H Unless specifically stated otherwise in the bill the following is deemed to be included in the description of the item:-
- (i) Labour and all costs in connection therewith including the labour in setting, fitting and fixing of materials and goods in position.
 - (ii) Materials and goods including materials required for lapping, jointing and the like and all costs in connection therewith such as conveyance, delivery, unloading, storing, returning packings, handling, hoisting and lowering.
 - (iii) Waste of materials.
 - (iv) All cutting and waste.
 - (v) Use of plant and all costs in connection therewith.
 - (vi) Establishment charges, overhead charges and profit.

GENERAL PRINCIPLES

- A The rates and prices entered in the Bills are to be the full inclusive value of the finished work described under the respective items including all general risks, liabilities and obligations set forth or implied in the Contract Documents and shall include for the cost of all plant, labour, supervision, materials, wastes, fuel, temporary works, insurance, maintenance, overhead charges, profit and every incidental and contingent cost and charge whatsoever except those in respect of which specific provision is made by way of separate items in the Bills.
- B Each item in the Bills shall have a separate rate or price and extension set against it and items where the prices of which are the same shall not be bracketed.
- C Item against which no price is entered will be considered as covered by other rates and prices in the Bills.
- D The Contractor will be deemed to have ascertained for himself before tendering details of the nature and extent of the work which will have to be carried out under tidal, monsoon, marine and other conditions and restrictions and his rates and prices shall include for all costs and charges whatsoever arising out of such working.
- E All items that are required for the proper execution and completion of the whole of the Works although not specifically mentioned in the Bills are deemed to be included in the rates for other items in the Bills.
- F The rates and prices are firm and not subject to any price fluctuation. Quantities are measured net and firm unless otherwise stated. Provisional quantities (if any) are subject to final measurement, provisional sums are subject to actual expenditure, and no claim arising from remeasurement (except for variation / instruction), fluctuation in cost of material, labour, plant, etc.
- G All rates shall include for supply, delivery to site and installing in positions as directed by the Superintending Officer, complete with all necessary fixing, devices, hacking, chasing, morticing, bolting down, grouting, touching up works and the like.
- H The Bills of Quantities has been prepared in accordance with the “Standard Method of Measurement of Building Works (Second Edition)” as prepared by the Singapore Institute of Surveyors and Valuers (as modified to suit the particular circumstances of this Contract).
- I Before the signing of the Contract any errors or omissions in the Contractor’s rates and calculations in the Bills of Quantities shall be rectified and adjusted such that the total amount shall be the same amount as that tendered by the Contractor. Rates inserted in the Tender must correctly reflect the cost of the works. If during evaluation of Tender, rates are found, which, in the Superintending Officer’s opinion, do not correctly reflect the cost of the particular item, the Tender may be rejected or considered for acceptance subject to adjustment of rates to provide a more equitable distribution cost.

GENERAL PRINCIPLES (cont'd)

- A All works necessary for completion of the Contract as per the Drawings, Specifications, Standard and Special Conditions of Contract shall be deemed to have been included in and covered by the various items in the Bills of Quantities whether or not specially mentioned in the Bills of Quantities.

PAYMENT OF LUMP SUM ITEMS/AMOUNTS

- B Notwithstanding the application of Clauses in the Conditions of Contract to the lump sum amounts entered in the Bills for mobilization of plant and equipment, etc., not more than sixty (60) percent of such amount shall become due to the Contractor when all the necessary plant and equipment are brought to the site as approved by the Engineer. The remaining of such amounts shall not become due to the Contractor until the works, for which the plant and equipment are intended, have been completed and such plant and equipment are removed from the site. Such sums due shall be subjected to the normal retention as specified in the Conditions of Contract.
- C Where lump sum amounts are given for items specifically provided for temporary works in the Bills, not more than sixty (60) percent of such amount become due to the Contractor when such temporary works are erected to the satisfaction of the Engineer. The remaining of such amount shall not become due to the Contractor until the permanent works, for which the temporary works are necessary, have been completed and such temporary works are demolished/dismantled and removed from the site. All such sums due shall be subjected to the normal retention as specified in the Conditions of Contract.

PAYMENT FOR PILES

- D The payment for the supply of piles shall be based on the actual paylength supplied and accepted. The paylength of a pile shall be the length between the point of maximum penetration of the toe of the pile shoe and the designed cut-off level.
- E The payment for the driving of piles under building shall be taken on the penetration into the ground measured from ground level before commencement of driving down to the toe of the pile, whereas for pile driving in wharf works, payment shall be the penetration into sea bed measured from sea bed before commencement down to the toe of the pile.

PAYMENT FOR EARTHWORK

- F The measurement of filling are those after compaction and the Contractor shall allow in his prices accordingly.

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
<u>BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)</u>					
<u>GENERAL</u>					
<p>A The Preliminary Particulars of Parties for the works, Possession of Site, Location of Site, Condition and Divisions of Works are described as follows:-</p> <p><u>Parties for the Works</u></p>					
<p>B The term "Employer" shall mean the Ministry of External Affairs, The Republic of Government of India</p>					
<p>C The term "Superintending Officer" where used in the Contract shall mean Arkitek RekaJaya.</p>					
<p>D The term "Architect" shall mean Arkitek RekaJaya</p>					
<p>E The term "C & S Engineer" shall mean Othman & Associates</p>					
<p>F The term "M & E Engineer" shall mean LKA Konsult Sdn. Bhd.</p>					
<p>G The term "Quantity Surveyor" shall mean MRBC Partnership</p>					
<p>H The term "Contractor" shall mean the Contractor awarded the Contract for the whole works.</p>					
<p>J The term "Nominated Subcontractor" shall mean any Contractor awarded the Contract for specialist works and who shall become a Nominated Subcontractor under the terms of the Contract.</p> <p><u>Location of Site</u></p>					
<p>K The site is situated on Lot 64081 at Kampong Jalan Kebangsaan, Mukim Kianggeh</p> <p><u>Site Conditions</u></p>					
<p>L The Contractor's working space and the areas for workyards, storage of materials, etc. will be restricted to the area within the site</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>(Cont) GENERAL</u>					
<u>Description of Works</u>					
A	The works which shall be carried out under this Contract comprise the supply of all materials, labour, plant, tools and equipment required for the execution and completion of the following, summarised briefly as belows:-				
B	1) High Commissioner's Residence				
C	2) All Mechanical and Electrical Works				
D	3) All associated External Works				
<u>SITE VISIT</u>					
E	The Contractor is deemed to have visited the site while preparing the tender to ascertain for himself the extent of the work involved and the nature of the working conditions and make himself thoroughly acquainted with any site restrictions, obstruction and all other details liable to affect his tender, allow the same, as no claim for extra payment in respect of the above will be entertained.				
<u>CONDITIONS OF CONTRACT</u>					
F	The Articles of Agreement and Conditions of Contract will be those contained in the Government of Brunei Darussalam Standard Form of Building Contract for use where Quantities form part of the Contract.				
G	The price in the Bills of Quantities shall be deemed to cover the cost of complying with the clauses.				
H	Banker's Guarantee Clause				
J	(i) Provide a Banker's Guarantee obtained from a Local Bank approved by the Employer to be jointly and severally bound to the Employer in a sum equal to 5% (ten percent) of the Contract Sum, valid for Contract Period plus Nine (9) months thereafter				

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>(Cont) CONDITIONS OF CONTRACT</u>					
<p>A (ii) The Banker's Guarantee is to be provided in consideration of the Employer not insisting on the Contractor paying ten percent of the value of the Contract as a Security Deposit. The term of the Bond shall be approved by the Employer and the cost of obtaining such and 'all-respect' guarantee shall be at the expense of the Contractor.</p>					
<p>B (iii) The Banker's Guarantee shall be extended where necessary to the expected completion date two weeks before the expiry of the Banker's Guarantee.</p>					
<p>C Progress Payments Clause</p>					
<p>D The value of the Contractor's materials (excluding Nominated Sub-Contractors materials) to be included in the Certificate is 80% of the full value of the materials at the current market rates of 80% of the element included for materials in the relevant Contract Rate whichever is the lower.</p>					
<p>E The term, 'Current market rates' means the prices usually paid by the Contractor for materials plus cartage at the date of his tender or such price plus cartage paid by the Contractor at the time the materials are supplied to the site, whichever is the lower. Prices are to be substantiated by invoices from the supplier.</p>					
<u>INSURANCES</u>					
<p>F All insurances shall be effected with internationally recognised insurance companies approved by the Superintending Officer in writing. The Workmen's Compensation Policy and Public Liability Policy shall remain in force until expiry date of Defects Liability Period.</p>					
<p>G Provide the following insurance policies and such other insurances as may be necessary to protect the Contractor's and the Government interests:-</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>(Cont) INSURANCES</u>					
A (a) Workmen's Compensation Policy in the joint names of the Government and the Contractor including period of Defect Liability Period.					
B (b) Public Liability Policy in the joint names of the Government and the Contractor including period of Defect Liability Period.					
C (c) Fire Policy in the joint names of the Government and the Contractor including demolition and clearing of fire damaged structures, debris, etc.					
D The limit of indemnity for the Public Liability Policy is to be B\$1,000,000.00 per accident with the number of accidents unlimited. The policy is to be endorsed as follows:-					
E (a) `Property of the Employer's employees and consultants of the Government and Property belonging to the employees and consultants of the Government shall for the purpose of this policy be treated and covered as Third Party Liabilities'.					
F (b) Each of the parties comprising the insured shall for the purpose of this policy be considered as a separate and distinct unit and the words `the insured' shall be considered as applying to each party in the same manner as if a separate policy had been issued to each of the said parties and insurers hereby agree to waive all rights of subrogation or action which they may have or acquire against any or the aforesaid parties arising out of any accident in respect of which any claims is made hereunder provided nevertheless that nothing in this clause shall be deemed to increase the limit of indemnity in respect of any one occurrence or series of occurrence.					
G The third party liability insurances generally will cover:-					
H (a) Accidental bodily injury or death to third parties.					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>(Cont) INSURANCES</u>					
A (b) Injury or damage to property belonging to third parties.					
B (c) Vibration, removal or weakening of support.					
C Excess clause and all 'minimums' if not deleted by the Insurer shall be borne by the Contractor.					
D Policies of insurances shall be deposited with the Superintending Officer. Evidence of payment of Insurances premiums must be presented to the Superintending Officer who on receipt of such evidence will include the premium in the first interim certificate and the balance (should the sum allowed herein exceeded the actual premium) shall be paid progressively.					
E The Contractor is to comply with the Current Government Enactment in force on Workmen's Compensation insurances, Public Liability insurances and any other requirements imposed by the Contract.					
<u>SETTING OUT AND SITE LEVELS</u>					
F Prior to the commencement of any excavation, the Contractor is to make a survey of the site showing relevant site dimensions and existing ground levels. The Contractor shall agree the survey and the levels obtained with the Superintending Officer in writing and the said levels, after agreement, will be used as the basis for measurement.					
G The Contractor is to engage the services of a Licensed Surveyor to carry out a site survey as required by the Superintending Officer before work commences and to establish boundaries, redefinition including boundary stone establishment on completion of the works.					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>(Cont) SETTING OUT AND SITE LEVELS</u>					
<p>A Responsibility for the accuracy of setting out will be entirely the Contractor's, whether or not the setting out is performed and directed by the Superintending Officer. It is the Contractor's responsibility to ensure that the setting out is accurate.</p>					
<u>COMPLETION JOINT-SURVEY AND AS-BUILT DRAWING</u>					
<p>B On completion of this Contract, the Contractor shall employ a Licensed Surveyor to carry out an "as-constructed" survey for checking and determining the accuracy of the works executed. The Contractor shall rectify any works found inaccurately done to the approval of the Superintending Officer and all expenses arising out of such rectification shall be borne by the Contractor.</p>					
<p>C The aforesaid survey shall include checking of the actual finished levels on site and the Contractor shall record the surveys on approved drawings which shall show the levels on plan with gridlines at intervals not exceeding 15 metres both ways and on which all levels shall be referred to Brunei Datum. The Contractor shall produce all necessary sectional drawings of the surveyed land and supply four sets plus the original of all the approved survey drawings to the Superintending Officer.</p>					
<p>D The Contractor shall produce as-constructed drawings showing the positions of works executed all to the approval of the Superintending Officer, and shall supply the drawings to the Superintending Officer .</p>					
<u>PLANT, TOOLS AND VEHICLES</u>					
<p>E Provide and maintain all necessary plant, equipment, tools and vehicles for the proper execution and completion of the works and clear away same on completion.</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>GENERAL SCAFFOLDING</u>					
<p>A Provide, maintain and remove when directed by the Superintending Officer and make good all temporary scaffolding with staging, planked footways, guardrails and the like and to whatever height as may be required for the use of workmen in accordance with the requirements of the Superintending Officer and the Authorities.</p>					
<u>SITE ADMINISTRATION</u>					
<p>B Provide for all on and off site management and supervisory costs and charges including the cost of foremen-in-charge.</p>					
<p>C The foremen-in-charge must be suitably qualified and competent and shall not be changed without one month's written notice of the Superintending Officer.</p>					
<p>D A project organisation chart should be submitted stating the persons who will be involved in the project.</p>					
<u>SITE SECURITY</u>					
<p>E Provide all necessary fencing, watching and lighting for the Security of the Works, material and plants against damage and theft.</p>					
<u>PROTECTING THE WORKS FROM INCLEMENT WEATHER</u>					
<p>F The Contractor shall be deemed to have taken all possible weather and tidal conditions into account when preparing his tender and shall not be entitled to extra payment by reason of the occurrence or effect of excessive rainfall, temperatures or humidity, high winds, waves, tides or any other meteorological or tidal phenomena.</p>					
<p>G The Contractor shall make suitable arrangements to protect the works, temporary works and constructional plant against the effect of weather and tidal conditions.</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
<u>BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
<u>WATER FOR WORKS</u>					
A Provide all fresh clean pure water required including storage facilities for use in the works.					
B Comply with the Public Works Department's guideline for the temporary supplier.					
C Pay all costs and charges in connection with water for the Works. Alter, shift and adapt from time to time as necessary. Clean away and make good on completion.					
<u>TEMPORARY LIGHTING AND POWER</u>					
D Provide temporary artificial lighting and electric power for the works including that of nominated subcontractor's. Where supply is not available, the Contractor shall provide and maintain adequate generator sets to meet the temporary consumption.					
E Comply with the Electrical Department's guide-line for the temporary supplies.					
F Pay all costs and charges in connection with temporary lighting and power for the works including that for testing equipment and services for nominated subcontractors. Alter, shift and adapt from time to time as necessary. Disconnect, clear away and make good on completion.					
<u>TEMPORARY ROADS, HARDSTANDING, CULVERTS, VEHICLES CROSSING, ETC.</u>					
G Provide, maintain and alter as necessary all temporary access roads, tracks, paths, hardstanding, pavement crossing, culverts, other temporary works and the like and remove and make good on completion.					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
<u>BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
<u>TEMPORARY OFFICE AND FACILITIES FOR CONSULTANTS AND CONTRACTORS</u>					
<p>A Provide and maintain at a position on or off site to be agreed with the Superintending Officer air-conditioning office with meeting facilities for the use of the Consultants', Contractor's and all nominated subcontractors' staff. Repaint, alter, shift and adapt from time to time as required, as directed and removed on completion of the works.</p>					
<p>B The Contractor shall not be permitted to construct temporary building to accommodate his workmen on site without the approval of the Superintending Officer.</p>					
<p>C Provide and maintain at position to be agreed with the Superintending Officer watertight temporary sheds for the storage of materials, tools and equipment for the use of his own workpeople. Provide and maintain covered working areas if required. Repaint, alter, shift and adapt from time to time as required or as directed and remove on completion of the works.</p> <p><u>COMMUNICATION</u></p>					
<p>D Provide and maintain telephone services or other means of communication to the Contractor's site office as may be necessary for the full period of the works and pay all charges and expenses in connection therewith and remove on completion.</p> <p><u>TRAFFIC REGULATIONS</u></p>					
<p>E The Contractor shall comply with all Bye-Laws issued by Land Transport Department and other relevant Authorities throughout his work and shall meet the requirements regarding the traffic regulations issued from time to time.</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
<u>BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
<u>SAFETY, HEALTH AND WELFARE OF PEOPLE</u>					
A Pay all costs and charges incurred by and comply with all standard and construction site health, safety and welfare regulations appertaining to all persons employed on the site.					
B The Contractor shall comply with Guidance Document - Guidelines for Safety Organisation and Guidelines for Safety on Construction Site 1994 throughout his work and shall meet the requirements regarding the Safety Guidelines issued by Ministry of Development					
C The Contractor shall provide twenty (20) No. safety helmets and twenty (20) pairs of safety boots for relevant authorities personnels and guests.					
<u>CONSTRUCTION SITE SAFETY, HEALTH AND WELFARE</u>					
<u>Legal Requirements and Regulations</u>					
D Allow for all costs and charges incurred by complying with all safety regulations of Government appertaining to all persons employed on or visitors to the site including those employed by all Sub-Contractor's and Superintending Officer's representatives.					
E Contractor shall comply with all applicable safety laws (whether international, national regional, local/PWD or otherwise) regulations and safe operating standards and shall take all necessary safety precautions related to or arising out of the performance of the contract in order to protect the work, the personnel and property of the Employer, contractor and all third parties.					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>(Cont) CONSTRUCTION SITE SAFETY, HEALTH AND WELFARE</u>					
<u>(Cont) Legal Requirements and Regulations</u>					
<p>A The Contractor is responsible for the support services in areas of safety, fire protection and prevention, industrial hygiene and is obliged to comply with by virtue of statutory requirements as well as being part of the contractual requirements. It is the responsibility of the Contractor that he, his employees and their sub-contracts are aware of and familiar with the safety rules and practices as authorised by the Superintending Officer.</p>					
<p>B A qualified and competent Safety officer must be assigned full time in the project. The Contractor to provide safety programme in accordance to safety regulations of Government.</p>					
<p>C The Contractor is also responsible for performing work under the contract in a healthy and safe manner including protecting the safety and welfare of other sub-contractos.</p>					
<u>Termination and Suspension</u>					
<p>D Any infringements by the contractor identified by the Superintending Officer of the above laws, regulations and safe operating standards shall be promptly remedied at contractor's expense.</p>					
<p>E The Superintending Officer reserves the right to stop the work at Contractor's expense until such unsafe acts and situations have been rectified and in the event of serious or repeated infringements, may terminate the contract without compensation.</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>(Cont) CONSTRUCTION SITE SAFETY, HEALTH AND WELFARE</u>					
<u>Safety Equipment</u>					
<p>A Contractor shall at its own expense provide adequate first aid equipment, fire extinguishers and other safety equipment of an approved type and amount, as may be specified (or expected in accordance with good working practices) in connection with this contract and shall maintain this equipment in a professional manner as instructed by the Superintending Officer.</p>					
<p>B Ensure at all times that the equipment shall be periodically inspected by a competent internationally recognised authority and certified by such authority to be in a safe working condition.</p>					
<u>Protective Personal Equipment</u>					
<p>C Contractor shall, at his own expense, supply his personnel and sub-contractor's personnel, required in connection with the safe performance of the work, with adequate protective personal clothing and other protective equipment which shall be maintained in good condition or replaced and shall be worn on relevant occasions as indicated by notices, instructions and good practice. These shall include safety shoes, safety helmets, eye goggles, hand gloves, safety belts and harness etc.</p>					
<u>Hygiene</u>					
<p>D Contractor shall ensure that his personnel and sub-contractor's personnel maintain the highest standard of hygiene in connection with the performance of this contract.</p>					
<u>Housekeeping</u>					
<p>E Contractor shall ensure that good housekeeping is maintained continuously throughout the duration of the work with due regards being paid to tidiness, access ways and disposal of scrap materials and rubbish.</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
<u>BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
<u>(Cont) CONSTRUCTION SITE SAFETY, HEALTH AND WELFARE</u>					
<u>Safety Warning Signs and Colours</u>					
<p>A Safety sign shall comply with BS.5378 : Part 1 & Part 2 : 1980 and Part 3 : 1982. All safety sign should be identified in one or more of the four basic categories such as prohibition, warning, mandatory or safe condition.</p>					
<u>Design Symbols</u>					
<p>B The design symbols shall be as simple as possible and details not essential for the understanding of the message shall be omitted.</p>					
<p>C Caution signs shall show the nature of the danger.</p>					
<p>D Mandatory sign shall show only what is being mandated and prohibition signs shall show only what, or who is prohibited.</p>					
<u>Colour, Shape and Layout</u>					
<p>E The Colour, Shape and Layout of the signs shall comply with BS.5378 : Part 1 and the colorimetric and photometric properties shall comply with BS.5378 : Part 2.</p>					
<u>General Safety Provisions</u>					
<p>F Suitable overhead protection (in the form of safety nets, catch platforms and hoardings, etc.) are to be provided where persons are required to work or pass by places that are normally exposed to falling materials or objects.</p>					
<u>Accident/ Incident Reporting</u>					
<p>G Report to the Superintending Officer, any accident or incident irrespective of whether injury to personnel, damage to property, plant or equipment, fire and a "near-miss" situation which might have led to one of the above mentioned consequences.</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
<u>BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
<u>(Cont) CONSTRUCTION SITE SAFETY, HEALTH AND WELFARE</u>					
<u>Safety Meetings</u>					
<p>A Contractor shall be responsible for maintaining and enhancing the safety awareness of its personnel and sub-contractor's personnel, including arranging safety meetings.</p>					
<u>First-Aid</u>					
<p>B Make arrangements for first-aid treatment to be available on site at all times. Adequate and suitable first-aid equipment shall be provided. All work-people and others on site shall be informed of the location of such equipment and treatment positions.</p>					
<u>Anti-malarial Measures</u>					
<p>C Take all necessary measures to prevent the breeding and presence of mosquitoes on the site and pay any charges levied by the relevant authorities for anti-malarial measures.</p>					
<u>CONSTRUCTION SITE SAFETY - BASIC SAFETY</u>					
<u>Site Tidiness</u>					
<p>D Materials, tools and equipments shall be properly stacked and stored at designated places. Electrical switchboards, emergency switches, alarms, fire fighting equipments, first aid equipments and exits shall be indicated and remain unobstructed.</p>					
<u>Excavation</u>					
<p>E Excavation must have adequate and proper shoring and side supports with access complete with barriers and conspicuous warning sign. The edge must be stable and barricaded at a safe clearance from vehicles, equipments and workers.</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>(Cont) CONSTRUCTION SITE SAFETY - BASIC SAFETY</u>					
<u>Machinery and Plant</u>					
<p>A Machinery and plant must be clean and properly maintained with guards on moving parts. They must have stable, firm base and properly supported and operated by skilled operators.</p>					
<u>Temporary Electrical Works</u>					
<p>B All temporary electrical works must have appropriate connection to main lines with meters and fuses. All wires and cables must be properly fastened, supported and neatly installed with protection from being wet and from workers, vehicles and equipments when at ground/floor surface. The works must be installed and maintained by competent electrician.</p>					
<u>Roof Works</u>					
<p>C Roofers must be provided with adequate and safety gears, crawl boards and ladders. Materials must be stacked safety on roof with easy and safe access for workers.</p>					
<u>Gas/ Arc Welding and Cutting</u>					
<p>D Ensuring appropriate and safe handling, stacking and location of gas cylinders. All electrical arc welding equipments, hoses, cables must be protected. Warning signs and protective gears to be used and the works operated by competent and qualified welders and fabricators.</p>					
<u>Periodic Inspection</u>					
<p>E Ensure that all items of equipment shall be periodically inspected by a competent internationally recognised authority and certified by such authority to be in a safe working conditions.</p>					
<u>LABOUR ON COST</u>					
<p>F Provide for all costs, payment and charges in respect of all employees for:-</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)				
<u>(Cont) LABOUR ON COST</u>				
1) Annual and Public Holidays				
2) Travelling time, expenses, fares and transport				
3) Non-productive time and other expenses in connection with overtime				
4) Incentive and bonus payments				
5) Payment of Labour Deposits or cost of providing Banker's Guarantee in lieu of such deposit				
6) Any other payments and charges arising from the employment of workmen				
<u>MAINTENANCE OF PUBLIC AND PRIVATE ROADS</u>				
A Keep the approaches to the site free from excavated materials, mud and debris.				
B Maintain public and private road, footpaths, roadside drains, kerbs and like, and make good any damage caused including that caused by all Sub-Contractor and supplier to the satisfaction of Superintending Officer and pay all costs and charges in connection therewith.				
C Where appropriate or where directed by the Superintending Officer or other competent authority the Contractors shall erect and maintain such temporary warning lights and flags as directed and required to emphasize danger from any works or construction plant.				
<u>REMOVAL OF RUBBISH</u>				
D Keep the site tidy and free from rubbish, debris and the like.				
E Provide all necessary containers like metal 'skip' and remove all rubbish, debris and the like from the site to approved dumping areas at regular intervals.				

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>(Cont) REMOVAL OF RUBBISH</u>					
A Burning of rubbish on site is strictly prohibited.					
<u>CLEARING UPON COMPLETION</u>					
B On completion of the works all plants, building appliances, apparatus or equipment are to be removed as quickly as possible and conveyed away from the site at the sole cost of the Contractor. All services and leads, temporary buildings, shed, barriers, scaffolding, etc. required in the work construction are to be disconnected, dismantled, taken down and removed.					
C All holes, trenches, excavation in connection with plant, etc. are to be filled in a proper manner, levelled of and closely turfed and the site left in a clean and orderly conditions.					
D In the event of the Contractor not clearing away the above mentioned materials, plant and other temporary works within a stipulated time, the Employer shall arrange for same to be executed by some other party and the cost of such clearing away shall be adjusted against the Contractor's Final Account. Employer will not be held responsible or liable for any material or plant left upon the site.					
E Before handing over the Works to the Superintending Officer, the Contractor shall scrub all floors, pavings, staircase, etc. and cleaning out all gutters, gulleys, manholes, sumps and drains. The Contractor shall also clean all glass panes and leave every part of the completed works included in this Contract in clean, sound and tidy condition to the approval of the Superintending Officer.					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>NUISANCE</u>					
A The amount of noise made on the works is to be kept to minimum. Generators, compressors and other nosiy plants are to be muffled at all times by means of silencers, screens and the like.					
B Make all precautions to prevent the starting and spread of fire and provide suitable fire fighting equipment.					
C Take all reasonable measures to prevent nuisance by dust by regular watering or other appropriate means and as when the need arises or when instructed by the Superintending Officer.					
D The Contractor shall not obstruct any public way or do any thing which may amount to a nuisance or annoyance, and shall not interfere with any right of way or light to adjoining property and may upon notice received by him or left upon the site requiring the discontinuance or suspension of any part of the works shall at once be forwarded by him to the Superintending Officer or if given verbally, shall at once be communicated by him to the Superintending Officer in writing and the Contractor shall keep the Employer indemnified against any claim or omission of the Contractor or his agents, servants or workmen in this respect.					
<u>SAMPLES</u>					
E Samples of materials and fittings shall be submitted for approval prior to any order by the Contractor and as early in the Contract as possible. All samples which are approved shall indicate the standard to be maintained in the execution of the works.					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>TEST</u>					
<p>A Arrange for test of any materials or workmanship to be carried out as and when the Superintending Officer may direct and either at on or off-site laboratories as instructed. Pay all costs and charges in connection therewith.</p>					
<u>SHOP DRAWINGS</u>					
<p>B Prepare and submit to the Superintending Officer for approval prior to ordering materials or commencing any works, fully detailed and dimensioned shop drawings as stated below. Obtain the Superintending Officer written approval to the drawings.</p> <p>(a) Structural Steelworks</p> <p>(b) Metalworks</p> <p>(c) Doors and Windows</p> <p>(d) Plumbing and Sanitary</p> <p>(e) Mechanical and Electrical Works</p> <p>(f) Other Proprietary or Prefabricated Items</p>					
<u>RECORD DRAWINGS</u>					
<p>C The Contractor shall make accurate records of those parts of the works which will become hidden by further progress as may be directed by Superintending Officer. Such records shall be checked and verified by the Superintending Officer while the work is open for inspection. Records shall be entered by the Contractor on prints of drawings which will be made available to him free of cost for this purpose, amplified by him with supplementary dimensioned sketches and handed to the Superintending Officer as soon as practicable.</p>					
<p>D This record drawings will be used for the preparation of as built drawings.</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
<u>BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
<u>OPERATING AND MAINTENANCE INSTRUCTION</u>					
<p>A Obtain and hand over to the Superintending Officer upon completion any operating and maintenance instruction provided by manufacturers, suppliers or sub-contractors.</p>					
<u>PROGRESS PHOTOGRAPHS</u>					
<p>B Provide six sets of photographs to the Superintending Officer before commencement of the works and thereafter on the first day of each month adequately recording the progress on site. Each set of not exceeding 20 copies suitably dated and titled taken from various elevations as directed by the Superintending Officer. The Contractor shall also provide necessary album for safe keeping of the progress photographs.</p>					
<p>C In addition to the progress photographs, the Contractor is required to submit together with each of his monthly progress payment application, all necessary photographic records (in 6 sets or more) showing his work done to date and materials delivered to site to facilitate the processing of progress payment.</p>					
<u>GENERAL ATTENDANCE</u>					
<p>D Provide the general attendance of one trade upon another.</p>					
<u>CONTRACTOR'S MECHANICAL AND ELECTRICAL CO-ORDINATOR</u>					
<p>E The Contractor shall submit for approval within 7 days from the day of acceptance of his tender the name and particulars of an English speaking, specially qualified and experienced supervisor for co-ordinating the specialist's work with the Main Contractor and other Nominated Subcontractors over the whole Contract period and he shall be in attendance full time on the works. He must have not less than 5 years experience in site management relating to Mechanical and Electrical co-ordination works.</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>PROTECTING THE WORKS</u>					
<p>A Take all necessary protective measures as directed throughout the currency of the Contract to protect all finished work from damage or deterioration because of the activities of any workpeople (including those of the Employer's separate specialist Contractors) or of any other cause and leave the whole of the works perfect and to the Superintending Officer's satisfaction on completion.</p>					
<u>EXISTING SERVICES</u>					
<p>B The Contractor shall take all necessary steps to ascertain the exact positions of existing overhead cables, pipes, ducts, sewers, services main and shall uphold, protect and maintain all these and other services of the like nature during excavations for the purpose of this Contract and make good or pay for making good all damage thereto and any consequential damage or loss arising out of such damage.</p>					
<p>C In the case where the services are to be temporarily terminated or diverted, the Contractor shall give the necessary notices to the appropriate Authorities and arrange for the work to be carried out and pay all charges in connection therewith.</p>					
<u>PROTECT PROPERTY</u>					
<p>D Take all adequate and reasonable measures to protect any private properties. Make good all damages due to any cause within the Contractor's control at his own expense or pay all costs and charges in connection therewith.</p>					
<u>ORDERING AND DELIVERY OF MATERIALS</u>					
<p>E The Bills of Quantities is not a schedule of material and the Contractor should not order any materials from the quantities and sizes stated in these Bills of Quantities but must take all quantities and sizes from the drawings.</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
<u>BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
<u>MATERIALS FROM GOVERNMENT STORE</u>					
<p>A When materials are required to be obtained from Government stores the Contractor is to load and transport these to site and is to return any returnable crates, drums or other containers, which will otherwise be charged to his account.</p>					
<u>COVERING UP</u>					
<p>B No work shall be covered until it has been examined and approved by the Superintending Officer.</p>					
<p>C Failure by the Contractor to inform the Superintending Officer on time before covering up the work may render his claim null and void.</p>					
<u>LOADING IN EXCESS OF DESIGN LOAD</u>					
<p>D No loading in excess of the design loading shall be placed on any portion of the structure without the written permission of the Superintending Officer.</p>					
<p>E If such permission is granted all structural members subjected to loading other than design shall be strengthened and supported to the satisfaction of the Superintending Officer and the Contractor will bear all additional expenditure.</p>					
<p>F Notwithstanding the written permission of the Superintending Officer the Contractor shall bear all costs arising out of the making good of any damage to the permanent structure caused by excess loading.</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>ROYALTIES AND PATENT RIGHT</u>					
<p>A All royalties or other sums payable in respect of the supply and use in carrying out the works as described in or referred to in Contract Bills of any patented articles, processes or inventions shall be deemed to have been included in the Contract Sum and the Contractor shall indemnify Employer from and against all claims, proceeding, damages, costs and expenses which may be brought or made against Employer or to which the Employer may be put by reason of the Contractor infringing or being held to have infringed any patent rights in relation to any articles, processes and inventions.</p>					
<p>B A Provisional Sum (where applicable) has been included elsewhere in these Bills as payment according to circular imposed by the Brunei Government Lands Department in connection with filling material imported to the site.</p>					
<u>CUSTOMS RESTRICTIONS AND DUTIES</u>					
<p>C Provide for all cost incurred in connection with customs restrictions, quotas, duties and taxes.</p>					
<u>KEEPING SITE DRY</u>					
<p>D The Contractor shall be responsible for keeping the whole of the works well drained and free from all water.</p>					
<u>TEMPORARY DRAINAGE, SILT TRAPS AND OTHER ANTI EROSION MEASURES</u>					
<p>E The Contractor shall during the course of the works take such additional measures including construction of temporary drainage, silt traps and other anti-erosion measure etc. as necessary, to prevent the movement of eroded materials and debris from construction areas and/ or other erosion of any parts of the site.</p>					
<p>F Construct stormwater drains along temporary roads, hardstanding, etc. to the satisfaction of the Superintending Officer.</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>TRESPASS</u>					
<p>A The Contractor shall prevent any trespass onto the adjacent properties by his own employees or those of 'Sub-Contractors' and shall indemnify Employer against any claims, costs of proceedings whatsoever arising out of any trespass.</p>					
<u>METRICATION</u>					
<p>B The Contractor is to bear all procedural and administration costs in connection with ordering and usage of materials which is specified in either metric or imperial dimension.</p>					
<p>C The Contractor will not be allowed reimbursement of additional costs should the nearest suitable and acceptable imperial sized material to the metric sized specified or vice-versa be more costly.</p>					
<u>CO-OPERATION AND CO-ORDINATION</u>					
<p>D Co-operate with all other persons who are on the site with the authority of the Employer. Co-ordinate the Works such that they may be completed in the most efficient and acceptable manner.</p>					
<p>E The Contractor shall permit other Contractors and the Employer to use any part of the Works.</p>					
<u>RESPONSIBILITY</u>					
<p>F Where the Contractor does not price an item in the Preliminaries or inserts a dash against any item in the Bills of Quantities, the value therefore will be deemed to be included in the rates contained in the Bills of Quantities.</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>(Cont) RESPONSIBILITY</u>					
<p>A The Contractor is to exercise care in pricing items of similar description throughout the Bills of Quantities. In pricing variations arising from Superintending Officer's instructions, the Quantity Surveyor will apply the lowest rate for any individual item where unit rates vary from element to element or from section to section.</p>					
<p>B Whether expressly stated or not in these Bills of Quantities all description, specification and quantities are implied to be directed at or towards the tenderer tendering for and later awarded the Contract. No allowance will be made for non compliance with any clause due to lack of understanding. The tenderer shall price every item for which he requires remuneration. If any item is not priced it shall be deemed that the tenderer required no remuneration or that no cost to the tenderer is involved in compliance with the particular clause.</p>					
<p>C All the provisional quantities and/ or items stated in these Bills of Quantities shall be remeasured according to the latest drawings or as directed at site. No claim shall be entertained in respect of any item omitted entirely or in part or alternatively increased in quantity by any amount in respect to the Bills.</p>					
<u>PROTECTION OF AND DAMAGE TO ADJOINING EXISTING BUILDINGS, OCCUPANTS, ETC.</u>					
<p>D The Contractor is to allow for all test pits to locate existing foundations, underpinning, all requisite shoring, needling, strutting and other supports, screens, barricades, etc., for the protection of operatives, site staff, occupants, adjoining property and the public, and alter, adapt and maintain them as necessary.</p>					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>(Cont) PROTECTION OF AND DAMAGE TO ADJOINING EXISTING BUILDINGS, OCCUPANTS, ETC.</u>					
A The Contractor shall carry out the works in such manner and with such care that no damage shall be caused to adjoining and neighbouring buildings, structures, drains, etc.					
B Should the Contractor damage any of the adjoining and neighbouring buildings, structures, drains, etc., he shall be liable for making good all works disturbed to adjoining and neighbouring buildings and shall indemnify the Employer in respect of claims or proceedings arising out of the neglect of this clause.					
C It is the responsibility of the Contractor to protect the adjacent buildings against movement caused by settlement during and after construction of the new building.					
<u>HOARDING</u>					
D Provide, erect and maintain adequate, secure and safe metal / timber hoarding as approved by the S. O. including removal after completion					
E The Contractor is to liase with the Superintending Officer on the exact location of the hoarding line based on site condition and the client's requirement, and to the approval and satisfaction of the Superintending Officer.					
<u>PROJECT NAME BOARDS</u>					
F The Contractor shall provide, erect and maintain standard size painted timber name boards with pitched roof showing the project name, Client, Consultants, Main Contractor and other sub-contractors as required and directed by the Superintending Officer					
G The design wording, sitting and maintenance of the boards shall be approved by Superintending Officer prior to it being erected.					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
<u>BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
<u>(Cont) PROJECT NAME BOARDS</u>					
A All boards are to be removed on completion of the works.					
<u>GROUND BREAKING CEREMONY</u>					
B Allow for ground breaking ceremony when required prior to laying of foundation and the date shall be confirmed by the S.O. The Contractor shall provide and remove on completion proper access, platform, wheel barrow, safety outfit, tent, electricity, water. etc.					
C No claim or extension of time shall be entertained on the ground of ignorance of this clause.					
<u>MOCK-UP</u>					
D Allow here for all costs in connection with the construction and completion of a mock-up as shown and specified on drawings.					
E The Contractor's attention is drawn to the fact that all the Architectural and Structural Works are measured and included in the Measured Works Bills of Quantities but the Contractor shall bear all costs and charges incurred for buying small quantities of material in advance and for the constructing the mock-up "out of sequence" with the overall master program					
F Priority must be given in the Contractor's overall program for executing the mock-up well ahead of the rest of the works					
G The Contractor shall liaise closely with Consultants especially with regards to the approval of sample to be used in the mock-up. The Contractor shall ensure that the progress of the works in the other areas is not adversely affected and should progress as per the master program. No claims will be entertained on the ground of disruption, inconvenience and/ or ignorance of this clause					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>GENERAL CONDITIONS & OTHER PRELIMINARIES</u>					
<p>A Allow here for complying with the general conditions and other preliminary items, etc. and provide all things required necessary for the complete execution of the Works herein, all to the approval and satisfaction of the Architect (Tenderers must specify items involved therein)</p>					
<u>OTHER WORKS NECESSARY</u>					
<p>B Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
COLLECTION					
Page No. BQ/1					
Page No. BQ/2					
Page No. BQ/3					
Page No. BQ/4					
Page No. BQ/5					
Page No. BQ/6					
Page No. BQ/7					
Page No. BQ/8					
Page No. BQ/9					
Page No. BQ/10					
Page No. BQ/11					
Page No. BQ/12					
Page No. BQ/13					
Page No. BQ/14					
Page No. BQ/15					
Page No. BQ/16					
Page No. BQ/17					
Page No. BQ/18					
Page No. BQ/19					
Page No. BQ/20					
Page No. BQ/21					
Page No. BQ/22					
Page No. BQ/23					

BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<p>COLLECTION</p> <p>Page No. BQ/24</p> <p>Page No. BQ/25</p> <p>Page No. BQ/26</p> <p>Page No. BQ/27</p> <p>Page No. BQ/28</p> <p>BILL 1A - GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE) Carried to Summary</p>					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)					
<u>GENERAL</u>					
<p>A The Preliminary Particulars of Parties for the works, Possession of Site, Location of Site, Condition and Divisions of Works are described as follows:-</p> <p><u>Parties for the Works</u></p>					
<p>B The term "Employer" shall mean the Ministry of External Affairs, The Republic of Government of India</p>					
<p>C The term "Superintending Officer" where used in the Contract shall mean Arkitek RekaJaya.</p>					
<p>D The term "Architect" shall mean Arkitek RekaJaya</p>					
<p>E The term "C & S Engineer" shall mean Othman & Associates</p>					
<p>F The term "M & E Engineer" shall mean LKA Konsult Sdn. Bhd.</p>					
<p>G The term "Quantity Surveyor" shall mean MRBC Partnership</p>					
<p>H The term "Contractor" shall mean the Contractor awarded the Contract for the whole works.</p>					
<p>J The term "Nominated Subcontractor" shall mean any Contractor awarded the Contract for specialist works and who shall become a Nominated Subcontractor under the terms of the Contract.</p> <p><u>Location of Site</u></p>					
<p>K The site is situated on Lot 62514 at Kampong Jalan Kebangsaan, Mukim Kianggeh</p> <p><u>Site Conditions</u></p>					
<p>L The Contractor's working space and the areas for workyards, storage of materials, etc. will be restricted to the area within the site</p>					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) GENERAL</u>					
<u>Description of Works</u>					
<p>A The works which shall be carried out under this Contract comprise the supply of all materials, labour, plant, tools and equipment required for the execution and completion of the following, summarised briefly as belows:-</p>					
<p>B 1) Chancery Building</p>					
<p>C 2) Staff Residences (RG & NRG)</p>					
<p>D 3) All Mechanical and Electrical Works</p>					
<p>E 4) All associated External Works</p>					
<u>SITE VISIT</u>					
<p>F The Contractor is deemed to have visited the site while preparing the tender to ascertain for himself the extent of the work involved and the nature of the working conditions and make himself thoroughly acquainted with any site restrictions, obstruction and all other details liable to affect his tender, allow the same, as no claim for extra payment in respect of the above will be entertained.</p>					
<u>CONDITIONS OF CONTRACT</u>					
<p>G The Articles of Agreement and Conditions of Contract will be those contained in the Government of Brunei Darussalam Standard Form of Building Contract for use where Quantities form part of the Contract.</p>					
<p>H The price in the Bills of Quantities shall be deemed to cover the cost of complying with the clauses.</p>					
<p>J Banker's Guarantee Clause</p>					
<p>K (i) Provide a Banker's Guarantee obtained from a Local Bank approved by the Employer to be jointly and severally bound to the Employer in a sum equal to 5% (ten percent) of the Contract Sum, valid for Contract Period plus Nine (9) months thereafter</p>					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)				
<u>(Cont) CONDITIONS OF CONTRACT</u>				
<p>A (ii) The Banker's Guarantee is to be provided in consideration of the Employer not insisting on the Contractor paying ten percent of the value of the Contract as a Security Deposit. The term of the Bond shall be approved by the Employer and the cost of obtaining such and 'all-respect' guarantee shall be at the expense of the Contractor.</p>				
<p>B (iii) The Banker's Guarantee shall be extended where necessary to the expected completion date two weeks before the expiry of the Banker's Guarantee.</p>				
<p>C Progress Payments Clause</p>				
<p>D The value of the Contractor's materials (excluding Nominated Sub-Contractors materials) to be included in the Certificate is 80% of the full value of the materials at the current market rates of 80% of the element included for materials in the relevant Contract Rate whichever is the lower.</p>				
<p>E The term, 'Current market rates' means the prices usually paid by the Contractor for materials plus cartage at the date of his tender or such price plus cartage paid by the Contractor at the time the materials are supplied to the site, whichever is the lower. Prices are to be substantiated by invoices from the supplier.</p>				
<u>INSURANCES</u>				
<p>F All insurances shall be effected with internationally recognised insurance companies approved by the Superintending Officer in writing. The Workmen's Compensation Policy and Public Liability Policy shall remain in force until expiry date of Defects Liability Period.</p>				
<p>G Provide the following insurance policies and such other insurances as may be necessary to protect the Contractor's and the Government interests:-</p>				

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)				
<u>(Cont) INSURANCES</u>				
A (a) Workmen's Compensation Policy in the joint names of the Government and the Contractor including period of Defect Liability Period.				
B (b) Public Liability Policy in the joint names of the Government and the Contractor including period of Defect Liability Period.				
C (c) Fire Policy in the joint names of the Government and the Contractor including demolition and clearing of fire damaged structures, debris, etc.				
D The limit of indemnity for the Public Liability Policy is to be B\$1,000,000.00 per accident with the number of accidents unlimited. The policy is to be endorsed as follows:-				
E (a) `Property of the Employer's employees and consultants of the Government and Property belonging to the employees and consultants of the Government shall for the purpose of this policy be treated and covered as Third Party Liabilities'.				
F (b) Each of the parties comprising the insured shall for the purpose of this policy be considered as a separate and distinct unit and the words `the insured' shall be considered as applying to each party in the same manner as if a separate policy had been issued to each of the said parties and insurers hereby agree to waive all rights of subrogation or action which they may have or acquire against any or the aforesaid parties arising out of any accident in respect of which any claims is made hereunder provided nevertheless that nothing in this clause shall be deemed to increase the limit of indemnity in respect of any one occurrence or series of occurrence.				
G The third party liability insurances generally will cover:-				
H (a) Accidental bodily injury or death to third parties.				

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) INSURANCES</u>					
A (b) Injury or damage to property belonging to third parties.					
B (c) Vibration, removal or weakening of support.					
C Excess clause and all 'minimums' if not deleted by the Insurer shall be borne by the Contractor.					
D Policies of insurances shall be deposited with the Superintending Officer. Evidence of payment of Insurances premiums must be presented to the Superintending Officer who on receipt of such evidence will include the premium in the first interim certificate and the balance (should the sum allowed herein exceeded the actual premium) shall be paid progressively.					
E The Contractor is to comply with the Current Government Enactment in force on Workmen's Compensation insurances, Public Liability insurances and any other requirements imposed by the Contract.					
<u>SETTING OUT AND SITE LEVELS</u>					
F Prior to the commencement of any excavation, the Contractor is to make a survey of the site showing relevant site dimensions and existing ground levels. The Contractor shall agree the survey and the levels obtained with the Superintending Officer in writing and the said levels, after agreement, will be used as the basis for measurement.					
G The Contractor is to engage the services of a Licensed Surveyor to carry out a site survey as required by the Superintending Officer before work commences and to establish boundaries, redefinition including boundary stone establishment on completion of the works.					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)				
<u>(Cont) SETTING OUT AND SITE LEVELS</u>				
<p>A Responsibility for the accuracy of setting out will be entirely the Contractor's, whether or not the setting out is performed and directed by the Superintending Officer. It is the Contractor's responsibility to ensure that the setting out is accurate.</p>				
<u>COMPLETION JOINT-SURVEY AND AS-BUILT DRAWING</u>				
<p>B On completion of this Contract, the Contractor shall employ a Licensed Surveyor to carry out an "as-constructed" survey for checking and determining the accuracy of the works executed. The Contractor shall rectify any works found inaccurately done to the approval of the Superintending Officer and all expenses arising out of such rectification shall be borne by the Contractor.</p>				
<p>C The aforesaid survey shall include checking of the actual finished levels on site and the Contractor shall record the surveys on approved drawings which shall show the levels on plan with gridlines at intervals not exceeding 15 metres both ways and on which all levels shall be referred to Brunei Datum. The Contractor shall produce all necessary sectional drawings of the surveyed land and supply four sets plus the original of all the approved survey drawings to the Superintending Officer.</p>				
<p>D The Contractor shall produce as-constructed drawings showing the positions of works executed all to the approval of the Superintending Officer, and shall supply the drawings to the Superintending Officer .</p>				
<u>PLANT, TOOLS AND VEHICLES</u>				
<p>E Provide and maintain all necessary plant, equipment, tools and vehicles for the proper execution and completion of the works and clear away same on completion.</p>				

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>GENERAL SCAFFOLDING</u>					
<p>A Provide, maintain and remove when directed by the Superintending Officer and make good all temporary scaffolding with staging, planked footways, guardrails and the like and to whatever height as may be required for the use of workmen in accordance with the requirements of the Superintending Officer and the Authorities.</p>					
<u>SITE ADMINISTRATION</u>					
<p>B Provide for all on and off site management and supervisory costs and charges including the cost of foremen-in-charge.</p>					
<p>C The foremen-in-charge must be suitably qualified and competent and shall not be changed without one month's written notice of the Superintending Officer.</p>					
<p>D A project organisation chart should be submitted stating the persons who will be involved in the project.</p>					
<u>SITE SECURITY</u>					
<p>E Provide all necessary fencing, watching and lighting for the Security of the Works, material and plants against damage and theft.</p>					
<u>PROTECTING THE WORKS FROM INCLEMENT WEATHER</u>					
<p>F The Contractor shall be deemed to have taken all possible weather and tidal conditions into account when preparing his tender and shall not be entitled to extra payment by reason of the occurrence or effect of excessive rainfall, temperatures or humidity, high winds, waves, tides or any other meteorological or tidal phenomena.</p>					
<p>G The Contractor shall make suitable arrangements to protect the works, temporary works and constructional plant against the effect of weather and tidal conditions.</p>					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
<u>BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)</u>					
<u>WATER FOR WORKS</u>					
A Provide all fresh clean pure water required including storage facilities for use in the works.					
B Comply with the Public Works Department's guideline for the temporary supplier.					
C Pay all costs and charges in connection with water for the Works. Alter, shift and adapt from time to time as necessary. Clean away and make good on completion.					
<u>TEMPORARY LIGHTING AND POWER</u>					
D Provide temporary artificial lighting and electric power for the works including that of nominated subcontractor's. Where supply is not available, the Contractor shall provide and maintain adequate generator sets to meet the temporary consumption.					
E Comply with the Electrical Department's guide-line for the temporary supplies.					
F Pay all costs and charges in connection with temporary lighting and power for the works including that for testing equipment and services for nominated subcontractors. Alter, shift and adapt from time to time as necessary. Disconnect, clear away and make good on completion.					
<u>TEMPORARY ROADS, HARDSTANDING, CULVERTS, VEHICLES CROSSING, ETC.</u>					
G Provide, maintain and alter as necessary all temporary access roads, tracks, paths, hardstanding, pavement crossing, culverts, other temporary works and the like and remove and make good on completion.					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>TEMPORARY OFFICE AND FACILITIES FOR CONSULTANTS AND CONTRACTORS</u>					
A Provide and maintain at a position on or off site to be agreed with the Superintending Officer air-conditioning office with meeting facilities for the use of the Consultants', Contractor's and all nominated subcontractors' staff. Repaint, alter, shift and adapt from time to time as required, as directed and removed on completion of the works.					
B The Contractor shall not be permitted to construct temporary building to accommodate his workmen on site without the approval of the Superintending Officer.					
C Provide and maintain at position to be agreed with the Superintending Officer watertight temporary sheds for the storage of materials, tools and equipment for the use of his own workpeople. Provide and maintain covered working areas if required. Repaint, alter, shift and adapt from time to time as required or as directed and remove on completion of the works.					
<u>COMMUNICATION</u>					
D Provide and maintain telephone services or other means of communication to the Contractor's site office as may be necessary for the full period of the works and pay all charges and expenses in connection therewith and remove on completion.					
<u>TRAFFIC REGULATIONS</u>					
E The Contractor shall comply with all Bye-Laws issued by Land Transport Department and other relevant Authorities throughout his work and shall meet the requirements regarding the traffic regulations issued from time to time.					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>SAFETY, HEALTH AND WELFARE OF PEOPLE</u>					
A Pay all costs and charges incurred by and comply with all standard and construction site health, safety and welfare regulations appertaining to all persons employed on the site.					
B The Contractor shall comply with Guidance Document - Guidelines for Safety Organisation and Guidelines for Safety on Construction Site 1994 throughout his work and shall meet the requirements regarding the Safety Guidelines issued by Ministry of Development					
C The Contractor shall provide twenty (20) No. safety helmets and twenty (20) pairs of safety boots for relevant authorities personnels and guests.					
<u>CONSTRUCTION SITE SAFETY, HEALTH AND WELFARE</u>					
<u>Legal Requirements and Regulations</u>					
D Allow for all costs and charges incurred by complying with all safety regulations of Government appertaining to all persons employed on or visitors to the site including those employed by all Sub-Contractor's and Superintending Officer's representatives.					
E Contractor shall comply with all applicable safety laws (whether international, national regional, local/PWD or otherwise) regulations and safe operating standards and shall take all necessary safety precautions related to or arising out of the performance of the contract in order to protect the work, the personnel and property of the Employer, contractor and all third parties.					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) CONSTRUCTION SITE SAFETY, HEALTH AND WELFARE</u>					
<u>(Cont) Legal Requirements and Regulations</u>					
<p>A The Contractor is responsible for the support services in areas of safety, fire protection and prevention, industrial hygiene and is obliged to comply with by virtue of statutory requirements as well as being part of the contractual requirements. It is the responsibility of the Contractor that he, his employees and their sub-contracts are aware of and familiar with the safety rules and practices as authorised by the Superintending Officer.</p>					
<p>B A qualified and competent Safety officer must be assigned full time in the project. The Contractor to provide safety programme in accordance to safety regulations of Government.</p>					
<p>C The Contractor is also responsible for performing work under the contract in a healthy and safe manner including protecting the safety and welfare of other sub-contractos.</p>					
<u>Termination and Suspension</u>					
<p>D Any infringements by the contractor identified by the Superintending Officer of the above laws, regulations and safe operating standards shall be promptly remedied at contractor's expense.</p>					
<p>E The Superintending Officer reserves the right to stop the work at Contractor's expense until such unsafe acts and situations have been rectified and in the event of serious or repeated infringements, may terminate the contract without compensation.</p>					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) CONSTRUCTION SITE SAFETY, HEALTH AND WELFARE</u>					
<u>Safety Equipment</u>					
<p>A Contractor shall at its own expense provide adequate first aid equipment, fire extinguishers and other safety equipment of an approved type and amount, as may be specified (or expected in accordance with good working practices) in connection with this contract and shall maintain this equipment in a professional manner as instructed by the Superintending Officer.</p>					
<p>B Ensure at all times that the equipment shall be periodically inspected by a competent internationally recognised authority and certified by such authority to be in a safe working condition.</p>					
<u>Protective Personal Equipment</u>					
<p>C Contractor shall, at his own expense, supply his personnel and sub-contractor's personnel, required in connection with the safe performance of the work, with adequate protective personal clothing and other protective equipment which shall be maintained in good condition or replaced and shall be worn on relevant occasions as indicated by notices, instructions and good practice. These shall include safety shoes, safety helmets, eye goggles, hand gloves, safety belts and harness etc.</p>					
<u>Hygiene</u>					
<p>D Contractor shall ensure that his personnel and sub-contractor's personnel maintain the highest standard of hygiene in connection with the performance of this contract.</p>					
<u>Housekeeping</u>					
<p>E Contractor shall ensure that good housekeeping is maintained continuously throughout the duration of the work with due regards being paid to tidiness, access ways and disposal of scrap materials and rubbish.</p>					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)				
<u>(Cont) CONSTRUCTION SITE SAFETY, HEALTH AND WELFARE</u>				
<u>Safety Warning Signs and Colours</u>				
<p>A Safety sign shall comply with BS.5378 : Part 1 & Part 2 : 1980 and Part 3 : 1982. All safety sign should be identified in one or more of the four basic categories such as prohibition, warning, mandatory or safe condition.</p>				
<u>Design Symbols</u>				
<p>B The design symbols shall be as simple as possible and details not essential for the understanding of the message shall be omitted.</p>				
<p>C Caution signs shall show the nature of the danger.</p>				
<p>D Mandatory sign shall show only what is being mandated and prohibition signs shall show only what, or who is prohibited.</p>				
<u>Colour, Shape and Layout</u>				
<p>E The Colour, Shape and Layout of the signs shall comply with BS.5378 : Part 1 and the colorimetric and photometric properties shall comply with BS.5378 : Part 2.</p>				
<u>General Safety Provisions</u>				
<p>F Suitable overhead protection (in the form of safety nets, catch platforms and hoardings, etc.) are to be provided where persons are required to work or pass by places that are normally exposed to falling materials or objects.</p>				
<u>Accident/ Incident Reporting</u>				
<p>G Report to the Superintending Officer, any accident or incident irrespective of whether injury to personnel, damage to property, plant or equipment, fire and a "near-miss" situation which might have led to one of the above mentioned consequences.</p>				

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) CONSTRUCTION SITE SAFETY, HEALTH AND WELFARE</u>					
<u>Safety Meetings</u>					
<p>A Contractor shall be responsible for maintaining and enhancing the safety awareness of its personnel and sub-contractor's personnel, including arranging safety meetings.</p>					
<u>First-Aid</u>					
<p>B Make arrangements for first-aid treatment to be available on site at all times. Adequate and suitable first-aid equipment shall be provided. All work-people and others on site shall be informed of the location of such equipment and treatment positions.</p>					
<u>Anti-malarial Measures</u>					
<p>C Take all necessary measures to prevent the breeding and presence of mosquitoes on the site and pay any charges levied by the relevant authorities for anti-malarial measures.</p>					
<u>CONSTRUCTION SITE SAFETY - BASIC SAFETY</u>					
<u>Site Tidiness</u>					
<p>D Materials, tools and equipments shall be properly stacked and stored at designated places. Electrical switchboards, emergency switches, alarms, fire fighting equipments, first aid equipments and exits shall be indicated and remain unobstructed.</p>					
<u>Excavation</u>					
<p>E Excavation must have adequate and proper shoring and side supports with access complete with barriers and conspicuous warning sign. The edge must be stable and barricaded at a safe clearance from vehicles, equipments and workers.</p>					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) CONSTRUCTION SITE SAFETY - BASIC SAFETY</u>					
<u>Machinery and Plant</u>					
<p>A Machinery and plant must be clean and properly maintained with guards on moving parts. They must have stable, firm base and properly supported and operated by skilled operators.</p>					
<u>Temporary Electrical Works</u>					
<p>B All temporary electrical works must have appropriate connection to main lines with meters and fuses. All wires and cables must be properly fastened, supported and neatly installed with protection from being wet and from workers, vehicles and equipments when at ground/floor surface. The works must be installed and maintained by competent electrician.</p>					
<u>Roof Works</u>					
<p>C Roofers must be provided with adequate and safety gears, crawl boards and ladders. Materials must be stacked safely on roof with easy and safe access for workers.</p>					
<u>Gas/ Arc Welding and Cutting</u>					
<p>D Ensuring appropriate and safe handling, stacking and location of gas cylinders. All electrical arc welding equipments, hoses, cables must be protected. Warning signs and protective gears to be used and the works operated by competent and qualified welders and fabricators.</p>					
<u>Periodic Inspection</u>					
<p>E Ensure that all items of equipment shall be periodically inspected by a competent internationally recognised authority and certified by such authority to be in a safe working conditions.</p>					
<u>LABOUR ON COST</u>					
<p>F Provide for all costs, payment and charges in respect of all employees for:-</p>					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)				
<u>(Cont) LABOUR ON COST</u>				
1) Annual and Public Holidays				
2) Travelling time, expenses, fares and transport				
3) Non-productive time and other expenses in connection with overtime				
4) Incentive and bonus payments				
5) Payment of Labour Deposits or cost of providing Banker's Guarantee in lieu of such deposit				
6) Any other payments and charges arising from the employment of workmen				
<u>MAINTENANCE OF PUBLIC AND PRIVATE ROADS</u>				
A Keep the approaches to the site free from excavated materials, mud and debris.				
B Maintain public and private road, footpaths, roadside drains, kerbs and like, and make good any damage caused including that caused by all Sub-Contractor and supplier to the satisfaction of Superintending Officer and pay all costs and charges in connection therewith.				
C Where appropriate or where directed by the Superintending Officer or other competent authority the Contractors shall erect and maintain such temporary warning lights and flags as directed and required to emphasize danger from any works or construction plant.				
<u>REMOVAL OF RUBBISH</u>				
D Keep the site tidy and free from rubbish, debris and the like.				
E Provide all necessary containers like metal 'skip' and remove all rubbish, debris and the like from the site to approved dumping areas at regular intervals.				

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) REMOVAL OF RUBBISH</u>					
<p>A Burning of rubbish on site is strictly prohibited.</p>					
<u>CLEARING UPON COMPLETION</u>					
<p>B On completion of the works all plants, building appliances, apparatus or equipment are to be removed as quickly as possible and conveyed away from the site at the sole cost of the Contractor. All services and leads, temporary buildings, shed, barriers, scaffolding, etc. required in the work construction are to be disconnected, dismantled, taken down and removed.</p>					
<p>C All holes, trenches, excavation in connection with plant, etc. are to be filled in a proper manner, levelled of and closely turfed and the site left in a clean and orderly conditions.</p>					
<p>D In the event of the Contractor not clearing away the above mentioned materials, plant and other temporary works within a stipulated time, the Employer shall arrange for same to be executed by some other party and the cost of such clearing away shall be adjusted against the Contractor's Final Account. Employer will not be held responsible or liable for any material or plant left upon the site.</p>					
<p>E Before handing over the Works to the Superintending Officer, the Contractor shall scrub all floors, pavings, staircase, etc. and cleaning out all gutters, gulleys, manholes, sumps and drains. The Contractor shall also clean all glass panes and leave every part of the completed works included in this Contract in clean, sound and tidy condition to the approval of the Superintending Officer.</p>					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)				
<u>NUISANCE</u>				
<p>A The amount of noise made on the works is to be kept to minimum. Generators, compressors and other nosiy plants are to be muffled at all times by means of silencers, screens and the like.</p>				
<p>B Make all precautions to prevent the starting and spread of fire and provide suitable fire fighting equipment.</p>				
<p>C Take all reasonable measures to prevent nuisance by dust by regular watering or other appropriate means and as when the need arises or when instructed by the Superintending Officer.</p>				
<p>D The Contractor shall not obstruct any public way or do any thing which may amount to a nuisance or annoyance, and shall not interfere with any right of way or light to adjoining property and may upon notice received by him or left upon the site requiring the discontinuance or suspension of any part of the works shall at once be forwarded by him to the Superintending Officer or if given verbally, shall at once be communicated by him to the Superintending Officer in writing and the Contractor shall keep the Employer indemnified against any claim or omission of the Contractor or his agents, servants or workmen in this respect.</p>				
<u>SAMPLES</u>				
<p>E Samples of materials and fittings shall be submitted for approval prior to any order by the Contractor and as early in the Contract as possible. All samples which are approved shall indicate the standard to be maintained in the execution of the works.</p>				

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)				
<u>TEST</u>				
<p>A Arrange for test of any materials or workmanship to be carried out as and when the Superintending Officer may direct and either at on or off-site laboratories as instructed. Pay all costs and charges in connection therewith.</p>				
<u>SHOP DRAWINGS</u>				
<p>B Prepare and submit to the Superintending Officer for approval prior to ordering materials or commencing any works, fully detailed and dimensioned shop drawings as stated below. Obtain the Superintending Officer written approval to the drawings.</p> <p>(a) Structural Steelworks</p> <p>(b) Metalworks</p> <p>(c) Doors and Windows</p> <p>(d) Plumbing and Sanitary</p> <p>(e) Mechanical and Electrical Works</p> <p>(f) Other Proprietary or Prefabricated Items</p>				
<u>RECORD DRAWINGS</u>				
<p>C The Contractor shall make accurate records of those parts of the works which will become hidden by further progress as may be directed by Superintending Officer. Such records shall be checked and verified by the Superintending Officer while the work is open for inspection. Records shall be entered by the Contractor on prints of drawings which will be made available to him free of cost for this purpose, amplified by him with supplementary dimensioned sketches and handed to the Superintending Officer as soon as practicable.</p>				
<p>D This record drawings will be used for the preparation of as built drawings.</p>				

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)				
<u>OPERATING AND MAINTENANCE INSTRUCTION</u>				
<p>A Obtain and hand over to the Superintending Officer upon completion any operating and maintenance instruction provided by manufacturers, suppliers or sub-contractors.</p>				
<u>PROGRESS PHOTOGRAPHS</u>				
<p>B Provide six sets of photographs to the Superintending Officer before commencement of the works and thereafter on the first day of each month adequately recording the progress on site. Each set of not exceeding 20 copies suitably dated and titled taken from various elevations as directed by the Superintending Officer. The Contractor shall also provide necessary album for safe keeping of the progress photographs.</p>				
<p>C In addition to the progress photographs, the Contractor is required to submit together with each of his monthly progress payment application, all necessary photographic records (in 6 sets or more) showing his work done to date and materials delivered to site to facilitate the processing of progress payment.</p>				
<u>GENERAL ATTENDANCE</u>				
<p>D Provide the general attendance of one trade upon another.</p>				
<u>CONTRACTOR'S MECHANICAL AND ELECTRICAL CO-ORDINATOR</u>				
<p>E The Contractor shall submit for approval within 7 days from the day of acceptance of his tender the name and particulars of an English speaking, specially qualified and experienced supervisor for co-ordinating the specialist's work with the Main Contractor and other Nominated Subcontractors over the whole Contract period and he shall be in attendance full time on the works. He must have not less than 5 years experience in site management relating to Mechanical and Electrical co-ordination works.</p>				

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)				
<u>PROTECTING THE WORKS</u>				
<p>A Take all necessary protective measures as directed throughout the currency of the Contract to protect all finished work from damage or deterioration because of the activities of any workpeople (including those of the Employer's separate specialist Contractors) or of any other cause and leave the whole of the works perfect and to the Superintending Officer's satisfaction on completion.</p>				
<u>EXISTING SERVICES</u>				
<p>B The Contractor shall take all necessary steps to ascertain the exact positions of existing overhead cables, pipes, ducts, sewers, services main and shall uphold, protect and maintain all these and other services of the like nature during excavations for the purpose of this Contract and make good or pay for making good all damage thereto and any consequential damage or loss arising out of such damage.</p>				
<p>C In the case where the services are to be temporarily terminated or diverted, the Contractor shall give the necessary notices to the appropriate Authorities and arrange for the work to be carried out and pay all charges in connection therewith.</p>				
<u>PROTECT PROPERTY</u>				
<p>D Take all adequate and reasonable measures to protect any private properties. Make good all damages due to any cause within the Contractor's control at his own expense or pay all costs and charges in connection therewith.</p>				
<u>ORDERING AND DELIVERY OF MATERIALS</u>				
<p>E The Bills of Quantities is not a schedule of material and the Contractor should not order any materials from the quantities and sizes stated in these Bills of Quantities but must take all quantities and sizes from the drawings.</p>				

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>MATERIALS FROM GOVERNMENT STORE</u>					
<p>A When materials are required to be obtained from Government stores the Contractor is to load and transport these to site and is to return any returnable crates, drums or other containers, which will otherwise be charged to his account.</p>					
<u>COVERING UP</u>					
<p>B No work shall be covered until it has been examined and approved by the Superintending Officer.</p>					
<p>C Failure by the Contractor to inform the Superintending Officer on time before covering up the work may render his claim null and void.</p>					
<u>LOADING IN EXCESS OF DESIGN LOAD</u>					
<p>D No loading in excess of the design loading shall be placed on any portion of the structure without the written permission of the Superintending Officer.</p>					
<p>E If such permission is granted all structural members subjected to loading other than design shall be strengthened and supported to the satisfaction of the Superintending Officer and the Contractor will bear all additional expenditure.</p>					
<p>F Notwithstanding the written permission of the Superintending Officer the Contractor shall bear all costs arising out of the making good of any damage to the permanent structure caused by excess loading.</p>					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>ROYALTIES AND PATENT RIGHT</u>					
<p>A All royalties or other sums payable in respect of the supply and use in carrying out the works as described in or referred to in Contract Bills of any patented articles, processes or inventions shall be deemed to have been included in the Contract Sum and the Contractor shall indemnify Employer from and against all claims, proceeding, damages, costs and expenses which may be brought or made against Employer or to which the Employer may be put by reason of the Contractor infringing or being held to have infringed any patent rights in relation to any articles, processes and inventions.</p>					
<p>B A Provisional Sum (where applicable) has been included elsewhere in these Bills as payment according to circular imposed by the Brunei Government Lands Department in connection with filling material imported to the site.</p>					
<u>CUSTOMS RESTRICTIONS AND DUTIES</u>					
<p>C Provide for all cost incurred in connection with customs restrictions, quotas, duties and taxes.</p>					
<u>KEEPING SITE DRY</u>					
<p>D The Contractor shall be responsible for keeping the whole of the works well drained and free from all water.</p>					
<u>TEMPORARY DRAINAGE, SILT TRAPS AND OTHER ANTI EROSION MEASURES</u>					
<p>E The Contractor shall during the course of the works take such additional measures including construction of temporary drainage, silt traps and other anti-erosion measure etc. as necessary, to prevent the movement of eroded materials and debris from construction areas and/ or other erosion of any parts of the site.</p>					
<p>F Construct stormwater drains along temporary roads, hardstanding, etc. to the satisfaction of the Superintending Officer.</p>					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>TRESPASS</u>					
<p>A The Contractor shall prevent any trespass onto the adjacent properties by his own employees or those of `Sub-Contractors' and shall indemnify Employer against any claims, costs of proceedings whatsoever arising out of any trespass.</p>					
<u>METRICATION</u>					
<p>B The Contractor is to bear all procedural and administration costs in connection with ordering and usage of materials which is specified in either metric or imperial dimension.</p>					
<p>C The Contractor will not be allowed reimbursement of additional costs should the nearest suitable and acceptable imperial sized material to the metric sized specified or vice-versa be more costly.</p>					
<u>CO-OPERATION AND CO-ORDINATION</u>					
<p>D Co-operate with all other persons who are on the site with the authority of the Employer. Co-ordinate the Works such that they may be completed in the most efficient and acceptable manner.</p>					
<p>E The Contractor shall permit other Contractors and the Employer to use any part of the Works.</p>					
<u>RESPONSIBILITY</u>					
<p>F Where the Contractor does not price an item in the Preliminaries or inserts a dash against any item in the Bills of Quantities, the value therefore will be deemed to be included in the rates contained in the Bills of Quantities.</p>					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)				
<u>(Cont) RESPONSIBILITY</u>				
<p>A The Contractor is to exercise care in pricing items of similar description throughout the Bills of Quantities. In pricing variations arising from Superintending Officer's instructions, the Quantity Surveyor will apply the lowest rate for any individual item where unit rates vary from element to element or from section to section.</p>				
<p>B Whether expressly stated or not in these Bills of Quantities all description, specification and quantities are implied to be directed at or towards the tenderer tendering for and later awarded the Contract. No allowance will be made for non compliance with any clause due to lack of understanding. The tenderer shall price every item for which he requires remuneration. If any item is not priced it shall be deemed that the tenderer required no remuneration or that no cost to the tenderer is involved in compliance with the particular clause.</p>				
<p>C All the provisional quantities and/ or items stated in these Bills of Quantities shall be remeasured according to the latest drawings or as directed at site. No claim shall be entertained in respect of any item omitted entirely or in part or alternatively increased in quantity by any amount in respect to the Bills.</p>				
<u>PROTECTION OF AND DAMAGE TO ADJOINING EXISTING BUILDINGS, OCCUPANTS, ETC.</u>				
<p>D The Contractor is to allow for all test pits to locate existing foundations, underpinning, all requisite shoring, needling, strutting and other supports, screens, barricades, etc., for the protection of operatives, site staff, occupants, adjoining property and the public, and alter, adapt and maintain them as necessary.</p>				

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)				
<u>(Cont) PROTECTION OF AND DAMAGE TO ADJOINING EXISTING BUILDINGS, OCCUPANTS, ETC.</u>				
A The Contractor shall carry out the works in such manner and with such care that no damage shall be caused to adjoining and neighbouring buildings, structures, drains, etc.				
B Should the Contractor damage any of the adjoining and neighbouring buildings, structures, drains, etc., he shall be liable for making good all works disturbed to adjoining and neighbouring buildings and shall indemnify the Employer in respect of claims or proceedings arising out of the neglect of this clause.				
C It is the responsibility of the Contractor to protect the adjacent buildings against movement caused by settlement during and after construction of the new building.				
<u>HOARDING</u>				
D Provide, erect and maintain adequate, secure and safe metal / timber hoarding as approved by the S. O. including removal after completion				
E The Contractor is to liase with the Superintending Officer on the exact location of the hoarding line based on site condition and the client's requirement, and to the approval and satisfaction of the Superintending Officer.				
<u>PROJECT NAME BOARDS</u>				
F The Contractor shall provide, erect and maintain standard size painted timber name boards with pitched roof showing the project name, Client, Consultants, Main Contractor and other sub-contractors as required and directed by the Superintending Officer				
G The design wording, sitting and maintenance of the boards shall be approved by Superintending Officer prior to it being erected.				

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)				
<u>(Cont) PROJECT NAME BOARDS</u>				
A All boards are to be removed on completion of the works.				
<u>GROUND BREAKING CEREMONY</u>				
B Allow for ground breaking ceremony when required prior to laying of foundation and the date shall be confirmed by the S.O. The Contractor shall provide and remove on completion proper access, platform, wheel barrow, safety outfit, tent, electricity, water. etc.				
C No claim or extension of time shall be entertained on the ground of ignorance of this clause.				
<u>MOCK-UP</u>				
D Allow here for all costs in connection with the construction and completion of a mock-up as shown and specified on drawings.				
E The Contractor's attention is drawn to the fact that all the Architectural and Structural Works are measured and included in the Measured Works Bills of Quantities but the Contractor shall bear all costs and charges incurred for buying small quantities of material in advance and for the constructing the mock-up "out of sequence" with the overall master program				
F Priority must be given in the Contractor's overall program for executing the mock-up well ahead of the rest of the works				
G The Contractor shall liaise closely with Consultants especially with regards to the approval of sample to be used in the mock-up. The Contractor shall ensure that the progress of the works in the other areas is not adversely affected and should progress as per the master program. No claims will be entertained on the ground of disruption, inconvenience and/ or ignorance of this clause				

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)				
<u>GENERAL CONDITIONS & OTHER PRELIMINARIES</u>				
<p>A Allow here for complying with the general conditions and other preliminary items, etc. and provide all things required necessary for the complete execution of the Works herein, all to the approval and satisfaction of the Architect (Tenderers must specify items involved therein)</p>				
<u>OTHER WORKS NECESSARY</u>				
<p>B Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item		

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
COLLECTION					
Page No. BQ/1					
Page No. BQ/2					
Page No. BQ/3					
Page No. BQ/4					
Page No. BQ/5					
Page No. BQ/6					
Page No. BQ/7					
Page No. BQ/8					
Page No. BQ/9					
Page No. BQ/10					
Page No. BQ/11					
Page No. BQ/12					
Page No. BQ/13					
Page No. BQ/14					
Page No. BQ/15					
Page No. BQ/16					
Page No. BQ/17					
Page No. BQ/18					
Page No. BQ/19					
Page No. BQ/20					
Page No. BQ/21					
Page No. BQ/22					
Page No. BQ/23					

BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$
BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)				
<p>COLLECTION</p> <p>Page No. BQ/24</p> <p>Page No. BQ/25</p> <p>Page No. BQ/26</p> <p>Page No. BQ/27</p> <p>Page No. BQ/28</p> <p>BILL 1B - GENERALLY AND PRELIMINARIES (CHANCERY BUILDING & STAFF RESIDENCES) Carried to Summary</p>				

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 2 - GENERAL NOTE</u></p> <p><u>NOTES</u></p> <p>The bills are to be read and priced in conjunction with the drawings, specification and include all works described / shown in bills and drawings</p> <p>The Contractor is to comply with the conditions of contract, specification, all preliminaries, etc. necessary for the complete execution of the works</p> <p>The Contractor shall be responsible for applying and obtaining all required permits from the relevant authorities for temporary accesses, etc. and for payment of fees thereof</p> <p>The Contractor must visit the site so as to take into consideration existing conditions and to have satisfied himself as to the nature of the site, soil condition, facilities for access, mobilisation of plants, etc. required under this contract. No claims will be allowed on the grounds of ignorance of the conditions under which the works will be executed</p> <p>Prior to the commencement of any work, the levels of the original surface of the site including all slopes shall be agreed by the Superintending Officer in accordance with Preliminaries under 'Setting Out and Site Levels' and on completion of this works, the Contractor must submit as built drawings as required in Preliminaries under 'Completion Joint-Survey and As Built Drawing' which shall form the basis of measurement</p> <p>The Contractor shall take all measures to protect the existing cables and services that is not affected by his scope of work. Any such damage caused by the Contractor shall be made good at the expense of the Contractor and to the satisfaction of the Superintending Officer</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 2 - GENERAL NOTE (Cont)</u></p> <p><u>(Cont) NOTES</u></p> <p>All making good shall be executed with materials and workmanship to match in every respect of the surrounding work and shall be properly done thereto to the complete satisfaction of the S.O.</p> <p>Unless otherwise specified, all materials and debris resulting from the clearing shall be stacked and removed completely from the site. On no account shall cleared timber or other materials be deposited in areas to be filled. Burning on site shall be prohibited</p> <p>No tipping on the adjoining land shall be allowed in this contract. The Contractor is therefore to make his own arrangements for disposal of all surplus excavated materials where directed and is to pay all charges in connection therewith</p> <p>Tenderer shall make his own assessment from all drawings and specification issued at the time of tederer. Any discrepancies between drawing and Bill of Quantities, the drawings shall take precedence. No additional claim will be entertained</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - GENERAL NOTE (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 2 - GENERAL NOTE Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - PILING</u>					
	<u>BORED PILE (ALL PROVISIONAL)</u>					
	Length of bored piles may vary up to 12 m		Note			
	The bored piles shall be installed into approximately 4 m of stiff clay layer and 5 m of hard strata below		Note			
	Temporary casing shall be used while drilling and be withdrawn during concreting		Note			
A	Top 6 m length of bored pile shall have reinforcement cage as specified in the bored pile schedule					
	Excentricity for each pile shall not exceed 50 mm in each direction from the specified location		Note			
	Piling Contractor shall submit soil samples in sealed containers, taken every 1 m during boring for bored piles to S.O.'s representative on site		Note			
	Minimum cement content for concrete shall be 400 kg/m ³ when concreting is done under water		Note			
	All details specification and method statement for bored piling to refer to Engineer's drawing piling note		Note			
B	Allow for provision of sufficient number of bored piling machinery, equipments and temporary steel casing for bored pile including transporting to and assembling at site, moving about site as required and finally dismantling and removing from site on completion and clear all debris (allow for all standing time between boring of piles)		Item			
C	Blind boring for 450 mm diameter bored pile	1545	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - PILING (Cont)</u>					
	<u>(Cont) BORED PILE (ALL PROVISIONAL)</u>					
	<u>Boring pile hole and installing bored pile including filling bored pile hole with reinforced concrete (grade 40) and reinforcement bars as shown on Engineer's drawing including removing excavated material from site</u>					
A	450 mm diameter bored pile with 8 nos. 16 mm diameter high tensile bar, 10 mm diameter high tensile spiral links at 200 mm centre pitch	1545	m			
	<u>Cleaning bottom of bored hole to receive concrete</u>					
B	450 mm diameter pile	91	no			
	<u>Labour for cutting off head of bored pile to the required level and remove debris off-site</u>					
C	450 mm diameter pile	91	no			
	<u>Allow for carrying out load test to twice the designed working load on working test pile to Engineer's approval including all necessary platform, kentledges and clearing away on completion</u>					
D	On 450 mm diameter bored pile with working load of 85 tonnes	2	no			
	<u>Allow for carrying out load test to failure on non-working test pile to Engineer's approval including all necessary platform, kentledges and clearing away on completion</u>					
E	On 450 mm diameter bored pile with working load of 85 tonnes	2	no			
	<u>OTHER WORKS NECESSARY</u>					
F	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 2 - PILING (Cont)</u></p>					
<p><u>(Cont) OTHER WORKS NECESSARY</u></p>					
<p>2) _____</p>					
<p>3) _____</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - PILING (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>BILL 2 - PILING Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - SUBSTRUCTURE</u>					
	EXCAVATION					
A	Excavate pit for pile cap and lift pit, commencing from platform level, not exceeding 2.00 m deep, get out part return, fill in, ram and surplus cart away excavated material where directed	148	m3			
B	Excavate trench for ground beam, commencing from platform level, not exceeding 2.00 m deep, get out and cart away excavated material where directed	185	m3			
C	Excavate for ground slab and apron slab commencing from platform level, not exceeding 300 mm, average 200 mm deep, get out and cart away excavated material where directed	1813	m2			
	ANTI-TERMITE TREATMENT					
D	Prepare and apply one coat of organic chlorine or other equal and approved anti-termite chemical treatment to general surfaces as specified (measured flat over ground floor slab and apron slab area; rate to include for treating surfaces of ground beam, footing and the like and for appointing a registered pest control company to carry out the work and also for providing a ten (10) year warranty)	1813	m2			
	DAMP PROOF MEMBRANE					
E	"POLY-FILM 1000" or other equal and approved damp proof membrane laid on prepared bed, seal laps with approved pressure sensitive tape (measured flat over ground floor slab - rate to include for laps, cutting and waste)	1813	m2			
	CONCRETE WORKS					
	<u>50 mm thick lean concrete (grade 15) to underside of</u>					
F	Pile cap	51	m2			
G	Ground beam	231	m2			
H	Ground floor slab	1423	m2			
J	Apron slab	390	m2			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - SUBSTRUCTURE (Cont)</u>					
	(Cont) CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	Pile cap	61	m3			
B	Stump	18	m3			
C	Ground beam	139	m3			
D	200 mm thick ground floor slab	118	m2			
E	150 mm thick ground floor slab	1305	m2			
F	150 mm thick apron slab	390	m2			
G	<u>Extra over</u> for non-slip groove line to ramp		Item			
	<u>10 mm to 25 mm diameter mild steel / high tensile reinforcement bar in</u>					
H	Pile cap	8418	kg			
J	Stump	2637	kg			
K	Ground beam	29468	kg			
L	Ground floor slab	18207	kg			
M	Apron slab	4856	kg			
	<u>Formwork to</u>					
N	Sides of pile cap	324	m2			
P	Sides of stump	197	m2			
Q	Sides of ground beam	1014	m2			
R	Drop in ground slab / apron slab and edge of ground slab / apron slab		Item			
S	Drop in ramp and edge of ramp		Item			

	Description	Qty	Unit	Rate	\$	c
<p style="text-align: center;"><u>BILL 2 - SUBSTRUCTURE (Cont)</u></p> <p>(Cont) CONCRETE WORKS</p> <p>A Movement/Expansion joint, filled with 25 mm wide x 50 mm deep 'Expandite 99' or other equal and approved expansion / movement joint complete with 25 mm thick softboard filler including slip membrane and additional use of formwork, all as detailed on drawings and in specification</p> <p>OTHER WORKS NECESSARY</p> <p>B Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>						
		Item				
			Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - SUBSTRUCTURE (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>BILL 2 - SUBSTRUCTURE Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - FRAME</u>					
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	Suspended beam	57	m3			
B	Column	124	m3			
	<u>10 mm to 32 mm diameter mild steel / high tensile reinforcement bar in</u>					
C	Suspended beam	10602	kg			
D	Column	18228	kg			
	<u>Formwork to</u>					
E	Sides and soffit of suspended beam	523	m2			
F	Sides of column	1337	m2			
	OTHER WORKS NECESSARY					
G	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - FRAME (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 2 - FRAME Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - UPPER FLOOR</u>					
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	150 mm thick suspended slab	630	m2			
	<u>10 mm and 12 mm diameter mild steel / high tensile reinforcement bar in</u>					
B	Suspended floor slab	7837	kg			
	<u>Formwork to</u>					
C	Sides and soffit of suspended slab	536	m2			
D	Drop in slab and edge of floor slab		Item			
E	Movement/Expansion joint, filled with 25 mm wide x 50 mm deep 'Expandite 99' or other equal and approved expansion / movement joint complete with 25 mm thick softboard filler including slip membrane and additional use of formwork, all as detailed on drawings and in specification		Item			
	OTHER WORKS NECESSARY					
F	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - UPPER FLOOR (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 2 - UPPER FLOOR Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - ROOF</u>					
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	Roof beam	134	m3			
B	Gutter beam	4	m3			
C	150 mm thick roof slab	233	m2			
D	200 mm thick roof slab	131	m2			
E	230 mm thick roof slab	31	m2			
F	150 mm thick gutter slab	8	m2			
	<u>10 mm to 25 mm diameter mild steel / high tensile reinforcement bar in</u>					
G	Roof beam	22780	kg			
H	Roof slab	5647	kg			
J	Gutter beam	681	kg			
K	Gutter slab	100	kg			
	<u>Formwork to</u>					
L	Sides and soffit of roof beam	1112	m2			
M	Sides and soffit of gutter beam	32	m2			
N	Soffit of roof slab	340	m2			
P	Soffit of gutter slab	8	m2			
Q	Drop in slab and edge of slab		Item			
R	Edge of lift core top slab		Item			
S	Reinforced concrete ledge in various thickness including all necessary formwork, reinforcement, finished with all exposed concrete surfaces with approved paint in approved color, waterproofing membrane and etc., all as per Architectural and Engineer's details drawings	83	m2			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - ROOF (Cont)</u>					
	(Cont) CONCRETE WORKS					
A	Extra over for forming 500 mm wide x 50 mm depth scupper drain finished with screeding and approved high quality waterproofing to specification and Architect's approval, all as detailed on drawings		Item			
B	Decorative reinforced concrete capping to gutter wall including all necessary formwork, reinforcement and finished all expose surface with 'KCC' textcoat with 'Wattyl Solagard' or other equal and approved paint in approved colour		Item			
	STRUCTURAL STEEL ROOF MEMBER					
	All steel works members shall be high tensile galvanised steel, welded and bolted together, including all shop and site welding, filling smooth junction, raking and cutting, hoisted and placed in position all as detailed on drawings		Note			
	Rate to include submission of shop drawings		Note			
	Rate to included for sand blast clean to BS4232, degrease and wash clean all steel area and repair all damaged including approved paint to Engineer's approval		Note			
	All steel works members, plates, cleats and bolts shall be high tensile galvanised steel including all necessary approved painting as specified		Note			
	<u>Supply, install and erect the following structural steelworks hoisted and fixed in position to level as accordance to drawing in bolted and welded connection with and including all cutting, drilling, welding and approved metal paint finished (to all expose surfaces), all as detailed on Engineer's drawings</u>					
C	RHS 100 x 200 x 5 mm thick	1787	kg			
D	RHS 120 x 80 x 6.3 mm thick	7163	kg			
E	RHS 70 x 70 x 5 mm thick	3063	kg			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - ROOF (Cont)</u>					
	(Cont) STRUCTURAL STEEL ROOF MEMBER					
A	C15016 lipped C purlin	1001	m			
B	Plates / splicing		Item			
C	Angle Cleat including fasteners		Item			
D	Bolts / anchor bolts including nuts and washers		Item			
E	Holding down bolts		Item			
F	Non shrink grout		Item			
	ROOF COVERING					
	<u>'Shinto' CERAM-FS or other equal and approved clay glazed roof tiles in approved colour to and including 50 x 25 mm treated hardwood battens at approximately 240 mm centre nailed to and including 50 x 75 mm treated hardwood counter battens at 450 mm centres complete with all necessary fixing accessories, all in strict accordance with the manufacturer's instruction (measured nett - no allowance made for laps)</u>					
G	Roofing tiles	1079	m2			
H	Gable left and right capping tiles	31	m			
J	Long gable left and right capping tiles	2	m			
K	Gable corner left or right tiles	6	no			
L	Ridge capping tiles	103	m			
M	Ridge down end tiles	7	no			
N	Ridge end tiles including packing with cement mortar reinforced with BRC wire mesh	5	no			
P	3-Forked ridge tiles	3	no			
Q	Bird stopper (black, 915 mm length)	220	no			
R	3.5 mm dia. x 51 mm GI screw	13000	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - ROOF (Cont)</u>					
	(Cont) ROOF COVERING (Cont) 'Shinto' CERAM-FS or other equal and approved clay glazed roof tiles in approved colour to and including 50 x 25 mm treated hardwood battens at approximately 240 mm centre nailed to and including 50 x 75 mm treated hardwood counter battens at 450 mm centres complete with all necessary fixing accessories, all in strict accordance with the manufacturer's instruction (measured nett - no allowance made for laps)					
A	3.8 mm dia. x 65 mm GI screw with packing	600	no			
B	High tensile colourstrong steel roof sheeting in approved colour, fixed to timber purlin with and including all fixing accessories all to the manufacturer's instruction (measured nett - no allowance made for laps)	1079	m2			
C	22 Gauge plain galvanised iron sub-roofing sheet, with bottom edge folded as shown, sides and end laps minimum 300 mm wide and edges filled with heat resistant silicone sealant (measured nett - no allowance made for laps)	1079	m2			
D	50 mm thick approved fibreglass insulation with and including 1 layer approved double sided aluminium foil and approved wire mesh (measured nett - no allowance for laps)	1079	m2			
E	Approved matching solid hardwood fascia board complete with galvanised angle framing and bracing including all cutting, drilling, welding, bolts and nuts, all as detailed on drawing and in specification	499	m			
F	Longitudinal end flashing, fixed with and including turning down at ends (measured nett - no allowance made for laps)		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - ROOF (Cont)</u>					
	ROOF WATERPROOFING SYSTEM					
	<u>30 mm thick cement and sand (1:3) screed laid to falls to receive waterproofing system to</u>					
A	Roof slab	763	m2			
B	Gutter slab	32	m2			
C	Sides of gutter wall	48	m2			
D	150 mm high upturn skirting	162	m			
E	300 mm high upturn skirting	123	m			
F	Down pipe and outlet		Item			
	<u>'FOSROC' Polyurea or other equal and approved (high quality, environmentally safe, energy saving and elastometric) waterproofing membrane on high-tech polymer chemistry formulation and acrylic polymers forming seamless joint, free water and weather light elastic membrane with heat insulation properties including cement and sand (1:3) screed, laid to fall and all necessary surface preparation with 'FOSROC' or other equal and approved primer 195 (Rate to include for providing a ten (10) years guarantee as specified hereinbefore) to</u>					
G	Roof slab	763	m2			
H	Gutter slab	32	m2			
J	Sides of gutter wall	48	m2			
K	150 mm high upturn skirting	162	m			
L	300 mm high upturn skirting	123	m			
M	Down pipe and outlet		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - ROOF (Cont)</u>					
	RAINWATER GOODS					
A	'TERRAIN' or other equal and approved 100 mm diameter rainwater downpipe with cement solvent joint fixed to concrete or brickwork with and including holderbats, brackets, straps, hangers, bends and the like, finish with approved finishes, to specification, engineer's, manufacturer's and specialist detail, recommendation and architect's approval, all as detailed on drawings	158	m			
B	'TERRAIN' or other equal and approved 100 mm diameter upvc rainwater downpipe with cement solvent joint laid under floor with and including brackets, straps, bends, excavation, backfill, 100 mm thick concrete (grade 20) surround reinforced with one layer BRC A6, formwork and 50 mm thick lean concrete (grade 15) under, all as detailed on drawings	219	m			
C	'TERRAIN' Geberit or other equal and approved 82 mm diameter domed roof outlet to suit 100 mm diameter upvc rainwater downpipe complete with all fixing accessories, all as detailed on drawings	26	no			
D	'TERRAIN' or other equal and approved 75 mm diameter upvc overflow pipe casted in reinforced concrete gutter wall, including all fixing accessories, finished with approved finishes to specification and architect's approval, all as detailed on drawings		Item			
	FINISHES					
	<u>20 mm thick cement and sand (1:3) plainface plaster including trowelling smooth to</u>					
E	Sides of gutter wall	83	m2			
F	Soffit of gutter slab	16	m2			
G	<u>Extra over</u> for drip mould		Item			

	Qty	Unit	Rate	\$	c
<u>BILL 2 - ROOF (Cont)</u>					
(Cont) FINISHES					
<u>(3.9) 'KCC' textcoat with 'Wattyl Solagard' or other equal and approved paint to plainface plastered (plaster measured separately) to</u>					
A	83	m2			
B	16	m2			
C		Item			
<u>OTHER WORKS NECESSARY</u>					
D		Item			
Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)					
1) _____					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - ROOF (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>Page No. BQ/5</p> <p>Page No. BQ/6</p> <p>Page No. BQ/7</p> <p>BILL 2 - ROOF Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - STAIRCASES</u>					
	Contractor to refer Schedule of Finishes for specification and description		Note			
	Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	Staircase	7	m3			
B	200 mm thick landing slab	10	m2			
	<u>10 to 12 mm diameter high tensile steel reinforcement in</u>					
C	Staircase	1183	kg			
D	Landing slab	590	kg			
	<u>Formwork to</u>					
E	Soffit of staircase	26	m2			
F	Soffit of landing slab	7	m2			
G	Side of stair open stringer 370 mm (maximum) cut to suit profile treads and risers	18	m			
H	Side of undercut riser 150 mm high	80	m			
	HANDRAILING AND BALUSTRADING					
J	1000 mm overall high decorative stainless steel in hairline natural finish handrailing and balustrading (straight and curved-on-plan) in welded connection complete with 50 mm diameter stainless steel hollow section as described top rail with 50 mm diameter short connection to railing post, 5 nos of 20 mm diameter stainless steel rod to center welded to 35 mm x 50 mm stainless steel hollow section railing post with and including all base plates, anchor bolts, bends, ramps, wreath, end caps and all fixing accessories as detailed on drawing and in specification	11	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - STAIRCASES (Cont)</u>					
	(Cont) HANDRAILING AND BALUSTRADING					
A	1000 mm overall high decorative stainless steel in hairline natural finish handrailing and balustrading (straight and curved-on-plan) in welded connection complete with 50 mm diameter stainless steel hollow section as described top rail with 50 mm diameter short connection to railing post, 10 mm thick tempered glass balustrade fixed to 35 mm x 50 mm stainless steel hollow section railing post with and including all base plates, anchor bolts, bends, ramps, wreath, end caps and all fixing accessories as detailed on drawing and in specification	13	m			
	<u>FINISHES</u>					
	<u>20 mm thick cement and sand (1:3) plainface plaster trowelled smooth to</u>					
B	Sloping soffit of staircase	24	m2			
C	Soffit of landing slab	7	m2			
D	Sides of open stringer 370 mm (maximum) wide to suit profile of treads and risers	18	m			
	<u>30 mm thick cement and sand (1:3) screed to receive tiles to</u>					
E	Landing slab	10	m2			
F	300 mm wide tread	74	m			
G	150 mm high undercut riser	80	m			
H	150 mm high tiles skirting	35	m			
	<u>(1.3) 'Cicogress' or other equal and approved 300 mm x 600 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
J	Landing slab	10	m2			
K	300 mm wide tread	74	m			
L	170 mm high undercut riser	80	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - STAIRCASES (Cont)</u>					
	(Cont) FINISHES					
A	(2.2) 'Cicogress' or other equal and approved tiles skirting, 150 mm x 600 mm	35	m			
B	<u>Extra over</u> for forming non-slip nosing tiles	74	m			
	<u>(3.2) 'ICI Dulux' pentalite or other equal and approved paint to plainface plastered (plaster measured seperately) to</u>					
C	Sloping soffit of staircase	24	m2			
D	Soffit of landing slab	7	m2			
E	Sides of open stringer 370 mm (maximum) wide to suit profile of treads and risers	18	m			
	<u>STEPS</u>					
	<u>Construction and completion of external steps including all excavation, reinforcement, reinforced concrete and all necessary formworks complete with all tiles finished, all as shown and detail on Architectural's and Engineer's drawings</u>					
F	300 mm wide steps x 150 mm high risers x 5500 mm length x 3 steps	1	no			
G	300 mm wide steps x 150 mm high risers x 3700 mm length x 4 steps	2	no			
H	300 mm wide steps x 150 mm high risers x 7000 mm length x 4 steps	1	no			
J	300 mm wide steps x 150 mm high risers x 9750 mm length x 3 steps	1	no			
K	300 mm wide steps x 150 mm high risers x 9850 mm length x 3 steps	1	no			
L	300 mm wide steps x 150 mm high risers x 1575 mm length x 1 steps	1	no			
M	165 mm wide steps x 150 mm high risers x 1575 mm length x 2 steps	1	no			

Description	Qty	Unit	Rate	\$	c
<p style="text-align: center;"><u>BILL 2 - STAIRCASES (Cont)</u></p> <p><u>(Cont) STEPS</u></p> <p>OTHER WORKS NECESSARY</p> <p>A Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - STAIRCASES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>BILL 2 - STAIRCASES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - EXTERNAL WALLS</u>					
	BRICKWALL					
	<u>Common brickwall in cement and sand (1:3) mortar with and including 'Exmet' reinforcement at every fourth course</u>					
A	115 mm thick brickwall	437	m2			
B	150 mm thick brickwall	10	m2			
C	300 mm thick cavity brickwall	420	m2			
D	415 mm thick cavity brickwall	105	m2			
	TIMBER LOUVERS SCREEN					
E	Supply and install solid timber screen with various profile in selective water based coating finished to approved colour complete with all framing and fixing accesories, built into concrete all support frames, all as per details on Architectural drawings and in strict accordance with the manufacturer's instructions and specification	145	m2			
	DECORATIVE SCREEN					
F	Supply and install of decorative Archifacade Lightweight Architectural Screen with metal framing finished with spray coated paint SKK stone finish, complete with bracket, all fixing accessories etc, all as detail on Architectural's drawing and in strick accordance with the manufacturer's instructions and specifications	224	m2			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - EXTERNAL WALLS (Cont)</u>					
	GLASS BALUSTRADE					
	<u>Decorative stainless steel in hairline natural finish balustrading (straight and curved-on-plan) in welded connection complete with 50 mm diameter stainless steel hollow section as described top rail with 50 mm diameter short connection to railing post, 10 mm thick tempered glass balustrade fixed to 35 mm x 50 mm stainless steel hollow section railing post with and including all base plates, anchor bolts, bends, ramps, wreath, end caps and all fixing accessories as detailed on drawing and in specification</u>					
A	1000 mm high, straight	2	m			
B	1100 mm high, straight	17	m			
C	115 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)			Item		
D	150 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)			Item		
E	300 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)			Item		
F	415 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)			Item		
G	6 mm diameter x 450 mm long mild steel bonding ties, one end cast into concrete column and hooked around column reinforcement and other end built into joints of brickwork including forming perforation in formwork			Item		
H	Approved mild steel cavity wall ties, installed in a slight fall and both ends pressed down in fresh mortar and surrounded by mortar			Item		

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - EXTERNAL WALLS (Cont)</u></p> <p>OTHER WORKS NECESSARY</p> <p>A Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - EXTERNAL WALLS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>BILL 2 - EXTERNAL WALLS Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 2 - WINDOWS</u></p> <p>The Contractor must verify exact size of windows, doors and curtain walling on site prior to fabrication</p> <p>The Contractor to submit shop drawings and full details of aluminium sections for various units, methods of fixings, details of ironmongeries, details of bolts, fixing etc for approval</p> <p>All aluminium profiles shall be "TECHNAL", "REYNAERS" OR SCHUCO" aluminium section or other equivalent and approved European system in powder coating finish in accordance to latest regulation; with (10) TEN years warranty.</p> <p>All aluminium profiles should be extruded from aluminium alloy and backed by a certificate from the extruder indicating its genuiness. All aluminium profiles and sections shall comply with the architect's drawings and details. All glazing shall be internally glazed using green Tinted and / or Processed glasses which samples are to be submitted and approved by the Project Architect.</p> <p>All aluminium curtain walling, windows and doors shall include with 25mm x 38mm aluminium sub framing and weatherseal sealant applied to perimeter of windows.</p> <p>All aluminium windows and doors hardware and locking mechanism shall be approved equivalent and hardware system from Europe.</p> <p>All shops drawings details and methods of fixing must be submitted by the Contractor and shall be approved in writing by the Project Architect prior to work proceed.</p> <p>All products / materials shall be supported by a Certificate of origin indicating its genuiness.</p> <p>A 10 years warranty as to the windows and doors performance is to be issued in joint names with the systems and hardware supplier.</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - WINDOWS (Cont)</u>					
	The Contractor is to submit relevant test reports or certificate indicating the aluminium system's compliance with the following performance standards and values					
	All shop drawings details shall be approved in writing by the Architect prior for work proceed. The number and sizes of all bolts, fixing etc shall be clearly indicated on the shop drawings					
	ALUMINIUM GLAZED SYSTEM					
	<u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated tempered glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
A	Overall size 10800 mm wide x 7600 mm high complete with fixed glass panels and sliding glass doors (W2)	1	no			
	<u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated tempered glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
B	Overall size 10000 mm wide x 3900 mm high complete with fixed glass panels and double leaves swing glass door (W1)	1	no			
C	Overall size 9700 mm wide x 3000 mm high complete with fixed glass panels and double leaves swing glass door (W7)	1	no			
D	Overall size 750 mm wide x 3500 mm high fixed glass panel (W8)	2	no			
E	Overall size 2260 mm wide x 3500 mm high complete with fixed glass panel and double leaves swing glass door (W9)	5	no			
F	Overall size 2600 mm wide x 3500 mm high fixed glass panel (W10)	1	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - WINDOWS (Cont)</u>					
	(Cont) ALUMINIUM GLAZED SYSTEM					
	(Cont) Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated tempered glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications					
A	Overall size 3950 mm wide x 3500 mm high fixed glass panel (W11)	2	no			
B	Overall size 565 mm wide x 6650 mm high fixed glass panels (W12)	7	no			
C	Overall size 300 mm wide x 3900 mm high fixed glass panel (W13)	10	no			
D	Overall size 13140 mm wide x 3200 mm high fixed glass panels (W14)	1	no			
E	Overall size 6000 mm wide x 3200 mm high fixed glass panels (W15)	1	no			
F	Overall size 3950 mm wide x 3200 mm high fixed glass panels (W17)	1	no			
G	Overall size 3450 mm wide x 3200 mm high fixed glass panels (W19)	1	no			
H	Overall size 5200 mm wide x 3200 mm high fixed glass panels (W20)	1	no			
J	Overall size 2200 mm wide x 3000 mm high fixed glass panel (W21)	1	no			
K	Overall size 2250 mm wide x 3500 mm high fixed glass panel (W22)	1	no			
L	Overall size 5450 mm wide x 900 mm high fixed glass panel (W23)	1	no			
M	Overall size 3450 mm wide x 3900 mm high fixed glass panel (W24)	1	no			
N	Overall size 2260 mm wide x 4000 mm high fixed glass panels (W30)	8	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - WINDOWS (Cont)</u>					
	(Cont) ALUMINIUM GLAZED SYSTEM					
	<u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated tempered glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
A	Overall size 5200 mm wide x 3900 mm high complete with fixed glass panels and sliding glass door (W3)	1	no			
B	Overall size 3950 mm wide x 3500 mm high complete with fixed glass panels and sliding glass door (W4)	1	no			
C	Overall size 5200 mm wide x 3500 mm high complete with fixed glass panels and sliding glass door (W5)	1	no			
	<u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated tempered glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
D	Overall size 5200 mm wide x 3200 mm high complete with fixed glass panel and sliding glass door (W16)	1	no			
E	Overall size 11000 mm wide x 3200 mm high complete with fixed glass panels and sliding glass door (W18)	1	no			
	<u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 6 mm thick green tinted glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
F	Overall size 1025 mm wide x 2850 mm high complete with fixed glass panel and single leaf swing glass door (W6)	2	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - WINDOWS (Cont)</u>					
	<u>(Cont) ALUMINIUM GLAZED SYSTEM</u>					
	<u>(Cont) Supply and install aluminium glazed system in standard approved powder coating finish complete with 6 mm thick green tinted glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
A	Overall size 1490 mm wide x 2150 mm high complete with fixed glass panel and single leaf swing glass door (W25)	1	no			
B	Overall size 2300 mm wide x 1800 mm high fixed glass panel (W26)	1	no			
	<u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 6 mm thick green tinted glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
C	Overall size 4700 mm wide x 1800 mm high complete with fixed glass panels and sliding windows (W28)	1	no			
D	Overall size 1850 mm wide x 2900 mm high complete with fixed glass panel and sliding windows (W29)	5	no			
	<u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 6 mm thick green tinted Frosted glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
E	Overall size 1600 mm wide x 800 mm high top hung windows (W27)	1	no			

	Description	Qty	Unit	Rate	\$	c
<p style="text-align: center;"><u>BILL 2 - WINDOWS (Cont)</u></p> <p>(Cont) ALUMINIUM GLAZED SYSTEM</p> <p>A Precast reinforced concrete (grade 20) lintol, in various sizes including reinforcement, bedded and jointed in cement and sand (1:3) mortar, hoisted and fixed in position, finished fair on all exposed surfaces, all as detailed on drawings and in specification</p> <p><u>OTHER WORKS NECESSARY</u></p> <p>B Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>						
		Item				
			Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - WINDOWS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>Page No. BQ/5</p> <p>Page No. BQ/6</p> <p>BILL 2 - WINDOWS Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - INTERNAL WALLS</u>					
	BRICKWALL					
	<u>Common brickwall in cement and sand (1:3) mortar with and including 'Exmet' reinforcement at every fourth course</u>					
A	115 mm thick brickwall	627	m2			
B	300 mm thick cavity brickwall	97	m2			
C	115 mm wide with 150 mm high upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
D	300 mm wide with 150 mm high upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
E	6 mm diameter x 450 mm long mild steel bonding ties, one end cast into concrete column and hooked around column reinforcement and other end built into joints of brickwork including forming perforation in formwork		Item			
F	Approved mild steel cavity wall ties, installed in a slight fall and both ends pressed down in fresh mortar and surrounded by mortar		Item			
	OTHER WORKS NECESSARY					
G	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - INTERNAL WALLS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 2 - INTERNAL WALLS Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<u>BILL 2 - DOORS</u>					
The Contractor must verify the exact sizes of doors and opening on site prior to fabrication		Note			
Shop drawings should be submitted by Contractor prior to fabrication and installation for Architect approval		Note			
The Contractor must submit sample / mock-up for Architect approval		Note			
All door frame and architrave shall finished with 'ICI' or other equal and approved spray gloss paint		Note			
All finished doors, linings, door frames and architrave shall be well-seasoned treated hardwood, planed, smoothed and sanded		Note			
All door shall include kontras, beading and moulding		Note			
All door finishes details shall refer to Architectural drawings and as in specification		Note			
SOLID TIMBER CORE FLUSH DOORS					
A Double leaves door, overall size 1900 x 2100 mm high (D1)	2	no			
B Single leaf door, overall size 950 x 2100 mm high (D2)	13	no			
C Single leaf door, overall size 950 x 2100 mm high (D4)	9	no			
D Single leaf door, overall size 750 x 1950 mm high at 150 mm above floor level (D5)	2	no			
E Single leaf sliding door complete with all track and fixing accessories, overall size 2700 x 2100 mm high (D6)	1	no			
F Single leaf sliding door complete with all track and fixing accessories, overall size 1200 x 2100 mm high (D7)	1	no			
G Single leaf sliding door complete with all track and fixing accessories, overall size 2300 x 2100 mm high (D8)	1	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - DOORS (Cont)</u>					
	(Cont) SOLID TIMBER CORE FLUSH DOORS					
A	Single leaf sliding door complete with all track and fixing accessories, overall size 1500 x 2100 mm high (D9)	2	no			
B	Single leaf door with louvre opening, overall size 745 x 2100 mm high (D12)	1	no			
	FIRE RATED SOLID HARDWOOD TIMBER DOOR					
C	One hour fire rated single leaf door, overall size 950 x 2100 mm high (D3)	6	no			
D	Single leaf sliding door complete with all track and fixing accessories, overall size 1000 x 2100 mm high (D10)	1	no			
E	One hour fire rated double leaves door, overall size 1900 x 2100 mm high (D11)	1	no			
	ALUMINIUM LOUVERS DOOR					
F	Double leaves door complete with approved door frame, overall size 1850 x 2100 mm high (D13)	1	no			
G	Single leaf door complete with approved door frame, overall size 1050 x 2100 mm high (D14)	1	no			
	<u>Wrot treated hardwood door frame and accessories in approved paint finished</u>					
H	Door frame	182	m			
J	Architrave	363	m			
K	Timber subframe	182	m			
L	Fire rated door frame	43	m			
M	Fire rated architrave	85	m			
N	Fire rated timber subframe	43	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - DOORS (Cont)</u>					
	(Cont) ALUMINIUM LOUVERS DOOR					
A	Precast reinforced concrete (grade 20) lintol in various sizes including reinforcement, bedded and jointed in cement and sand (1:3) mortar, hoisted and fixed in position, finished fair on all exposed surfaces, all as detailed on drawings and in specification		Item			
B	150 x 50 x 100 mm high heelstone cast to suit the profile of door jamb with one end built into door jamb and other end cast into heelstone and finish to match floor finishes		Item			
C	150 x 25 x 3 mm thick mild steel lugs with one end fishtailed built into joints of brickwork and the other end turned up, holed and screwed to back of timber door frame		Item			
D	6 mm wide approved silicone sealant pointing to gap between frame and tile		Item			
	<u>IRONMONGERY</u>					
	<u>Supply and fix the following or other equal and approved stainless steel ironmongery to doors and frames including all matching screws unless otherwise stated</u>					
E	'Kawajun' 503.12.101 or other equal and approved hinges	90	no			
F	"Hafele" 502.10.125 or other equal and approved Pull Handle SSSP 11200mm	7	no			
G	"Hafele" 502.11.120 or other equal and approved Mortise roller lock SS matte forend width 24mm	17	no			
H	"Kawajun" 503.11.110 or other equal and approved 65mm Key-Thumb Turn Profile Cylinder	18	no			
J	"Kawajun" 503.11.107 or other equal and approved Square Escutcheon *Shot black	31	no			
K	"Kawajun" 503.11.238 or other equal and approved C1 Lever Handle on Square Rose & Escutcheon Finish: Shot Black	31	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - DOORS (Cont)</u>					
	(Cont) IRONMONGERY					
	<u>(Cont) Supply and fix the following or other equal and approved stainless steel ironmongery to doors and frames including all matching screws unless otherwise stated</u>					
A	"Hafele" 502.11.103 or other equal and approved mortise lock for profile cylinders	13	no			
B	"Kawajun" 503.11.117 or other equal and approved Thumb Turn & Coin Turn profile *For Toilet	13	no			
C	"Hafele" 502.12.112 or other equal and approved Heavy Duty Butt Hinge	21	no			
D	"Hafele" 502.13.106 or other equal and approved Concealed door closer DCL 34 *suitable for Fire-Rated Doors	7	no			
E	"Hafele" or other equal and approved Flush Ring Pull Handle w spindle	1	no			
F	"Hafele" 502.10.100 or other equal and approved Mortise Latch	1	no			
G	"Hafele" 502.11.104 or other equal and approved Flush Bolt 8" SS	25	no			
H	"Hafele" 502.16.112 or other equal and approved Flush Bolt 18" SS	25	no			
J	"Hafele" 502.16.113 or other equal and approved Floor Socket 15mm dia	25	no			
K	"Hafele" 502.16.111 or other equal and approved Door Stopper	31	no			
L	"Hafele" 502.16.120 or other equal and approved Door Closer (without hold open-standard arm)	26	no			
M	"Hafele" 502.11.107 or other equal and approved Mortise Lock for Sliding Door	6	no			
N	"Hafele" 502.14.182 or other equal and approved Sliding door fitting for 250 kg door	2	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - DOORS (Cont)</u>					
	(Cont) IRONMONGERY					
	<u>(Cont) Supply and fix the following or other equal and approved stainless steel ironmongery to doors and frames including all matching screws unless otherwise stated</u>					
A	"Hafele" 502.14.183 or other equal and approved Running track for sliding door fitting 250kg 6MTR	2	no			
B	"Hafele" 502.14.179 or other equal and approved Sliding door fitting for 160kg door	3	no			
C	"Hafele" 502.14.180 or other equal and approved Running track for sliding door fitting 160kg 3MTR	3	no			
D	"Hafele" 502.14.177 or other equal and approved Sliding door fitting for 100kg door	1	no			
E	"Hafele" 502.14.178 or other equal and approved Running track for sliding door fitting 100kg 2MTR	1	no			
F	"Hafele" 502.10.126 or other equal and approved Pull Handle SSSP L900mm	6	no			
	MASTER KEY SYSTEM					
G	Allow for all locks to be keyed in one master key to the approval of the Superintending Officer		Item			
	<u>OTHER WORKS NECESSARY</u>					
H	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - DOORS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>Page No. BQ/5</p> <p>BILL 2 - DOORS Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - INTERNAL WALL FINISHES</u>					
	Contractor to refer Schedule of Finishes for complete specification and description		Note			
	Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
A	20 mm thick cement and sand (1:3) plainface plaster including trowelling smooth to wall and column	2067	m2			
B	20 mm thick cement and sand (1:3) backing screed to receive ceramic wall tiles to wall and column	828	m2			
C	Approved Skim coat on plastered wall surface to received finishes including all surface preparation	2067	m2			
D	(3.1) 'ICI Dulux' all-in-one or other equal and approved paint to plainface plastered (plaster measured seperately) wall and column	1438	m2			
E	(3.2) 'ICI Dulux' pentelite or other equal and approved paint to plainface plastered (plaster measured seperately) wall and column	508	m2			
F	(3.3) 'Cicogress' or other equal and approved 300 mm x 600 mm wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column	362	m2			
G	(3.4) 'Cicogress' or other equal and approved 400 mm x 1200 mm wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column	335	m2			
H	(3.5) 'Portino' Basic series or other equal and approved 300 mm x 600 mm wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column	35	m2			
J	(3.6) Red Sandstone wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column including primed A5631 or other equalvalent, bracket and all other fixing accessories	96	m2			

Description	Qty	Unit	Rate	\$	c
<u>BILL 2 - INTERNAL WALL FINISHES (Cont)</u>					
A (3.9) 'KCC' textcoat with 'Wattyl Solagard' or other equal and approved paint to plainface plastered (plaster measured separately) wall and column	121	m2			
B 'Fosroc' brushbond or other equal and approved cementious waterproofing to concrete surfaces, applied strictly in accordance with the manufacturer's instruction to wall and column (Rate to include for providing a ten (10) years guarantee as specified hereinbefore)	854	m2			
OTHER WORKS NECESSARY					
C Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
1) _____					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - INTERNAL WALL FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 2 - INTERNAL WALL FINISHES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - INTERNAL FLOOR FINISHES</u>					
	Contractor to refer Schedule of Finishes for complete specification and description		Note			
	Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
	<u>30 mm thick cement and sand (1:3) backing screed to floor to receive</u>					
A	Floor tiles	1221	m2			
B	150 mm high tiles skirting	473	m			
C	Drop in slab		Item			
	<u>(1.1) 'Cicogress' or other equal and approved 750 mm x 1500 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
D	Floor	632	m2			
E	Drop in slab		Item			
	<u>(1.2) 'Cicogress' or other equal and approved 400 mm x 1200 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
F	Floor	58	m2			
G	Drop in slab		Item			
	<u>(1.3) 'Cicogress' or other equal and approved 300 mm x 600 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
H	Floor	110	m2			
J	Drop in slab		Item			
	<u>(1.4) 'Cicogress' or other equal and approved 600 mm x 600 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
K	Floor	421	m2			
L	Drop in slab		Item			

Description	Qty	Unit	Rate	\$	c
<u>BILL 2 - INTERNAL FLOOR FINISHES (Cont)</u>					
<u>The following skirting, laid on cement and sand screed (screed measured separately)</u>					
A (2.1) 'Cicogress' or other equal and approved tiles skirting, 150 mm x 1500 mm	206	m			
B (2.2) 'Cicogress' or other equal and approved tiles skirting, 150 mm x 600 mm	267	m			
C Selective Aluminium U-Channel termination accessories with natural anodised finish to Architect's approval, install strictly in accordance with the manufacturer's instruction	473	m			
D 'Fosroc' brushbond or other equal and approved cementitious waterproofing to concrete surfaces, applied strictly in accordance with the manufacturer's instruction (Rate to include for providing a ten (10) years guarantee as specified hereinbefore)	164	m2			
E Approved aluminium edge strip and dividing strip, fixed strictly in accordance with manufacturer's instruction		Item			
F Approved stainless steel divider strip, fixed strictly in accordance with manufacturer's instruction		Item			
OTHER WORKS NECESSARY					
G Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
1) _____					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - INTERNAL FLOOR FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 2 - INTERNAL FLOOR FINISHES Carried to Summary</p>					

Description	Qty	Unit	Rate	\$
<u>BILL 2 - INTERNAL CEILING FINISHES</u>				
Contractor to refer Schedule of Finishes for complete specification and description		Note		
A (4.1) 'Gyproc' or other equal and approved gypsum board ceiling with square edge complete with standard fixing accessories all as per manufacturer's detail, recommendation and approval as detailed on drawings.	1101	m2		
B (4.2) 'Gyproc' or other equal and approved gypsum moisture resistant board ceiling with square edge complete with standard fixing accessories all as per manufacturer's detail, recommendation and approval as detailed on drawings.	131	m2		
C (4.6) 'SIAM' or other equal and approved gypsum weatherbloc ceiling with square edge complete with standard fixing accessories finished, all as per manufacturer's detail, recommendation and approval as detailed on drawings.	59	m2		
<u>Prepare, prime and apply 'ICI DULUX' or other equal and approved paint finish to</u>				
D Gypsum board <u>Prepare, prime and apply 'Wattyl Solagard' or other equal and approved paint finish to</u>	1232	m2		
E Gypsum weatherbloc board	59	m2		
F Shadow gap including paint		Item		
G Drop in ceiling including paint		Item		
H <u>Extra for forming ceiling access opening including all frame and painting</u>		Item		
OTHER WORKS NECESSARY				
J Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein) 1) _____		Item		

Description	Qty	Unit	Rate	\$	c
<u>BILL 2 - INTERNAL CEILING FINISHES (Cont)</u>					
(Cont) OTHER WORKS NECESSARY					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - INTERNAL CEILING FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 2 - INTERNAL CEILING FINISHES Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<u>BILL 2 - EXTERNAL WALL FINISHES</u>					
Contractor to refer Schedule of Finishes for complete specification and description		Note			
Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
A 20 mm thick cement and sand (1:3) plainface plaster including trowelling smooth to wall and column	2247	m2			
B 20 mm thick cement and sand (1:3) backing screed to receive wall tiles to wall and column	822	m2			
C (3.6) Red Sandstone wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column including primed A5631 or other equalvalent, bracket and all other fixing accessories	822	m2			
D (3.9) 'KCC' textcoat with 'Wattyl Solagard' or other equal and approved paint to plainface plastered (plaster measured separately) wall and column	2247	m2			
OTHER WORKS NECESSARY					
E Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
1) _____					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - EXTERNAL WALL FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 2 - EXTERNAL WALL FINISHES Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<u>BILL 2 - EXTERNAL FLOOR FINISHES</u>					
Contractor to refer Schedule of Finishes for complete specification and description					
Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule					
<u>30 mm thick cement and sand (1:3) backing screed to floor to receive</u>					
A Floor tiles	38	m2			
B Block	739	m2			
C 150 mm high tiles skirting	29	m			
D Drop in slab <u>(1.5) 'Cicogress' wood series or other equal and approved 200 mm x 1200 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
E Floor	38	m2			
F Drop in slab <u>(1.8) 'CIFRE CERAMICA' Extend Series or other equal and approved 20 mm thick floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
G Floor	739	m2			
H Drop in slab <u>The following skirting, laid on cement and sand screed (screed measured separately)</u>					
J (2.3) 'Cicogress' wood series or other equal and approved tiles skirting, 200 mm x 1200 mm	29	m			
K Selective Aluminium U-Channel termination accessories with natural anodised finish to Architect's approval, install strictly in accordance with the manufacturer's instruction	29	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - EXTERNAL FLOOR FINISHES (Cont)</u>					
A	'Fosroc' brushbond or other equal and approved cementitious waterproofing to concrete surfaces, applied strictly in accordance with the manufacturer's instruction (Rate to include for providing a ten (10) years guarantee as specified hereinbefore)	38	m2			
	OTHER WORKS NECESSARY					
B	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - EXTERNAL FLOOR FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 2 - EXTERNAL FLOOR FINISHES Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<u>BILL 2 - EXTERNAL CEILING FINISHES</u>					
Contractor to refer Schedule of Finishes for complete specification and description					
A (4.4) 20 mm thick cement and sand (1:3) plainface plaster trowelled smooth to soffit of slab	178	m2			
B (4.3) Solid timber ceiling (Kapor wood) curved on section with selective waterbase weatherproof coating finish complete with all fixing accessories all as per manufacturer's details, recommendation and approval as detailed on drawings (measured flat on plan)	489	m2			
C (4.6) 'SIAM' or other equal and approved gypsum weatherbloc ceiling with square edge complete with standard fixing accessories finished, all as per manufacturer's detail, recommendation and approval as detailes on drawings.	42	m2			
<u>Prepare, prime and apply 'ICI DULUX' or other equal and approved paint finish to</u>					
D Soffit of slab	178	m2			
<u>Prepare, prime and apply 'Wattyl Solagard' or other equal and approved paint finish to</u>					
E Gypsum weatherbloc board	42	m2			
F Shadow gap including paint		Item			
G Drop in ceiling including paint		Item			
H <u>Extra for forming ceiling access opening including all frame and painting</u>		Item			
OTHER WORKS NECESSARY					
J Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
1) _____					
2) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - EXTERNAL CEILING FINISHES (Cont)</u></p> <p>(Cont) OTHER WORKS NECESSARY</p> <p>3) _____</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - EXTERNAL CEILING FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 2 - EXTERNAL CEILING FINISHES Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 2 - FURNISHING FITTINGS</u></p> <p>All sizes shall be checked on site prior to fabrication</p> <p>All external surfaces shall be of selective Lamitak laminated finish or of equal equivalent unless otherwise stated, face pattern and colour as selected by the Architect</p> <p>All internal surfaces shall be of selective Lamitak laminated finish or of equal equivalent unless otherwise stated, face pattern and colour as selected by the Architect</p> <p>All hardwood edging and lipping shall be painted with 2 coats of approved transcolor preservative wood stain finishing or of equal equivalent, colour as selected by Architect</p> <p>All cabinet doors, shelves and drawers shall be provided with and including approved ironmongeries (Lock set to drawer refer to Architectural drawings denoted as circular keyhole in elevation)</p> <p>All counter top finished with 12.3 mm thick 'Samsung Staron' or other equal and approved solid surface material back with plywood and 'Non-drip' edge profile on front and sides of appoved colour as selected by the Architect</p> <p>Unless otherwise stated, all finishes and details as shown/detailed on Architectural drawings</p> <p>Tenderer shall make his own assessment from all drawings and specification issued at the time of tederer. Any discrepancies between drawing and Bill of Quantities, the drawings shall take precedence. No additional claim will be entertained</p> <p>Mock up units shall be provided when require</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

Description	Qty	Unit	Rate	\$	c
<u>BILL 2 - FURNISHING FITTINGS (Cont)</u>					
WASH HAND BASIN COUNTER TOP					
<u>Wash hand basin counter top and 150 mm high splashboard in approved colour finished with waterproofing, including forming opening to receive basin including mild steel bracket support and all necessary fixing accessories all as detailed on drawing and in specification</u>					
A Overall size 1254 mm long x 600 mm deep x 400 mm high	1	no			
B Overall size 1200 mm long x 600 mm deep x 400 mm high	3	no			
C Overall size 1677 mm long x 600 mm deep x 400 mm high	2	no			
D Overall size 1312 mm long x 600 mm deep x 400 mm high	1	no			
MAIN KITCEHN CABINET					
E Low Cabinet, overall size 6350 + 3495 mm long x 600 mm deep x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, splashboard, sink top, forming opening for sink, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings	1	no			
F Low Cabinet, overall size 5250 mm long x 600 mm deep x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, splashboard, sink top, forming opening for sink, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings	1	no			
G High Cabinet, overall size 2250+ 3910 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per detailed on Architectural drawings	1	no			
H High Cabinet, overall size 6250 mm long x 600 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per detailed on Architectural drawings	1	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - FURNISHING FITTINGS (Cont)</u>					
	ISLAND COUNTER TOP AND CABINET					
A	Counter Top and Cabinet, overall size 3050 mm long x 1350 mm wide x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings	1	no			
	FAMILY KITCHEN / PANTRY					
B	Low Cabinet, overall size 4042 + 1877 mm long x 600 mm deep x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, splashboard, sink top, forming opening for sink, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings	1	no			
C	High Cabinet, overall size 4043 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per detailed on Architectural drawings	1	no			
	KITCHENETTE					
D	Low Cabinet, overall size 1875 + 1315 mm long x 600 mm deep x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, splashboard, sink top, forming opening for sink, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings	2	no			
	BAR COUNTER AND CABINetry					
E	Overall size, detail designs, finishes specification for bar counter including all ironmongeries and etc, all as detailed on Architectural drawings	1	no			
	TV CABINetry AT MASTER BEDROOM					
F	Overall size, detail designs, finishes specification for TV Cabinetry including all ironmongeries and etc, all as detailed on Architectural drawings	1	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - FURNISHING FITTINGS (Cont)</u>					
	SECURITY COUNTER TOP					
A	Overall size, detail designs, finishes specification for security counter top including all ironmongeries and etc, all as detailed on Architectural drawings	1	no			
	WARDROBE					
B	Overall size 1890 mm long x 600 mm deep x 3000 mm high comprised of wardrobe doors, drawers, open shelves, adjustable shelves, hanging rod, LED strip lighting, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings (maid's room)	1	no			
C	Overall size 2035 + 2300 + 1085 mm long x 600 mm deep x 3200 mm high comprised of wardrobe doors, drawers, open shelves, adjustable shelves, hanging rod, LED strip lighting, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings (master's bedroom - walk in closet 1)	1	no			
D	Overall size 2300 + 1350 mm long x 600 mm deep x 3200 mm high comprised of wardrobe doors, drawers, open shelves, adjustable shelves, hanging rod, LED strip lighting, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings (master's bedroom - walk in closet 2)	1	no			
E	Overall size 3950 mm long x 600 mm deep x 3200 mm high comprised of wardrobe doors, drawers, open shelves, adjustable shelves, hanging rod, LED strip lighting, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings (master's bedroom - wardrobe 1)	1	no			
F	Overall size 1885 + 1878 mm long x 600 mm deep x 3200 mm high comprised of wardrobe doors, drawers, open shelves, adjustable shelves, hanging rod, LED strip lighting, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings (bedroom 1 - walk in closet 1)	1	no			

Description	Qty	Unit	Rate	\$	c
<u>BILL 2 - FURNISHING FITTINGS (Cont)</u>					
(Cont) WARDROBE					
A Overall size 1885 + 1493 mm long x 600 mm deep x 3200 mm high comprised of wardrobe doors, drawers, open shelves, adjustable shelves, hanging rod, LED strip lighting, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings (bedroom 2 - walk in closet 1)	1	no			
B Overall size 1460 mm long x 600 mm deep x 3200 mm high comprised of wardrobe doors, drawers, open shelves, adjustable shelves, hanging rod, LED strip lighting, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings (bedroom 1&2 - wardrobe 1)	2	no			
C Overall size 2135 mm long x 600 mm deep x 3200 mm high comprised of wardrobe doors, drawers, open shelves, adjustable shelves, hanging rod, LED strip lighting, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings (bedroom 3 - wardrobe 1)	1	no			
MIRROR					
<u>8 mm thick bronze tinted mirror with 10 mm thick plywood backing complete with powder coated aluminium frame and all fixing equipment and accessories</u>					
D Overall size 1255 mm long x 1000 mm high	1	no			
E Overall size 1200 mm long x 1000 mm high	3	no			
F Overall size 500 mm long x 800 mm high	3	no			
G Overall size 1675 mm long x 1000 mm high	2	no			
H Overall size 1310 mm long x 1000 mm high	1	no			
OTHER WORKS NECESSARY					
J Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein) 1) _____		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - FURNISHING FITTINGS (Cont)</u></p>					
<p>(Cont) OTHER WORKS NECESSARY</p>					
<p>2) _____</p>					
<p>3) _____</p>					
Empty space for description					

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Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - FURNISHING FITTINGS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>Page No. BQ/5</p> <p>Page No. BQ/6</p> <p>BILL 2 - FURNISHING FITTINGS Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - PLUMBING</u>					
	<u>PLUMBING</u>					
	Fire Hosereel and all associated tanks, pump sets and plumbing works measured in Bill 8A		Note			
	All bends, junctions, tees and the like shall be with access eye opening of pipe diameter		Note			
	All soil and waste pipes shall be connected to gully trap and first manhole		Note			
	SOIL, WASTE AND VENT PIPES					
A	Waste, soil and vent piping system, including all connection and fittings, all as detailed on drawings and in specification		Item			
B	Floor trap including all connection, fittings and gratings, all as detailed on drawings and in specification		Item			
	GULLY TRAP					
C	Gully trap and chamber size 300 x 300 mm in various depth internally with multiple inlets comprising 125 mm thick concrete (grade 20) wall and base, upvc gully trap to B.S.4660 with perforated grating, 300 x 300 mm stainless steel grating with hinge, etc. finished with cement and sand render internally, epoxy painting, inlet and outlet, jointing to waste pipes, including excavation, disposal, backfilling, formwork, etc, the whole as per detail shown on Engineer's drawing		Item			
	COLD AND HOT WATER SERVICES					
D	Cold water and piping including all fittings and connections, all as detailed on drawings and in specification		Item			
E	Hot water and piping including all fittings and connections, all as detailed on drawings and in specification		Item			

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 2 - PLUMBING (Cont)</u></p>					
<p><u>(Cont) PLUMBING</u></p>					
<p>TESTING</p>					
<p>A Allow for testing the whole of the plumbing system to the approval of the relevant authorities and to the satisfaction of the Superintending Officer</p>		Item			
<p><u>OTHER WORKS NECESSARY</u></p>					
<p>B Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p>		Item			
<p>1) _____</p>					
<p>2) _____</p>					
<p>3) _____</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - PLUMBING (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 2 - PLUMBING Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - SANITARY FITTINGS</u>					
	<u>Supply and fix the following or other equal and approved vitreous china (unless otherwise stated) sanitary fittings including setting and bedding in positions, building in all brackets, grouting solid, making all connection to supply, vent, waste, overflow drains and for providing all necessary fixing accessories in strict accordance with the sanitary schedule and manufacturer's instruction</u>					
A	DURAVIT 2133010005-C Starck 2 One piece 4.8L Single Flush Syphonic W.C., 0063390000-C Seat & Cover (Soft Close), 014180096 Mounting Set (S-Trap : 305MM), 1/2" Stop Valve (Include In Mounting Set), 1/2" Flexible Hose (Include In Mounting Set)	1	no			
B	DURAVIT 2157010083-C Durastyle One Piece Dual Flush 5/3.5L Syphonic Jet W.C., 0060590000-C Seat & Cover (Soft Close), 0014160000 Mounting Set (S-Trap : 305mm), 1/2" Stop Valve (Include In Mounting Set), 1/2" Flexible Hose (Include In Mounting Set)	6	no			
C	JOHNSON SUISSE WBAENW211WW Windsor 250 BO WC, WBALTN111WW Trend Cistern With Lid, WBFT400335XX Trend 6/3L Flush Fittings, SC402 Seat & Cover (Soft Close), WBFT400101Xx Fixing Bolt (X2), P450 Straight Connector (S-Trap : 250mm), AV300 1/2' Stop Valve With Flange, DA650N 1/2" Flexible Hose	4	no			
D	DURAVIT 0380800000 Luv Countertop Basin With 1 Tap Hole W/O Overflow Hole Size (800 X 400 X 140)mm, Ceramic Covered Slotted Waste, Premium Chrome Plated P-Trap, 1/2" Stop Valve (X2)	2	no			
E	DURAVIT 0452500000 Vero Countertop Basin With 1 Tap Hole W/Overflow Hole Size (500 X 470 X 175)mm, Premium Chrome Plated P-Trap, 1/2" Stop Valve (X2)	4	no			
F	DURAVIT 0454500000 Vero Wall-Hung Basin With 1 Tap Hole W/Overflow Hole Size (500 X 470 X 175)mm, WBFT400099XX Fixing Bolt (X2), Premium Chrome Plated P-Trap, 1/2" Stop Valve (X2)	1	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - SANITARY FITTINGS (Cont)</u>					
	<u>(Cont) Supply and fix the following or other equal and approved vitreous china (unless otherwise stated) sanitary fittings including setting and bedding in positions, building in all brackets, grouting solid, making all connection to supply, vent, waste, overflow drains and for providing all necessary fixing accessories in strict accordance with the sanitary schedule and manufacturer's instruction</u>					
A	JOHNSON SUISSE WBAABS201WW Boston 500 Wall-Hung basin With 1 Tap Hole W/Overflow Hole Size (500 X 430 X 210)m, WBFT400099XX Fixing Bolt (X2), WBABHP000WW Half Pedestal, WBFT400101XX Fixing Bolt (X2), 32mm - 1 1/4" UPVC Bottle Trap, AV300 1/2" Stop Valve With Flange (X2)	1	no			
B	JOHNSON SUISSE WBAABS291WW Boston 500 Wall-Hung Basin With 1 Tap Hole W/Overflow Hole Size (500 X 430 X 210)mm, WBFT400099XX Fixing Bolt (X2), WBABHP000WW Half Pedestal, WBFT400101XX Fixing Bolt (X2), 32mm - 1 1/4" UPVC Bottle Trap, A202 Chrome Plated Waste, Plug & Chain, AV300 1/2" Stop Valve With Flange, DA650-N1/2" Flexible Hose	3	no			
C	FIMA CARLO FRATTINI F3721MCR.WS Quad Deck Mounted Basin Mixer (Hot & Cold), Click Clack Pop-Up Waste, 1/2" Supply Hose (X2)	2	no			
D	FIMA CARLO FRATTINI F3761.2CR Serie 4 Deck Mounted Basin Mixer (Hot & Cold), Click Clack Pop-Up Waste, 1/2" Supply Hose (X2)	5	no			
E	JOHNSON SUISSE WBFA301434CP Turin Deck Mounted Basin Mixer (Hot & Cold), Chrome Plated Waste, Plug & Chain, 1/2" Supply Hose (X2)	3	no			
F	JOHNSON SUISSE WBFA300933CP Fermo Deck Mounted Sink Tap (Cold Only)	2	no			
G	JOHNSON SUISSE WBFA300760CP Deck Mounted Self Closing Tap (Cold Only)	1	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - SANITARY FITTINGS (Cont)</u>					
	<u>(Cont) Supply and fix the following or other equal and approved vitreous china (unless otherwise stated) sanitary fittings including setting and bedding in positions, building in all brackets, grouting solid, making all connection to supply, vent, waste, overflow drains and for providing all necessary fixing accessories in strict accordance with the sanitary schedule and manufacturer's instruction</u>					
A	FIMA CARLO FRATTINI F3729x2CR Quad Concealed Bath & Shower Mixer With Diverter (Hot & Cold), F3000 Fima Concealed Box, F2224/2CR Brass Round Overhead Shower (Dia : 300mm), F2584CR Ceiling Mounted Shower Arm (L-150mm), F2297CR Sliding Rail c/w Brass Flex Hose (L-1500mm) + Anti-Limesone Handshower, F2013CR 1/2" Water Outlet Connector	1	no			
B	FIMA CARLO FRATTINI F3165/RP251CR Serie 22 Shower Column Mixer With Diverter (Hot & Cold), ABS Overhead Shower (Dia : 200mm), Anti-Limestone Handshower (1 Spray Mode), 1500mm Brass Flex Hose	4	no			
C	JOHNSON SUISSE WBFA301439CP Turin Exposed Bath & Shower Mixer With Diverter (Hot & Cold), WBFA300694CP Wall-Mounted Sliding Bar (L-600mm), WBFA300723CP Caspian II Hand Shower (1 Spray Mode), WBFA300583CP Double Interlock Shower Hose (L-1.5m)	3	no			
D	DURAVIT 0099401000 Starck-T Paper Holder	1	no			
E	FIMA CARLO FRATTINI F6005/1CR Rotola Toilet Paper Holder	6	no			
F	JOHNSON SUISSE WBBA100264CP Trendy Paper Holder With Cover	4	no			
G	DURAVIT 0099301000 Starck-T Double Robe Hook	1	no			
H	FIMA CARLO FRATTINI F6004/2CR Rotola Double Robe Hook	6	no			
J	JOHNSON SUISSE WBBA100257CP Trendy Single Robe Hook	4	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 2 - SANITARY FITTINGS (Cont)</u>					
	<u>(Cont) Supply and fix the following or other equal and approved vitreous china (unless otherwise stated) sanitary fittings including setting and bedding in positions, building in all brackets, grouting solid, making all connection to supply, vent, waste, overflow drains and for providing all necessary fixing accessories in strict accordance with the sanitary schedule and manufacturer's instruction</u>					
A	DURAVIT 0099421000 Starck-T Single Towel Rail (L-610mm)	1	no			
B	FIMA CARLO FRATTINI F6000/60CR Rotola Towel Rail (L-600mm)	4	no			
C	JOHNSON SUISSE WBBA100265CP Trendy Single Towel Rail (Length : 600mm)	3	no			
D	DURAVIT 0099471000 Starck-T Towel Ring	2	no			
E	FIMA CARLO FRATTINI F2454/7CR Collettivita Bidet Angle Valve (Cold Only), ABS hand Bidet Spray, 1200mm Flexible Chromalux Hose, Spray Holder	7	no			
F	FIMA CARLO FRATTINI F2840/7CR Collettivita Bidet Angle Valve (Cold Only), ABS Hand Bidet Spray, 1200mm Flexible Stainless Steel Hose, Spray Holder	4	no			
G	CAM AHI-1015BWC Single Bowl Single Drainer Insert Type Stainless Steel Kitchen Sink Size (1000 X 500 X 250)mm, Waste, 40MM 1.2" UPVC Bottle Trap, AV300 1/2" Stop Valve With Flange, DA650-N1/2" Flexible Hose	2	no			
H	NOVATEC FT201-6 Stainless Steel Decorative Tile Insert Floor Grating Size (153 X 153)mm, FLV Anti Insect & odor Flow Valve	24	no			
	OTHER WORKS NECESSARY					
J	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - SANITARY FITTINGS (Cont)</u></p>					
<p>(Cont) OTHER WORKS NECESSARY</p>					
<p>2) _____</p>					
<p>3) _____</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 2 - SANITARY FITTINGS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>Page No. BQ/5</p> <p>BILL 2 - SANITARY FITTINGS Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 3 - GENERAL NOTE</u></p> <p><u>NOTES</u></p> <p>The bills are to be read and priced in conjunction with the drawings, specification and include all works described / shown in bills and drawings</p> <p>The Contractor is to comply with the conditions of contract, specification, all preliminaries, etc. necessary for the complete execution of the works</p> <p>The Contractor shall be responsible for applying and obtaining all required permits from the relevant authorities for temporary accesses, etc. and for payment of fees thereof</p> <p>The Contractor must visit the site so as to take into consideration existing conditions and to have satisfied himself as to the nature of the site, soil condition, facilities for access, mobilisation of plants, etc. required under this contract. No claims will be allowed on the grounds of ignorance of the conditions under which the works will be executed</p> <p>Prior to the commencement of any work, the levels of the original surface of the site including all slopes shall be agreed by the Superintending Officer in accordance with Preliminaries under 'Setting Out and Site Levels' and on completion of this works, the Contractor must submit as built drawings as required in Preliminaries under 'Completion Joint-Survey and As Built Drawing' which shall form the basis of measurement</p> <p>The Contractor shall take all measures to protect the existing cables and services that is not affected by his scope of work. Any such damage caused by the Contractor shall be made good at the expense of the Contractor and to the satisfaction of the Superintending Officer</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 3 - GENERAL NOTE (Cont)</u></p> <p><u>(Cont) NOTES</u></p> <p>All making good shall be executed with materials and workmanship to match in every respect of the surrounding work and shall be properly done thereto to the complete satisfaction of the S.O.</p> <p>Unless otherwise specified, all materials and debris resulting from the clearing shall be stacked and removed completely from the site. On no account shall cleared timber or other materials be deposited in areas to be filled. Burning on site shall be prohibited</p> <p>No tipping on the adjoining land shall be allowed in this contract. The Contractor is therefore to make his own arrangements for disposal of all surplus excavated materials where directed and is to pay all charges in connection therewith</p> <p>Tenderer shall make his own assessment from all drawings and specification issued at the time of tederer. Any discrepancies between drawing and Bill of Quantities, the drawings shall take precedence. No additional claim will be entertained</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - GENERAL NOTE (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 3 - GENERAL NOTE Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - PILING</u></p>					
<p>PRECAST REINFORCED CONCRETE PILES (ALL PROVISIONAL)</p>					
<p>The system installation shall consist of 9.0 metre long precast concrete piles element forced into the ground using hydraulic jack method including cast in pile shoe</p>		Note			
<p>The piles should conform to B.S. 8004 : 1986 and be approved by CPRU Min. of Development for use in Brunei Darussalam</p>		Note			
<p>Steel reinforcement shall conform to B.S. 4449</p>		Note			
<p>End plate should be manufactured to conform to B.S. 4360</p>		Note			
<p>Concrete strength during transfer should correspond to a cube strength of minimum 25 Mpa</p>		Note			
<p>The 28-day strength of concrete shall not be less than 50 Mpa</p>		Note			
<p>Joint between the consecutive pile element shall be in full weld on each side of the end plates brought in contact</p>		Note			
<p>The setting pressure of twice the working load shall be held for a minimum of ten seconds before release</p>		Note			
<p>Each pile shall not deviate by more than 75 mm from the vertical or more than 74 mm from its designed position at the level of the piling chamber</p>		Note			
<p>The paylengths for the supply and inject complete of each pile shall be measured from pile toe to cut-off level</p>		Note			
<p>A Provide and erect on site all necessary plant and equipment for installation of precast concrete piles, and dismantle and clear away on completion</p>		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - PILING (Cont)</u>					
	(Cont) PRECAST REINFORCED CONCRETE PILES (ALL PROVISIONAL)					
A	<p>Allow for moving and handling piling frame and equipment inclusive of assembling and dismantling about at site from position to position including use of Selangan timber matt and hiring of Kobelco for the full duration</p> <p><u>Supply, transport, handle, pitch, inject, weld, extend, cut-off head, etc. precast reinforced (Grade 50) concrete piles, all in strict accordance with the pile specification.</u></p>		Item			
B	<p>200 mm square piles</p> <p><u>Provide the necessary kentledge, jack and dial gauges for the application and release of the load test. The rates include all supervision and labour, watching and lighting and removal of kentledge and equipment</u></p>	7725	m			
C	<p>Load test twice the working load for 200 mm square piles</p> <p><u>OTHER WORKS NECESSARY</u></p>	2	no			
D	<p>Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - PILING (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 3 - PILING Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - SUBSTRUCTURE</u>					
	EXCAVATION					
A	Excavate pit for pile cap and lift pit, commencing from platform level, not exceeding 2.00 m deep, get out part return, fill in, ram and surplus cart away excavated material where directed	229	m3			
B	Excavate for basement, commencing from platform level, exceeding 2.00 m deep, get out part return, fill in, ram and surplus cart away excavated material where directed including all temporary protection and removal	463	m3			
C	Excavate trench for ground beam, commencing from platform level, not exceeding 2.00 m deep, get out and cart away excavated material where directed	229	m3			
D	Excavate for ground slab and apron slab commencing from platform level, not exceeding 300 mm, average 200 mm deep, get out and cart away excavated material where directed	2410	m2			
	ANTI-TERMITE TREATMENT					
E	Prepare and apply one coat of organic chlorine or other equal and approved anti-termite chemical treatment to general surfaces as specified (measured flat over ground floor slab and apron slab area; rate to include for treating surfaces of ground beam, footing and the like and for appointing a registered pest control company to carry out the work and also for providing a ten (10) year warranty)	2410	m2			
	DAMP PROOF MEMBRANE					
F	"POLY-FILM 1000" or other equal and approved damp proof membrane laid on prepared bed, seal laps with approved pressure sensitive tape (measured flat over ground floor slab - rate to include for laps, cutting and waste)	2410	m2			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - SUBSTRUCTURE (Cont)</u>					
	WATERPROOFING / TANKING SYSTEM					
A	'Bitumat' Polyflex or other equal and approved 4mm sandtop thick waterproofing / tanking system spot-bonding to lean concrete (measured separately) prior to succeeding slab construction complete with 'Fosroc' Nitoproof 600 polyurethane coating applied along the joints and pin holing all in strict accordance with manufacturer's instruction (measured flat over floor slab and wall area - rate to include for laps, cutting, waste and providing a ten (10) years warranty against workmanship and material) to basement slab / lift pit	115	m2			
B	'Bitumat' Polyflex or other equal and approved 3mm sandtop thick waterproofing / tanking system spot-bonding and fully-torched bonded on wall surfaces prior to succeeding wall construction and including 'Proofex' protection board fixed onto tanking complete with 'Fosroc' Nitoproof 600 polyurethane coating applied along the joints and pin holing all in strict accordance with manufacturer's instruction (measured flat over floor slab and wall area - rate to include for laps, cutting, waste and providing a ten (10) years warranty against workmanship and material) to basement wall / lift pit	194	m2			
C	Approved type PVC waterstop or equivalent complete with grout and treatment all to specialist specifications		Item			
D	Allow for de-watering including all pump etc to be approved by the S.O. / Engineer		Item			
E	Pump sump formed in ground slabs including grating, any necessary extra excavation, disposal, hardcore, blinding, formwork and concrete		Item			
F	Sump formed in ground slabs including grating, any necessary extra excavation, disposal, hardcore, blinding, formwork and concrete		Item			
G	Boxing to form 500 mm high vent opening in basement wall including any necessary finishing works		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - SUBSTRUCTURE (Cont)</u>					
	(Cont) WATERPROOFING / TANKING SYSTEM					
A	<u>Extra for waterproofing / tanking to lift pit and sump</u>		Item			
	CONCRETE WORKS					
	<u>50 mm thick lean concrete (grade 15) to underside of</u>					
B	Pile cap	146	m2			
C	Ground beam	373	m2			
D	Ground floor slab	2029	m2			
E	Lift pit	8	m2			
	<u>Reinforced concrete (grade 30) in</u>					
F	Pile cap	88	m3			
G	Stump	59	m3			
H	Basement beam	12	m3			
J	Ground beam	210	m3			
K	150 mm thick ground floor slab	2410	m2			
L	200 mm thick basement slab	105	m2			
M	230 mm thick lift pit wall	13	m2			
N	300 mm thick basement wall	153	m2			
P	<u>Extra over lift pit wall for thickening including additional formwork and reinforcement</u>	12	m			
Q	300 x 300 x 300 mm deep lift sump pit, 230 mm thick to wall and slab including formwork and reinforcement	1	no			
R	<u>Extra over for non-slip groove line to ramp</u>		Item			
	<u>10 mm to 25 mm diameter mild steel / high tensile reinforcement bar in</u>					
S	Pile cap	12144	kg			
T	Stump	9440	kg			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - SUBSTRUCTURE (Cont)</u>					
	(Cont) CONCRETE WORKS					
	<u>(Cont) 10 mm to 25 mm diameter mild steel / high tensile reinforcement bar in</u>					
A	Basement beam	1306	kg			
B	Ground beam	23520	kg			
C	Ground floor slab	30005	kg			
D	Basement slab	1743	kg			
E	Lift pit wall	302	kg			
F	Basement Wall	4336	kg			
	<u>Formwork to</u>					
G	Sides of pile cap	504	m2			
H	Sides of stump	618	m2			
J	Sides of basement beam	100	m2			
K	Sides of ground beam	2039	m2			
L	Sides of lift pit wall	25	m2			
M	Sides of basement wall	306	m2			
N	Drop in ground slab and edge of ground slab		Item			
P	Drop in ramp and edge of ramp		Item			
Q	Movement/Expansion joint, filled with 25 mm wide x 50 mm deep 'Expandite 99' or other equal and approved expansion / movement joint complete with 25 mm thick softboard filler including slip membrane and additional use of formwork, all as detailed on drawings and in specification		Item			
	OTHER WORKS NECESSARY					
R	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - SUBSTRUCTURE (Cont)</u></p> <p>(Cont) OTHER WORKS NECESSARY</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - SUBSTRUCTURE (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>Page No. BQ/5</p> <p>BILL 3 - SUBSTRUCTURE Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - FRAME</u>					
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	Suspended beam	95	m3			
B	Column	297	m3			
C	230 mm thick lift core wall	111	m2			
D	<u>Extra over</u> for lift core wall thickening including additional formwork and reinforcement	12	m			
	<u>10 mm to 32 mm diameter mild steel / high tensile reinforcement bar in</u>					
E	Suspended beam	9310	kg			
F	Column	47520	kg			
G	Lift core wall	2579	kg			
	<u>Formwork to</u>					
H	Sides and soffit of suspended beam	976	m2			
J	Sides of column	2921	m2			
K	Sides of lift core wall	222	m2			
L	<u>Extra over</u> for edge of lift core wall opening not exceeding 300 mm wide		Item			
	OTHER WORKS NECESSARY					
M	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - FRAME (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 3 - FRAME Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - UPPER FLOOR</u>					
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	150 mm thick suspended slab	589	m2			
B	200 mm thick suspended slab	5	m2			
	<u>10 mm and 12 mm diameter mild steel / high tensile reinforcement bar in</u>					
C	Suspended floor slab	7417	kg			
	<u>Formwork to</u>					
D	Sides and soffit of suspended slab	594	m2			
E	Drop in slab and edge of floor slab		Item			
F	Movement/Expansion joint, filled with 25 mm wide x 50 mm deep 'Expandite 99' or other equal and approved expansion / movement joint complete with 25 mm thick softboard filler including slip membrane and additional use of formwork, all as detailed on drawings and in specification		Item			
	OTHER WORKS NECESSARY					
G	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - UPPER FLOOR (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 3 - UPPER FLOOR Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - ROOF</u>					
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	Roof beam	74	m3			
B	Gutter beam	125	m3			
C	150 mm thick roof slab	570	m2			
D	150 mm thick gutter slab	298	m2			
E	200 mm thick lift core top slab	8	m2			
	<u>10 mm to 25 mm diameter mild steel / high tensile reinforcement bar in</u>					
F	Roof beam	4884	kg			
G	Gutter beam	8250	kg			
H	Roof slab	7097	kg			
J	Gutter slab	3711	kg			
K	Lift core top slab	386	kg			
	<u>Formwork to</u>					
L	Sides and soffit of roof beam	822	m2			
M	Sides and soffit of gutter beam	1212	m2			
N	Soffit of roof slab	571	m2			
P	Soffit of gutter slab	298	m2			
Q	Soffit of lift core top slab	8	m2			
R	<u>Extra over</u> for forming opening to slab for roof hatch	3	no			
S	Drop in slab and edge of slab		Item			
T	Edge of lift core top slab		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - ROOF (Cont)</u>					
	(Cont) CONCRETE WORKS					
A	Reinforced concrete ledge in various thickness including all necessary formwork, reinforcement, finished with all exposed concrete surfaces with approved paint in approved color, waterproofing membrane and etc., all as per Architectural and Engineer's details drawings	47	m2			
B	<u>Extra over</u> for forming 500 mm wide x 50 mm depth scupper drain finished with screeding and approved high quality waterproofing to specification and Architect's approval, all as detailed on drawings		Item			
C	Decorative reinforced concrete capping to gutter wall including all necessary formwork, reinforcement and finished all expose surface with 'KCC' textcoat with 'Wattyl Solagard' or other equal and approved paint in approved colour		Item			
	STRUCTURAL STEEL ROOF MEMBER					
	All steel works members shall be high tensile galvanised steel, welded and bolted together, including all shop and site welding, filling smooth junction, raking and cutting, hoisted and placed in position all as detailed on drawings		Note			
	Rate to include submission of shop drawings		Note			
	Rate to included for sand blast clean to BS4232, degrease and wash clean all steel area and repair all damaged including approved paint to Engineer's approval		Note			
	All steel works members, plates, cleats and bolts shall be high tensile galvanised steel including all necessary approved painting as specified		Note			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - ROOF (Cont)</u>					
	(Cont) STRUCTURAL STEEL ROOF MEMBER					
	<u>Supply, install and erect the following structural steelworks hoisted and fixed in position to level as accordance to drawing in bolted and welded connection with and including all cutting, drilling, welding and approved metal paint finished (to all expose surfaces), all as detailed on Engineer's drawings</u>					
A	RHS 160 x 80 x 6.3 mm thick	5283	kg			
B	RHS 120 x 80 x 6.3 mm thick	9587	kg			
C	RHS 100 x 60 x 6.3 mm thick	187	kg			
D	SHS 70 x 70 x 5 mm thick	4509	kg			
E	C15016 lipped C purlin	1570	m			
F	Plates / splicing		Item			
G	Angle Cleat including fasteners		Item			
H	Bolts / anchor bolts including nuts and washers		Item			
J	Holding down bolts		Item			
K	Non shrink grout		Item			
	ROOF COVERING					
	Rate to include a ten (10) years warranty for materials					
L	'Lysaght' or other equal and approved Kliplock Hi-Ten 406 0.47 mm thick TCT in clean colorbond XRW fixed to steel purlins (purlins measured separately), laid in full length to fall complete with damping felt and self-adhesive bitumen felt, all clips and including all others matching fixing devices and accessories, all in accordance to the manufacturer's instruction (measured nett- rate to include for laps, cutting and waste) to sloping roof covering	1445	m2	Note		

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - ROOF (Cont)</u>					
	(Cont) ROOF COVERING					
A	`Lysaght' or other equal and approved clean colorbond gable end including flashing, clip, channel, thermal barrier pad and all fixing accessorise and sealant all as detailed on Architectural drawings		Item			
B	`Lysaght' or other equal and approved clean colorbond eave including flashing, foam filler, drip angle, thermal barrier pad and all fixing accessorise and sealant all as detailed on Architectural drawings		Item			
C	`Lysaght' or other equal and approved clean colorbond flashing between wall and roof, one end chase into brickwall filled with approved non-setting silicone sealant including all fixing accessorise all as per detailed on drawings		Item			
	ROOF INSULATION					
D	50 mm thick 'Lysaght' ROXUL MPB100 or orther equal and approved rockwool insulation at 40kg/m3 including all other fixing accessories (measured nett - rate to include for laps, cutting and waste)	1445	m2			
E	BRC 3315 wire mesh including all other fixing accessories	1445	m2			
F	Meta aluminium double sided foil including all other fixing accessories	1445	m2			
	ROOF WATERPROOFING SYSTEM					
	<u>30 mm thick cement and sand (1:3) screed laid to falls to receive waterproofing system to</u>					
G	Roof slab	570	m2			
H	Gutter slab	298	m2			
J	Lift core top slab	8	m2			
K	Sides of gutter wall	893	m2			
L	300 mm high upturn skirting	704	m			
M	Down pipe and outlet		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - ROOF (Cont)</u>					
	(Cont) ROOF WATERPROOFING SYSTEM					
	<u>'FOSROC' Polyurea or other eaqual and approved (high quality, environmentally safe, enery saving and elastrometric) waterproofing membrane on high-tech polymer chemistry formulation and acrylic polymers forming seamless joint, free water and weather light elastic membrane with heat insulation properties including cement and sand (1:3) screed, laid to fall and all necessary surface preparation with 'FOSROC' or other equal and approved primer 195 (Rate to include for providing a ten (10) years guarantee as specified hereinbefore) to</u>					
A	Roof slab	570	m2			
B	Gutter slab	298	m2			
C	Lift core top slab	8	m2			
D	Sides of gutter wall	893	m2			
E	300 mm high upturn skirting	704	m			
F	Down pipe and outlet		Item			
	RAINWATER GOODS					
G	'TERRAIN' or other equal and approved 75 mm diameter rainwater downpipe with cement solvent joint fixed to concrete or brickwork with and including holderbats, brackets, straps, hangers, bends and the like, finish with approved finishes, to specification, engineer's, manufacturer's and specialist detail, recommendation and architect's approval, all as detailed on drawings	210	m			
H	'TERRAIN' or other equal and approved 100 mm diameter rainwater downpipe with cement solvent joint fixed to concrete or brickwork with and including holderbats, brackets, straps, hangers, bends and the like, finish with approved finishes, to specification, engineer's, manufacturer's and specialist detail, recommendation and architect's approval, all as detailed on drawings	657	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - ROOF (Cont)</u>					
	(Cont) RAINWATER GOODS					
A	'TERRAIN' or other equal and approved 75 mm diameter upvc rainwater downpipe with cement solvent joint laid under floor with and including brackets, straps, bends, excavation, backfill, 100 mm thick concrete (grade 20) surround reinforced with one layer BRC A6, formwork and 50 mm thick lean concrete (grade 15) under, all as detailed on drawings	123	m			
B	'TERRAIN' or other equal and approved 100 mm diameter upvc rainwater downpipe with cement solvent joint laid under floor with and including brackets, straps, bends, excavation, backfill, 100 mm thick concrete (grade 20) surround reinforced with one layer BRC A6, formwork and 50 mm thick lean concrete (grade 15) under, all as detailed on drawings	510	m			
C	'TERRAIN' or other equal and approved 150 mm diameter upvc rainwater downpipe with cement solvent joint laid under floor with and including brackets, straps, bends, excavation, backfill, 100 mm thick concrete (grade 20) surround reinforced with one layer BRC A6, formwork and 50 mm thick lean concrete (grade 15) under, all as detailed on drawings	16	m			
D	'TERRAIN' Geberit or other equal and approved 82 mm diameter domed roof outlet to suit 75 mm diameter upvc rainwater downpipe complete with all fixing accessories, all as detailed on drawings	35	no			
E	'TERRAIN' Geberit or other equal and approved 82 mm diameter domed roof outlet to suit 100 mm diameter upvc rainwater downpipe complete with all fixing accessories, all as detailed on drawings	85	no			
F	'TERRAIN' or other equal and approved 75 mm diameter upvc overflow pipe casted in reinforced concrete gutter wall, including all fixing accessories, finished with approved finishes to specification and architect's approval, all as detailed on drawings		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - ROOF (Cont)</u>					
	(Cont) RAINWATER GOODS					
A	<u>Extra over</u> for 200 x 100 weep hole to gutter wall		Item			
	FINISHES					
	<u>20 mm thick cement and sand (1:3) plainface plaster including trowelling smooth to</u>					
B	Sides of gutter wall	1495	m2			
C	Soffit of gutter slab	298	m2			
D	<u>Extra over</u> for drip mould		Item			
	<u>(3.9) 'KCC' textcoat with 'Wattyl Solagard' or other equal and approved paint to plainface plastered (plaster measured separately) to</u>					
E	Sides of gutter wall	1495	m2			
F	Soffit of gutter slab	298	m2			
G	<u>Extra over</u> for drip mould		Item			
	GLAZED SKYLIGHT					
	<u>To supply, fabricate & install of REYNAERS CW50 in powder coated aluminium frame system complete with 12.76mm thick 'AGC' F-Green Tinted Laminated Heat Strengthened Glass; including weatherseal sealant, all structural steel framing and all necessary accessories for completion of works all in accordance with Manufacturer's Specification and Instructions.</u>					
H	Glazed skylight, overall size 4700 x 2665 mm high (SKY1)	1	no			
J	'Gorter' or other equal and approved roof hatch RHT 1010 complete with fixed vertical ladder in aluminium finished including all fixing accessories, installed in accordance with manufacturer's instruction	3	no			

Description	Qty	Unit	Rate	\$	c
<p style="text-align: center;"><u>BILL 3 - ROOF (Cont)</u></p> <p><u>OTHER WORKS NECESSARY</u></p> <p>A Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - ROOF (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>Page No. BQ/5</p> <p>Page No. BQ/6</p> <p>Page No. BQ/7</p> <p>Page No. BQ/8</p> <p>BILL 3 - ROOF Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - STAIRCASES</u>					
	Contractor to refer Schedule of Finishes for specification and description		Note			
	Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	Staircase	12	m3			
B	200 mm thick landing slab	6	m2			
C	225 mm thick landing slab	5	m2			
	<u>10 to 12 mm diameter high tensile steel reinforcement in</u>					
D	Staircase	1846	kg			
E	Landing slab	534	kg			
	<u>Formwork to</u>					
F	Soffit of staircase	43	m2			
G	Soffit of landing slab	11	m2			
H	Side of stair open stringer 352 mm (maximum) cut to suit profile treads and risers	25	m			
J	Side of stair open stringer 377 mm (maximum) cut to suit profile treads and risers	24	m			
K	Side of undercut riser 176 mm high	113	m			

	Description	Qty	Unit	Rate	\$	c
<u>BILL 3 - STAIRCASES (Cont)</u>						
HANDRAILING AND BALUSTRADING						
A	1000 mm overall high decorative stainless steel in hairline natural finish handrailing and balustrading (straight and curved-on-plan) in welded connection complete with 50 mm diameter stainless steel hollow section as described top rail with 50 mm diameter short connection to railing post, 5 nos of 20 mm diameter stainless steel rod to center welded to 35 mm x 50 mm stainless steel hollow section railing post with and including all base plates, anchor bolts, bends, ramps, wreath, end caps and all fixing accessories as detailed on drawing and in specification	14	m			
B	1010 mm overall high decorative stainless steel in hairline natural finish handrailing and balustrading (straight and curved-on-plan) in welded connection complete with 50 mm diameter stainless steel hollow section as described top rail with 50 mm diameter short connection to railing post, 5 nos of 20 mm diameter stainless steel rod to center welded to 35 mm x 50 mm stainless steel hollow section railing post with and including all base plates, anchor bolts, bends, ramps, wreath, end caps and all fixing accessories as detailed on drawing and in specification (to ramp)	14	m			
C	1000 mm overall high decorative stainless steel in hairline natural finish handrailing and balustrading (straight and curved-on-plan) in welded connection complete with 50 mm diameter stainless steel hollow section as described top rail with 50 mm diameter short connection to railing post, 10 mm thick tempered glass balustrade fixed to 35 mm x 50 mm stainless steel hollow section railing post with and including all base plates, anchor bolts, bends, ramps, wreath, end caps and all fixing accessories as detailed on drawing and in specification	38	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - STAIRCASES (Cont)</u>					
	FINISHES					
	<u>20 mm thick cement and sand (1:3) plainface plaster trowelled smooth to</u>					
A	Sloping soffit of staircase	43	m2			
B	Soffit of landing slab	11	m2			
C	Sides of open stringer 352 mm (maximum) wide to suit profile of treads and risers	25	m			
D	Sides of open stringer 377 mm (maximum) wide to suit profile of treads and risers	24	m			
E	Sides of landing slab	17	m			
	<u>30 mm thick cement and sand (1:3) screed to receive tiles to</u>					
F	Landing slab	11	m2			
G	325 mm wide tread	113	m			
H	175 mm high undercut riser	113	m			
J	150 mm high tiles skirting	55	m			
	<u>(1.4) 'Cicogress' or other equal and approved 600 mm x 600 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
K	Landing slab	5	m2			
L	325 mm wide tread	49	m			
M	175 mm high undercut riser	49	m			
N	<u>Extra over for forming non-slip nosing tiles</u>	49	m			
	<u>(1.7) Polished marble, laid in pattern on cement and sand screed (screed measured separately) to</u>					
P	Landing slab	6	m2			
Q	325 mm wide tread	65	m			
R	175 mm high undercut riser	65	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - STAIRCASES (Cont)</u>					
	(Cont) FINISHES					
	<u>(Cont) (1.7) Polished marble, laid in pattern on cement and sand screed (screed measured separately) to</u>					
A	<u>Extra over</u> for forming non-slip nosing tiles	65	m			
B	(2.2) 'Cicogress' or other equal and approved tiles skirting, 150 mm x 600 mm	17	m			
C	(2.5) Polished marble skirting	38	m			
	<u>(3.1) 'ICI Dulux' all-in-one or other equal and approved paint to plainface plastered (plaster measured seperately) to</u>					
D	Sloping soffit of staircase	27	m2			
E	Soffit of landing slab	6	m2			
F	Sides of open stringer 352 mm (maximum) wide to suit profile of treads and risers	25	m			
G	Sides of landing slab	11	m			
	<u>(3.2) 'ICI Dulux' pentelite or other equal and approved paint to plainface plastered (plaster measured seperately) to</u>					
H	Sloping soffit of staircase	17	m2			
J	Soffit of landing slab	5	m2			
K	Sides of open stringer 377 mm (maximum) wide to suit profile of treads and risers	24	m			
L	Sides of landing slab	6	m			
	<u>STEPS</u>					
	<u>Construction and completion of external steps including all excavation, reinforcement, reinforced concrete and all necessary formworks complete with all tiles finished, all as shown and detail on Architectural's and Engineer's drawings</u>					
M	300 mm wide steps x 150 mm high risers x 7100 mm length x 4 steps	1	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - STAIRCASES (Cont)</u>					
	<u>(Cont) STEPS</u>					
	<u>(Cont) Construction and completion of external steps including all excavation, reinforcement, reinforced concrete and all necessary formworks complete with all tiles finished, all as shown and detail on Architectural's and Engineer's drawings</u>					
A	535 mm wide steps x 150 mm high risers x 7100 mm length x 1 step	1	no			
	OTHER WORKS NECESSARY					
B	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - STAIRCASES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>Page No. BQ/5</p> <p>BILL 3 - STAIRCASES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - EXTERNAL WALLS</u>					
	BRICKWALL					
	<u>Common brickwall in cement and sand (1:3) mortar with and including 'Exmet' reinforcement at every fourth course</u>					
A	115 mm thick brickwall	1271	m2			
B	150 mm thick brickwall	288	m2			
C	230 mm thick brickwall	130	m2			
D	300 mm thick cavity brickwall	191	m2			
	DECORATIVE SCREEN					
E	Supply and install of decorative Archifacade Lightweight Architectural Screen with metal framing finished with spray coated paint SKK stone finish, complete with bracket, all fixing accessories etc, all as detail on Architectural's drawing and in strick accordance with the manufacturer's instructions and specifications	750	m2			
	FEATURE WALL					
F	Feature wall, overall size 5000 mm x 3000 mm x 380 mm thick comprised of brick cavity wall, RC capping, finished all exposed surface with red sandstone wall tiles on cement and sand plainface plaster, all as detailed on Architectural drawings	1	no			
G	Feature wall, overall size 3600 mm x 3000 mm x 380 mm thick comprised of brick cavity wall, RC capping, finished all exposed surface with red sandstone wall tiles on cement and sand plainface plaster, all as detailed on Architectural drawings	2	no			
H	115 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - EXTERNAL WALLS (Cont)</u>					
	(Cont) FEATURE WALL					
A	150 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
B	230 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
C	300 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
D	6 mm diameter x 450 mm long mild steel bonding ties, one end cast into concrete column and hooked around column reinforcement and other end built into joints of brickwork including forming perforation in formwork		Item			
	OTHER WORKS NECESSARY					
E	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - EXTERNAL WALLS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 3 - EXTERNAL WALLS Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 3 - WINDOWS</u></p> <p>The Contractor must verify exact size of windows, doors and curtain walling on site prior to fabrication</p> <p>The Contractor to submit shop drawings and full details of aluminium sections for various units, methods of fixings, details of ironmongeries, details of bolts, fixing etc for approval</p> <p>All aluminium profiles shall be "TECHNAL", "REYNAERS" OR SCHUCO" aluminium section or other equivalent and approved European system in powder coating finish in accordance to latest regulation; with (10) TEN years warranty.</p> <p>All aluminium profiles should be extruded from aluminium alloy and backed by a certificate from the extruder indicating its genuineness. All aluminium profiles and sections shall comply with the architect's drawings and details. All glazing shall be internally glazed using green Tinted and / or Processed glasses which samples are to be submitted and approved by the Project Architect.</p> <p>All aluminium curtain walling, windows and doors shall include with 25mm x 38mm aluminium sub framing and weatherseal sealant applied to perimeter of windows.</p> <p>All aluminium windows and doors hardware and locking mechanism shall be approved equivalent and hardware system from Europe.</p> <p>All shops drawings details and methods of fixing must be submitted by the Contractor and shall be approved in writing by the Project Architect prior to work proceed.</p> <p>All products / materials shall be supported by a Certificate of origin indicating its genuineness.</p> <p>A 10 years warranty as to the windows and doors performance is to be issued in joint names with the systems and hardware supplier.</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - WINDOWS (Cont)</u>					
	The Contractor is to submit relevant test reports or certificate indicating the aluminium system's compliance with the following performance standards and values					
	All shop drawings details shall be approved in writing by the Architect prior for work proceed. The number and sizes of all bolts, fixing etc shall be clearly indicated on the shop drawings					
	ALUMINIUM GLAZED SYSTEM					
	<u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
A	Overall size 2040 mm wide x 4800 mm high fixed glass panel (W1)	24	no			
B	Overall size 2040 mm wide x 4700 mm high fixed glass panel (W2)	9	no			
C	Overall size 8405 mm wide x 4800 mm high complete with fixed glass panels and double leaves swing glass door (W3)	1	no			
D	Overall size 4050 mm wide x 3500 mm high complete with fixed glass panels and single leaf swing glass door (W4)	1	no			
E	Overall size 8890 mm wide x 4800 mm high complete with fixed glass panels and double leaves swing glass door (W5)	1	no			
F	Overall size 2200 mm wide x 4800 mm high complete with fixed glass panels and single leaf swing glass door (W6)	1	no			
G	Overall size 2385 mm wide x 4800 mm high complete with fixed glass panels and single leaf swing glass door (W7)	1	no			
H	Overall size 1813 mm wide x 4800 mm high fixed glass panel (W8)	2	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - WINDOWS (Cont)</u>					
	(Cont) ALUMINIUM GLAZED SYSTEM					
	<u>(Cont) Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
A	Overall size 4700 mm wide x 4800 mm high complete with fixed glass panels and single leaf swing glass door (W9)	1	no			
B	Overall size 1940 mm wide x 4800 mm high complete with fixed glass panels and double leaves swing glass door (W10)	1	no			
C	Overall size 4735 mm wide x 4800 mm high complete with fixed glass panels and single leaf swing glass door (W11)	1	no			
D	Overall size 1635 mm wide x 4800 mm high complete with fixed glass panels and single leaf swing glass door (W12)	1	no			
E	Overall size 4765 mm wide x 4800 mm high complete with fixed glass panels and single leaf swing glass door (W13)	1	no			
F	Overall size 2920 mm wide x 4800 mm high complete with fixed glass panels and double leaves swing glass door (W14)	1	no			
G	Overall size 2040 mm wide x 4800 mm high complete with fixed glass panels and double leaves swing glass door (W15)	3	no			
H	Overall size 2040 mm wide x 4700 mm high complete with fixed glass panels and double leaves swing glass door (W16)	6	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - WINDOWS (Cont)</u>					
	(Cont) ALUMINIUM GLAZED SYSTEM					
	<u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
A	Overall size 1250 mm wide x 3050 mm high complete with fixed glass panels and single leaf swing glass door (W19)	2	no			
B	Overall size 3790 mm wide x 3050 mm high complete with fixed glass panels and single leaf swing glass door (W20)	1	no			
C	Overall size 4790 mm wide x 3050 mm high fixed glass panel (W21)	1	no			
D	Overall size 4610 mm wide x 3050 mm high fixed glass panel (W22)	1	no			
E	Overall size 3790 mm wide x 3050 mm high fixed glass panel (W23)	1	no			
F	Overall size 3290 mm wide x 3050 mm high fixed glass panel (W24)	1	no			
G	Overall size 1500 mm wide x 3050 mm high complete with fixed glass panels and single leaf swing glass door (W25)	1	no			
H	Overall size 1800 mm wide x 3050 mm high complete with fixed glass panels and single leaf swing glass door (W26)	1	no			
J	Overall size 6450 mm wide x 3050 mm high complete with fixed glass panels and double leaves swing glass door (W27)	1	no			
K	Overall size 4790 mm wide x 3050 mm high fixed glass panel (W28)	1	no			
L	Overall size 5240 mm wide x 3150 mm high complete with fixed glass panels and double leaves swing glass door (W29)	1	no			
M	Overall size 2375 mm wide x 3600 mm high complete with fixed glass panels and single leaf swing glass door (W32)	2	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - WINDOWS (Cont)</u>					
	(Cont) ALUMINIUM GLAZED SYSTEM					
	(Cont) Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications					
A	Overall size 3110 mm wide x 3050 mm high fixed glass panel (W33)	1	no			
B	Overall size 4670 mm wide x 3600 mm high fixed glass panel (W34)	1	no			
C	Overall size 2040 mm wide x 3200 mm high complete with fixed glass panels and double leaves swing glass door (W35)	3	no			
D	Overall size 2040 mm wide x 3610 mm high fixed glass panel (W36)	28	no			
E	Overall size 5275 mm wide x 3500 mm high fixed glass panel (W37)	1	no			
F	Overall size 7895 mm wide x 3500 mm high complete with fixed glass panels and single leaf swing glass door (W38)	1	no			
G	Overall size 10480 mm wide x 3500 mm high complete with fixed glass panels and single leaf swing glass door (W39)	1	no			
H	Overall size 4700 mm wide x 3500 mm high complete with fixed glass panels and single leaf swing glass door (W40)	1	no			
J	Overall size 1940 mm wide x 3500 mm high complete with fixed glass panels and single leaf swing glass door (W41)	1	no			
K	Overall size 3160 mm wide x 3500 mm high complete with fixed glass panels and double leaves swing glass door (W42)	2	no			
L	Overall size 8675 mm wide x 3500 mm high complete with fixed glass panels and double leaves swing glass door (W43)	1	no			
M	Overall size 2295 mm wide x 3500 mm high complete with fixed glass panels and double leaves swing glass door (W44)	2	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - WINDOWS (Cont)</u>					
	(Cont) ALUMINIUM GLAZED SYSTEM <u>(Cont) Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
A	Overall size 1000 mm wide x 2150 mm high single leaf swing glass door (W48) <u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>	2	no			
B	Overall size 1750 mm wide x 3000 mm high complete with fixed glass panels and sliding glass window (W46)	2	no			
C	Overall size 3050 mm wide x 3000 mm high complete with fixed glass panels and sliding glass windows (W47) <u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>	2	no			
D	Overall size 1150 mm wide x 4430 mm high complete with fixed glass panel and folding panels (W17)	2	no			
E	Overall size 2040 mm wide x 4430 mm high complete with fixed glass panels and folding panels (W18)	7	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - WINDOWS (Cont)</u>					
	(Cont) ALUMINIUM GLAZED SYSTEM					
	<u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 6 mm thick green tinted Frosted glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
A	Overall size 1600 mm wide x 600 mm high top hung windows (W30)	2	no			
B	Overall size 800 mm wide x 600 mm high top hung windows (W31)	3	no			
C	Overall size 600 mm wide x 600 mm high top hung windows (W45)	6	no			
D	Precast reinforced concrete (grade 20) lintol, in various sizes including reinforcement, bedded and jointed in cement and sand (1:3) mortar, hoisted and fixed in position, finished fair on all exposed surfaces, all as detailed on drawings and in specification		Item			
	<u>OTHER WORKS NECESSARY</u>					
E	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - WINDOWS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>Page No. BQ/5</p> <p>Page No. BQ/6</p> <p>Page No. BQ/7</p> <p>BILL 3 - WINDOWS Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - INTERNAL WALLS</u>					
	BRICKWALL					
	<u>Common brickwall in cement and sand (1:3) mortar with and including 'Exmet' reinforcement at every fourth course</u>					
A	115 mm thick brickwall	1732	m2			
B	230 mm thick brickwall	117	m2			
C	300 mm thick cavity brickwall	235	m2			
	<u>Decorative stainless steel in hairline natural finish balustrading (straight and curved-on-plan) in welded connection complete with 50 mm diameter stainless steel hollow section as described top rail with 50 mm diameter short connection to railing post, 10 mm thick tempered glass balustrade fixed to 35 mm x 50 mm stainless steel hollow section railing post with and including all base plates, anchor bolts, bends, ramps, wreath, end caps and all fixing accessories as detailed on drawing and in specification</u>					
D	1100 mm high	8	m			
E	115 mm wide with 150 mm high upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
F	230 mm wide with 150 mm high upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
G	300 mm wide with 150 mm high upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
H	6 mm diameter x 450 mm long mild steel bonding ties, one end cast into concrete column and hooked around column reinforcement and other end built into joints of brickwork including forming perforation in formwork		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - INTERNAL WALLS (Cont)</u></p> <p>OTHER WORKS NECESSARY</p> <p>A Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - INTERNAL WALLS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 3 - INTERNAL WALLS Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<u>BILL 3 - DOORS</u>					
The Contractor must verify the exact sizes of doors and opening on site prior to fabrication		Note			
Shop drawings should be submitted by Contractor prior to fabrication and installation for Architect approval		Note			
The Contractor must submit sample / mock-up for Architect approval		Note			
All door frame and architrave shall finished with 'ICI' or other equal and approved spray gloss paint		Note			
All finished doors, linings, door frames and architrave shall be well-seasoned treated hardwood, planed, smoothed and sanded		Note			
All door shall include kontras, beading and moulding		Note			
All door finishes details shall refer to Architectural drawings and as in specification		Note			
SOLID TIMBER CORE FLUSH DOORS					
A Double leaves door, overall size 1900 x 2100 mm high (D2)	3	no			
B Single leaf door, overall size 750 x 1950 mm high at 150 mm above floor level (D3)	12	no			
C Single leaf door with louvre opening, overall size 800 x 2100 mm high (D4)	42	no			
D Single leaf door with louvre opening, overall size 745 x 2100 mm high (D6)	2	no			
FIRE RATED SOLID HARDWOOD TIMBER DOORS					
E One hour fire rated single leaf door, overall size 950 x 2100 mm high (D1)	6	no			
F One hour fire rated double leaves door, overall size 1900 x 2100 mm high (D2A)	5	no			
G One hour fire rated double leaves door, overall size 1000 x 2100 mm high (D7)	4	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - DOORS (Cont)</u>					
	DECORATIVE ARCHIFACADE SCREEN DOOR					
A	Double leaves door complete with approved door frame, overall size 1600 x 2100 mm high (D5)	2	no			
	ALUMINIUM LOUVERS DOOR					
B	Double leaves door complete with approved door frame, overall size 1800 x 2100 mm high (D8)	1	no			
	<u>Wrot treated hardwood door frame and accessories in approved paint finished</u>					
C	Door frame	298	m			
D	Architrave	596	m			
E	Timber subframe	298	m			
F	Fire rated door frame	83	m			
G	Fire rated architrave	165	m			
H	Fire rated timber subframe	83	m			
J	Precast reinforced concrete (grade 20) lintol in various sizes including reinforcement, bedded and jointed in cement and sand (1:3) mortar, hoisted and fixed in position, finished fair on all exposed surfaces, all as detailed on drawings and in specification		Item			
K	150 x 50 x 100 mm high heelstone cast to suit the profile of door jamb with one end built into door jamb and other end cast into heelstone and finish to match floor finishes		Item			
L	150 x 25 x 3 mm thick mild steel lugs with one end fishtailed built into joints of brickwork and the other end turned up, holed and screwed to back of timber door frame		Item			
M	6 mm wide approved silicone sealant pointing to gap between frame and tile		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - DOORS (Cont)</u>					
	IRONMONGERY					
	<u>Supply and fix the following or other equal and approved stainless steel ironmongery to doors and frames including all matching screws unless otherwise stated</u>					
A	"Kawajun" 503.12.101 or other equal and approved Hinge	249	no			
B	"Hafele" 502.10.125 or other equal and approved Pull Handle SSSP L1200mm	6	no			
C	"Hafele" 502.11.120 or other equal and approved Mortise roller lock SS matte forend width 24mm	16	no			
D	"Kawajun" 503.11.110 or other equal and approved 65mm Key-Thumb Turn Profile Cylinder	18	no			
E	"Kawajun" 503.11.107 or other equal and approved Square Escutcheon shot black	18	no			
F	"Kawajun" 503.10.238 or other equal and approved C1 Lever Handle on Square Rose & Escutcheon Finish : Shot Black	73	no			
G	"Hafele" 502.11.103 or other equal and approved mortise lock for profile cylinders	57	no			
H	"Kawajun" 503.11.117 or other equal and approved Thumb Turn & Coin Turn profile *For Toilet	55	no			
J	"Hafele" 502.12.112 or other equal and approved Heavy Duty Buttt Hinge	42	no			
K	"Hafele" 502.13.106 or other equal and approved Concealed diir closer DCL 34 *suitable for Fire-Rated Doors	14	no			
L	"Hafele" 502.10.100 or other equal and approved Flush Ring Pull Handle w spindle	5	no			
M	"Hafele" 502.11.104 or other equal and approved Mortise Latch	5	no			
N	"Hafele" 502.16.112 or other equal and approved Flush Bolt 8" SS	19	no			

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To Collection \$

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - DOORS (Cont)</u>					
	(Cont) IRONMONGERY					
	<u>(Cont) Supply and fix the following or other equal and approved stainless steel ironmongery to doors and frames including all matching screws unless otherwise stated</u>					
A	"Hafele" 502.16.113 or other equal and approved Flush Bolt 18" SS	19	no			
B	"Hafele" 502.16.111 or other equal and approved Floor Socket-15mm dia	14	no			
C	"Hafele" 502.16.120 or other equal and approved Door Stopper	88	no			
D	"Hafele" 502.13.105 or other equal and approved Door Closer (without hold open - standard arm)	60	no			
E	"Hafele" 502.11.127 or other equal and approved Single Deadbolt (Light Duty)	1	no			
	<u>MASTER KEY SYSTEM</u>					
F	Allow for all locks to be keyed in one master key to the approval of the Superintending Officer		Item			
	<u>OTHER WORKS NECESSARY</u>					
G	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - DOORS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>BILL 3 - DOORS Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<u>BILL 3 - INTERNAL WALL FINISHES</u>					
Contractor to refer Schedule of Finishes for complete specification and description					
Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule					
A 20 mm thick cement and sand (1:3) plainface plaster including trowelling smooth to wall and column	4683	m2			
B 20 mm thick cement and sand (1:3) backing screed to receive ceramic wall tiles to wall and column	1304	m2			
C Approved Skim coat on plastered wall surface to received paint	4460	m2			
D (3.1) 'ICI Dulux' all-in-one or other equal and approved paint to plainface plastered (plaster measured seperately) wall and column	3173	m2			
E (3.2) 'ICI Dulux' pentelite or other equal and approved paint to plainface plastered (plaster measured seperately) wall and column	1510	m2			
F (3.3) 'Cicogress' or other equal and approved 300 mm x 600 mm wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column	212	m2			
G (3.4) 'Cicogress' or other equal and approved 400 mm x 1200 mm wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column	970	m2			
H (3.5) 'Portino' Basic series or other equal and approved 300 mm x 600 mm wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column	122	m2			
J 'Fosroc' brushbond or other equal and approved cementious waterproofing to concrete surfaces, applied strictly in accordance with the manufacturer's instruction to wall and column (Rate to include for providing a ten (10) years guarantee as specified hereinbefore)	1182	m2			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - INTERNAL WALL FINISHES (Cont)</u></p> <p>OTHER WORKS NECESSARY</p> <p>A Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - INTERNAL WALL FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 3 - INTERNAL WALL FINISHES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - INTERNAL FLOOR FINISHES</u>					
	Contractor to refer Schedule of Finishes for complete specification and description		Note			
	Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
A	(1.9) 50 mm thick cement and sand (1:3) screed including trowelled smooth to floor	98	m2			
	<u>30 mm thick cement and sand (1:3) backing screed to floor to receive</u>					
B	Floor tiles	508	m2			
C	Carpet	657	m2			
D	Polished Marble	642	m2			
E	Block	36	m2			
F	150 mm high tiles skirting	304	m			
G	150 mm high timber skirting	278	m			
H	Polished marble	289	m			
J	Drop in slab		Item			
	<u>(1.1) 'Cicogress' or other equal and approved 750 mm x 1500 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
K	Floor	116	m2			
L	Drop in slab		Item			
	<u>(1.2) 'Cicogress' or other equal and approved 400 mm x 1200 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
M	Floor	121	m2			
N	Drop in slab		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - INTERNAL FLOOR FINISHES (Cont)</u>					
	<u>(1.3) 'Cicogress' or other equal and approved 300 mm x 600 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
A	Floor	163	m2			
B	Drop in slab		Item			
	<u>(1.4) 'Cicogress' or other equal and approved 600 mm x 600 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
C	Floor	108	m2			
D	Drop in slab		Item			
	<u>(1.6) 'Modulyss' DSGN CLOUD series or other equal and approved carpet tiles with approved pile weight and colour, complete with and including foam underlay laid to floor with matching adhesive, cutting, aluminium edge strip and dividing strip, etc. laid on cement and sand screed (screed measured separately) to</u>					
E	Floor	657	m2			
F	Drop in slab		Item			
	<u>(1.7) Polished marble, laid in pattern on cement and sand screed (screed measured separately) to</u>					
G	Floor	642	m2			
H	Drop in slab		Item			
	<u>(1.8) 'CIFRE CERAMICA' Extend Series or other equal and approved 20 mm thick floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
J	Floor	36	m2			
K	Drop in slab		Item			

Description	Qty	Unit	Rate	\$	c
<u>BILL 3 - INTERNAL FLOOR FINISHES (Cont)</u>					
<u>The following skirting, laid on cement and sand screed (screed measured separately)</u>					
A (2.1) 'Cicogress' or other equal and approved tiles skirting, 150 mm x 1500 mm	71	m			
B (2.2) 'Cicogress' or other equal and approved tiles skirting, 150 mm x 600 mm	233	m			
C (2.4) Solid timber skirting	278	m			
D (2.5) Polished marble skirting	289	m			
E Selective Aluminium U-Channel termination accessories with natural anodised finish to Architect's approval, install strictly in accordance with the manufacturer's instruction	871	m			
F 'Fosroc' brushbond or other equal and approved cementitious waterproofing to concrete surfaces, applied strictly in accordance with the manufacturer's instruction (Rate to include for providing a ten (10) years guarantee as specified hereinbefore)	170	m2			
G Approved aluminium edge strip and dividing strip, fixed strictly in accordance with manufacturer's instruction		Item			
H Approved stainless steel divider strip, fixed strictly in accordance with manufacturer's instruction		Item			
OTHER WORKS NECESSARY					
J Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
1) _____					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - INTERNAL FLOOR FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>BILL 3 - INTERNAL FLOOR FINISHES Carried to Summary</p>					

Description	Qty	Unit	Rate	\$
<u>BILL 3 - INTERNAL CEILING FINISHES</u>				
Contractor to refer Schedule of Finishes for complete specification and description		Note		
A (4.4) 20 mm thick cement and sand (1:3) plainface plaster trowelled smooth to soffit of slab	98	m2		
B (4.1) 'Gyproc' or other equal and approved gypsum board ceiling with square edge complete with standard fixing accessories all as per manufacturer's detail, recommendation and approval as detailed on drawings.	1092	m2		
C (4.2) 'Gyproc' or other equal and approved gypsum moisture resistant board ceiling with square edge complete with standard fixing accessories all as per manufacturer's detail, recommendation and approval as detailed on drawings.	123	m2		
D (4.5) 'USG' or other equal and approved grid ceiling on suspension system complete with perimeter edge trimming T-grid, aluminium trimmer, moluding and capping with matching colour including approved paint, all fixing accessories all as to manufacturer's detail, recommendation and approval as detailed on drawings.	556	m2		
E (4.7) 'Hunter Douglas' or other equal and approved Luxalon aluminium clip-in tiles ceiling, 600 mm x 600 mm on suspension system complete with perimeter edge trimming T-grid, aluminium trimmer, moluding and capping with matching colour including approved paint, all fixing accessories all as to manufacturer's detail, recommendation and approval as detailed on drawings.	70	m2		
F Decorative coffer feature ceiling in 'Gyproc' or other equal and approved gypsum board complete with fixing accessories and finished with 'ICI DULUX' or other equal and approved paint, all as detailed on Architectural drawings and in specification	285	m2		

BILL 3 - INTERNAL CEILING FINISHES

Description	Qty	Unit	Rate	\$	c
<u>BILL 3 - INTERNAL CEILING FINISHES (Cont)</u>					
<u>Prepare, prime and apply 'ICI DULUX' or other equal and approved paint finish to</u>					
A Soffit of slab	98	m2			
B Gypsum board	1215	m2			
C Shadow gap including paint		Item			
D Drop in ceiling including paint		Item			
E <u>Extra for forming ceiling access opening including all frame and painting</u>		Item			
OTHER WORKS NECESSARY					
F Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
1) _____					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - INTERNAL CEILING FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 3 - INTERNAL CEILING FINISHES Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<u>BILL 3 - EXTERNAL WALL FINISHES</u>					
Contractor to refer Schedule of Finishes for complete specification and description		Note			
Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
A 20 mm thick cement and sand (1:3) plainface plaster including trowelling smooth to wall and column	2870	m2			
B 20 mm thick cement and sand (1:3) backing screed to receive ceramic wall tiles to wall and column	1862	m2			
C (3.6) Red Sandstone wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column including primed A5631 or other equalvalent, bracket and all other fixing accessories	1862	m2			
D (3.9) 'KCC' textcoat with 'Wattyl Solagard' or other equal and approved paint to plainface plastered (plaster measured separately) wall and column	2870	m2			
OTHER WORKS NECESSARY					
E Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
1) _____					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - EXTERNAL WALL FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 3 - EXTERNAL WALL FINISHES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - EXTERNAL FLOOR FINISHES</u>					
	Contractor to refer Schedule of Finishes for complete specification and description		Note			
	Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
	<u>30 mm thick cement and sand (1:3) backing screed to floor to receive</u>					
A	Block	959	m2			
B	Block tile skirting	62	m			
C	Red sandstone	273	m			
D	Drop in slab		Item			
	<u>(1.8) 'CIFRE CERAMICA' Extend Series or other equal and approved 20 mm thick floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
E	Floor	959	m2			
F	Drop in slab		Item			
	<u>The following skirting, laid on cement and sand screed (screed measured separately)</u>					
G	(2.6) 20 mm thick CIFRE CERAMICA Extend Series tiles skirting	62	m			
H	(2.7) Red sandstone tiles skirting	273	m			
J	Selective Aluminium U-Channel termination accessories with natural anodised finish to Architect's approval, install strictly in accordance with the manufacturer's instruction	335	m			
	OTHER WORKS NECESSARY					
K	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					

Description	Qty	Unit	Rate	\$	c
<u>BILL 3 - EXTERNAL FLOOR FINISHES (Cont)</u>					
(Cont) OTHER WORKS NECESSARY					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - EXTERNAL FLOOR FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 3 - EXTERNAL FLOOR FINISHES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - EXTERNAL CEILING FINISHES</u>					
	Contractor to refer Schedule of Finishes for complete specification and description		Note			
A	(4.6) 'SIAM' or other equal and approved gypsum weatherbloc ceiling with square edge complete with standard fixing accessories finished, all as per manufacturer's detail, recommendation and approval as detailes on drawings.	392	m2			
	<u>Prepare, prime and apply 'Wattyl Solagard' or other equal and approved paint finish to</u>					
B	Gypsum weatherbloc board	392	m2			
C	Shadow gap including paint		Item			
D	Drop in ceiling including paint		Item			
E	<u>Extra for forming ceiling access opening including all frame and painting</u>		Item			
	OTHER WORKS NECESSARY					
F	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - EXTERNAL CEILING FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 3 - EXTERNAL CEILING FINISHES Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 3 - FURNISHING FITTINGS</u></p> <p>All sizes shall be checked on site prior to fabrication</p> <p>All external surfaces shall be of selective Lamitak laminated finish or of equal equivalent unless otherwise stated, face pattern and colour as selected by the Architect</p> <p>All internal surfaces shall be of selective Lamitak laminated finish or of equal equivalent unless otherwise stated, face pattern and colour as selected by the Architect</p> <p>All hardwood edging and lipping shall be painted with 2 coats of approved transcolor preservative wood stain finishing or of equal equivalent, colour as selected by Architect</p> <p>All cabinet doors, shelves and drawers shall be provided with and including approved ironmongeries (Lock set to drawer refer to Architectural drawings denoted as circular keyhole in elevation)</p> <p>All counter top finished with 12.3 mm thick 'Samsung Staron' or other equal and approved solid surface material back with plywood and 'Non-drip' edge profile on front and sides of appoved colour as selected by the Architect</p> <p>Unless otherwise stated, all finishes and details as shown/detailed on Architectural drawings</p> <p>Tenderer shall make his own assessment from all drawings and specification issued at the time of tederer. Any discrepancies between drawing and Bill of Quantities, the drawings shall take precedence. No additional claim will be entertained</p> <p>Mock up units shall be provided when require</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - FURNISHING FITTINGS (Cont)</u>					
	WASH HAND BASIN COUNTER TOP					
	<u>Wash hand basin counter top and 150 mm high splashboard in approved colour finished with waterproofing, including forming opening to receive basin including mild steel bracket support and all necessary fixing accessories all as detailed on drawing and in specification</u>					
A	Overall size 2750 mm long x 600 mm deep x 400 mm high	2	no			
B	Overall size 4000 mm long x 600 mm deep x 400 mm high	2	no			
C	Overall size 1300 mm long x 600 mm deep x 400 mm high	2	no			
D	Overall size 900 mm long x 600 mm deep x 400 mm high	2	no			
E	Overall size 1162 mm long x 600 mm deep x 400 mm high	2	no			
F	Overall size 700 mm long x 600 mm deep x 400 mm high	1	no			
	PANTRY CABINET					
G	Low Cabinet, overall size 3313 mm long x 600 mm deep x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, splashboard, sink top, forming opening for sink, skirting, all ironmongeries and etc, all as per details on Architectural drawings	1	no			
H	High Cabinet, overall size 3313 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	1	no			
J	Low Cabinet, overall size 5897 mm long x 600 mm deep x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, splashboard, sink top, forming opening for sink, skirting, all ironmongeries and etc, all as per details on Architectural drawings	2	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - FURNISHING FITTINGS (Cont)</u>					
	(Cont) PANTRY CABINET					
A	High Cabinet, overall size 5895 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	2	no			
	SECURITY COUNTER TOP (Guard House)					
B	Overall size, detail designs, finishes specification for security counter top including all ironmongeries and etc, all as detailed on Architectural drawings	2	no			
	SECURITY COUNTER TOP (Guard Office)					
C	Overall size, detail designs, finishes specification for security counter top including all ironmongeries and etc, all as detailed on Architectural drawings	2	no			
	INTERIOR DESIGN WALL PANELLING					
	All details design and finishes specification to refer to Architectural detail drawings		Note			
D	ID detail 01 - Reception foyer, feature wall and gallery wall cladding comprised of: a) Reception counter in selective 20 mm thick white volakas polished marble finish complete with all necessary plywood backing and cabinetry timber framing b) Lower Reception counter in selective Samsung Staron solid surface finish complete with necessary plywood backing and cabinetry timber framing c) Feature wall in selective walnut timber veneer complete with sprayed lacquer coating finish d) Drop ceiling feature in selective walnut timber veneer complete with sprayed lacquer coating finish	1	no			
E	ID detail 02 - Library cabinetry detail comprised of:	1	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - FURNISHING FITTINGS (Cont)</u>					
	(Cont) INTERIOR DESIGN WALL PANELLING					
	a) Selective red sandstone cladding finish in dry fixing system complete with stainless steel brackets, all to manufacturer's instruction and detail					
	b) Cabinetry works in selective finishes including all framing, fixing accessories and ironmongeries					
A	ID detail 03 - Lift Shaft and staircase wall cladding (ground and first floor) comprised of:	1	no			
	a) Feature wall in selective Walnut timber veneer complete with sprayed lacquer coating finish					
	b) Selective red sandstone cladding finish in dry fixing system complete with stainless steel brackets, all to manufacturer's instruction and detail					
	c) Selective coloured stainless steel cladding in natural hairline finish					
	d) 60mm diameter solid Walnut timber handrail complete with stainless steel wall fixing bracket					
	e) Archifoam Archifacade CPC panel in decorative pattern design complete with sprayed paint finish and sprayed lacquer coating to architect's approval. Feature to complete with 8mm thick grey tinted mirror finish as backdrop for CPC panel					
B	ID detail 04 - Gallery wall cladding comprised of:	1	no			
	a) Box-up column feature in selective red sandstone cladding finish in dry fixing system complete with brackets, all to manufacturer's instruction and detail					
C	ID detail 05 - Consular display counter comprised of:	1	no			
	a) Feature wall in selective Walnut timber veneer complete with sprayed lacquer coating finish					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - FURNISHING FITTINGS (Cont)</u>					
	(Cont) INTERIOR DESIGN WALL PANELLING					
	b) Selective red sandstone cladding finish in dry fixing system complete with stainless steel brackets, all to manufacturer's instruction and detail					
	c) Feature counter in selective 20mm thick White Volakas polished marble finish complete with Walnut timber veneer insert in sprayed lacquer coating					
A	ID detail 06 - Consular display counter comprised of:	1	no			
	a) Box up column feature in selective red sandstone cladding finish in dry fixing system complete with stainless steel brackets all to manufacturer's instruction and detail					
	b) Consular counter in selective 20mm thick White Volakas polished marble complete with plywood backing					
B	ID detail 07 - Multipurpose hall entrance feature wall comprised of:	1	no			
	a) Selective red sandstone cladding finish in dry fixing system complete with stainless steel brackets, all to manufacturer's instruction and detail					
	b) Selective silk padded fabric paneling complete with all necessary box up timber framing and plywood backing					
	c) Archifoam Archifacade CPC panel in decorative pattern design complete with sprayed paint finish and sprayed lacquer coating to architect's approval. Feature to complete with 8mm thick grey tinted mirror finish as backdrop for CPC panel					
	d) Column box up feature in selective Walnut timber veneer finish complete with sprayed lacquer coating finish					
	e) Drop ceiling feature in selective Walnut timber veneer finish complete with sprayed lacquer coating finish					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - FURNISHING FITTINGS (Cont)</u>					
	(Cont) INTERIOR DESIGN WALL PANELLING					
A	<p>ID detail 08 - Multipurpose hall stage feature wall comprised of:</p> <p>a) Selective silk padded fabric paneling complete with all necessary box up timber framing and plywood backing</p> <p>b) Drop ceiling feature in selective Walnut timber veneer finish complete with sprayed lacquer coating finish</p> <p>c) Archifoam Archifacade CPC panel in decorative pattern design complete with sprayed paint finish and sprayed lacquer coating to architect's approval. Feature to complete with 8mm thick grey tinted mirror finish as backdrop for CPC panel</p> <p>d) Column box up feature in selective Walnut timber veneer finish complete with sprayed lacquer coating finish</p> <p>e) Selective red sandstone cladding finish in dry fixing system complete with stainless steel brackets, all to manufacturer's instruction and detail</p>	1	no			
B	<p>ID detail 09 - Multipurpose hall and Refreshment Area ceiling & column feature comprised of:</p> <p>a) Box up ceiling feature in selective Walnut timber veneer finish complete with sprayed lacquer coating finish</p> <p>b) Column box up feature in selective Walnut timber veneer finish complete with sprayed lacquer coating finish</p> <p>c) Hunter douglas powder coated aluminium baffle ceiling complete with all necessary fixing accessories, all as per manufacturer's instruction and detail</p>	1	no			
C	<p>ID detail 10 - High Commissioner's Office Cabinetry and feature wall comprised of:</p>	1	no			

Description	Qty	Unit	Rate	\$	c
<u>BILL 3 - FURNISHING FITTINGS (Cont)</u>					
(Cont) INTERIOR DESIGN WALL PANELLING					
a) Cabinetry, overall size 6600 mm long x 600 mm deep x 3500 mm high comprised of solid timber door, cabinet doors, drawers, open shelves, mirrors, skirting, all ironmongeries and etc, all as per details on Architectural drawings (Elevation A)					
b) Selective red sandstone cladding finish in dry fixing system complete with skirting and stainless steel brackets, all to manufacturer's instruction and detail (Elevation B)					
c) Selective silk padded fabric paneling complete with all necessary box up timber framing and plywood backing, feature wall in selective Walnut timber veneer complete with sprayed lacquer coating finish, solid timber door, stone skirting and etc, all as per details on Architectural drawings (Elevation C)					
d) Feature wall in selective Walnut timber veneer complete with sprayed lacquer coating finish complete with solid timber door and all ironmongeries (Elevation D)					
MIRROR					
<u>8 mm thick bronze tinted mirror with 10 mm thick plywood backing complete with powder coated aluminium frame and all fixing equipment and accessories</u>					
A	Overall size 2700 mm long x 1000 mm high	4	no		
B	Overall size 500 mm long x 800 mm high	6	no		
C	Overall size 1200 mm long x 1000 mm high	2	no		
OTHER WORKS NECESSARY					
D	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item		
1) _____					
2) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - FURNISHING FITTINGS (Cont)</u></p> <p>(Cont) OTHER WORKS NECESSARY</p> <p>3) _____</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - FURNISHING FITTINGS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>Page No. BQ/5</p> <p>Page No. BQ/6</p> <p>Page No. BQ/7</p> <p>Page No. BQ/8</p> <p>BILL 3 - FURNISHING FITTINGS Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - PLUMBING</u>					
	<u>PLUMBING</u>					
	Fire Hosereel and all associated tanks, pump sets and plumbing works measured in Bill 8B		Note			
	All bends, junctions, tees and the like shall be with access eye opening of pipe diameter		Note			
	All soil and waste pipes shall be connected to gully trap and first manhole		Note			
	SOIL, WASTE AND VENT PIPES					
A	Waste, soil and vent piping system, including all connection and fittings, all as detailed on drawings and in specification		Item			
B	Floor trap including all connection, fittings and gratings, all as detailed on drawings and in specification		Item			
	GULLY TRAP					
C	Gully trap and chamber size 300 x 300 mm in various depth internally with multiple inlets comprising 125 mm thick concrete (grade 20) wall and base, upvc gully trap to B.S.4660 with perforated grating, 300 x 300 mm stainless steel grating with hinge, etc. finished with cement and sand render internally, epoxy painting, inlet and outlet, jointing to waste pipes, including excavation, disposal, backfilling, formwork, etc, the whole as per detail shown on Engineer's drawing		Item			
	COLD AND HOT WATER SERVICES					
D	Cold water and piping including all fittings and connections, all as detailed on drawings and in specification		Item			
E	Hot water and piping including all fittings and connections, all as detailed on drawings and in specification		Item			

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 3 - PLUMBING (Cont)</u></p>					
<p><u>(Cont) PLUMBING</u></p>					
<p>TESTING</p>					
<p>A Allow for testing the whole of the plumbing system to the approval of the relevant authorities and to the satisfaction of the Superintending Officer</p>		Item			
<p><u>OTHER WORKS NECESSARY</u></p>					
<p>B Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p>		Item			
<p>1) _____</p>					
<p>2) _____</p>					
<p>3) _____</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - PLUMBING (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 3 - PLUMBING Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - SANITARY FITTINGS</u>					
	<u>Supply and fix the following or other equal and approved vitreous china (unless otherwise stated) sanitary fittings including setting and bedding in positions, building in all brackets, grouting solid, making all connection to supply, vent, waste, overflow drains and for providing all necessary fixing accessories in strict accordance with the sanitary schedule and manufacturer's instruction</u>					
A	DURAVIT 2133010005-C Starck 2 One Piesce 4.8L single flush syphonic W.C., 0063390000-C seat & cover (soft close), 014180096 mounting set (s-trap:305mm), 112" stop valve (include in mounting set), 1/2" flexible hose (include in mounting set)	1	no			
B	DURAVIT 21180900002-G D-Code closed coupled washdown W.C., 0927100004-G cistern with 6/3L dual flush fittings, U7070S+I107 seat & cover (soft close), bend connector (S-trap:170mm), 1/2" stop valve, 3/8" x 1/2" flexible hose	17	no			
C	JOHNSON SUISSE WBAENW211WW windsor 250 BO WC, WBALTN111WW trend cistern with lid, WBFT400335XX trend 6/3L flush fittings, SC402 seat & cover (soft close), WBFT400101XX fixing bolt (x2), P450 Straight Connector (S-Trap: 250mm) , AV300 1/2" Stop Valve with Flange, DA650-N 1/2" Flexible Hose	3	no			
D	DURAVIT 0828300000 D-Code Wall-Hung Urinal, Jet Nozzle, 32mm Bottle Trap, Fixings, UF-EX01 Exposed Urinal Flush Valve with 6" Semi Flex Pipe	2	no			
E	DURAVIT 8500000000 Starck 3 Wall-Hung Ceramic Urinal Partition Size (705 x 400)mm, Fixings	2	no			
F	DURAVIT 2323550000 Starck 2 Wall-Hung Basin with 1 Tap Hole Size (0 x 410 x 185) mm, WBFT400099XX Fixing Bolt (x2), 32mm - 1/4" UPVC Bottle Trap, 0858340000 Half Pedestal, 0055030000 Fixings, AV300 1/2" Stop Valve with Flange (x2)	1	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - SANITARY FITTINGS (Cont)</u>					
	<u>(Cont) Supply and fix the following or other equal and approved vitreous china (unless otherwise stated) sanitary fittings including setting and bedding in positions, building in all brackets, grouting solid, making all connection to supply, vent, waste, overflow drains and for providing all necessary fixing accessories in strict accordance with the sanitary schedule and manufacturer's instruction</u>					
A	DURAVIT 0337540000 D-Code Insert Basin with 1 Tap Hole W/Overflow Hole Size (545 x 435 x 180)mm, Chrome Plated P-Trap, A202 Chrome Plated Waste, Plug & Chain, AV300 1/2" Stop Valve with Flange, DA650-N 1/2" Flexible Hose	14	no			
B	DCODE 23105500002 D-Code Wall-Hung Basin with 1 Tap Hole W/Overflow Hole Size 550 x 430 x 175)mm, WBFT400099XX Fixing Bolt (x2), 32mm - 1/4" UPVC Bottle Trap, 08571800002 Half Pedestal with Fixings, A202 Chrome Plated Wasted, Plug & Chain, AV300 1/2" Stop Valve with Flange, DA650-N 1/2" Flexible Hose	2	no			
C	JOHNSON SUISSE WBAABS201WW Boston 500 Wall-Hung Basin with 1 Tap Hole W/Overflow Hole Size (500 x 430 x 210)MM, WBFT400099xx Fixing Bolt (x2), WBABHP000WW Half Pedestal, WBFT400101XX Fixing Bolt (x2), 32mm - 1 1/4" Upvc Bottle Trap, A202 Chrome Plated Waste Plug & Chain, AV300 1/2" Stop Valve withFlange, DA650-N 1/2" Flexible Hose	3	no			
D	FIMA CARLO FRATTINI F3721CR.WS.2 Quad Deck Mounted Basin Mixer (Hot & Cold), Ckick Clack Pop-Up Wasta, 1/2" Supply Hose (x2)	1	no			
E	JOHNSON SUISSE WBFA300760CP Deck Mounted Self Closing Tap (Cold Only)	19	no			
F	JOHNSON SUISSE WBFA300933CP Fermo Deck Mounted Sink Tap (Cold Only)	3	no			
G	JOHNSON SUISSE WBFA301482CP Fermo-N Two Way Bib Tap With Screw Collar & Flange (Cold Only)	1	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - SANITARY FITTINGS (Cont)</u>					
	<u>(Cont) Supply and fix the following or other equal and approved vitreous china (unless otherwise stated) sanitary fittings including setting and bedding in positions, building in all brackets, grouting solid, making all connection to supply, vent, waste, overflow drains and for providing all necessary fixing accessories in strict accordance with the sanitary schedule and manufacturer's instruction</u>					
A	FIMA CARLO FRATTINI F3729X2CR Quad Concealed Bath & Shower Mixer With Diverter (Hot & Cold), F3000 Fima Concealed Box, F2224/2CR Brass Round Overhead Shower (Dia: 300mm), F2584CR Ceiling Mounted Shower Arm (L-150mm), F2297CR Sliding Rail c/w Brass Flex Hose (L-1500mm) + Anto-Limestone Handshower, F2013CR 1/2" Water Outlet Connector	1	no			
B	DURAVIT 0099401000 Starck-T Paper Holder	1	no			
C	METLAM ML841 Stainless Steel #304 Wall-Mounted Jumbo Toilet Roll Dispenser	20	no			
D	DURAVIT 0099301000 Starck-T Double Robe Hook	1	no			
E	FIMA CARLO FRATTINI F6004/1CR Rotola Robe Hook	20	no			
F	DURAVIT 0099421000 Starck-T Single Towel Rail (L-610mm)	1	no			
G	DURAVIT 0099471000 Starck-T Towel Ring	1	no			
H	METLAM ML710-SMMK2 Wall Mounted Stainless Steel #304 Lockable Paper Towel Dispenser & Waste Receptacle Size (720 x 365 x 115)mm	13	no			
J	DURAVIT 0099351000 Starck-T Wall Mounted Soap Dispenser	1	no			
K	METLAM ML 600AS Stainless Steel #304 Wall Mounted Horizontal Liquid Soap Dispenser Size (209 x 123 x 71) mm Capacity : 1.2L	15	no			
L	METLAM ML 1800 Auto Operation Hand Dryer in White High Grade Fire Retardent ABS Casing Size (268 x 220 x 170)mm A/C: 240V	13	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 3 - SANITARY FITTINGS (Cont)</u>					
	<u>(Cont) Supply and fix the following or other equal and approved vitreous china (unless otherwise stated) sanitary fittings including setting and bedding in positions, building in all brackets, grouting solid, making all connection to supply, vent, waste, overflow drains and for providing all necessary fixing accessories in strict accordance with the sanitary schedule and manufacturer's instruction</u>					
A	FIMA CARLO FRATTINI F2454/7CR Collettivita Bidet Angle Valve (Cold Only), ABS Hand Bidet Spray, 1200 mm Flexible Chromalux Hose, Spray Holder	1	no			
B	FIMA CARLO FRATTINI F2840/7CR Collettivita Bidet Angle Valve (Cold Only), ABS Hand Bidet Spray, 1200 mm Flexible Stainless Steel Hose, Spray Holder	20	no			
C	CAM AHI-1015BWC Single Bowl Single Drainer Insert Type Stainless Steel Kitchen Sink Size (1000 x 500 x 250)mm, Waste, 40mm 1/2 UPVC Bottle Trap, AV300 1/2" Stop Valve with Flange, DA650-N 1/2" Flexible Hose	3	no			
D	SHOWY 2333 Single Bowl 45L Stainless Steel Lay On Sink with Up-Turn Size (557 x 453 x 282)mm, Waste, 40 mm - 1 1/2" UPVC Bottle Trap, L-Bracket (x2)	1	no			
E	NOVATEC FT201-6 Stainless Steel Decorative Tile Insert Floor Grating Size (153 x 153)mm, FLV Anti Insect & Odor Flow Valve	36	no			
	OTHER WORKS NECESSARY					
F	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 3 - SANITARY FITTINGS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>BILL 3 - SANITARY FITTINGS Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 4 - GENERAL NOTE</u></p> <p><u>NOTES</u></p> <p>The bills are to be read and priced in conjunction with the drawings, specification and include all works described / shown in bills and drawings</p> <p>The Contractor is to comply with the conditions of contract, specification, all preliminaries, etc. necessary for the complete execution of the works</p> <p>The Contractor shall be responsible for applying and obtaining all required permits from the relevant authorities for temporary accesses, etc. and for payment of fees thereof</p> <p>The Contractor must visit the site so as to take into consideration existing conditions and to have satisfied himself as to the nature of the site, soil condition, facilities for access, mobilisation of plants, etc. required under this contract. No claims will be allowed on the grounds of ignorance of the conditions under which the works will be executed</p> <p>Prior to the commencement of any work, the levels of the original surface of the site including all slopes shall be agreed by the Superintending Officer in accordance with Preliminaries under 'Setting Out and Site Levels' and on completion of this works, the Contractor must submit as built drawings as required in Preliminaries under 'Completion Joint-Survey and As Built Drawing' which shall form the basis of measurement</p> <p>The Contractor shall take all measures to protect the existing cables and services that is not affected by his scope of work. Any such damage caused by the Contractor shall be made good at the expense of the Contractor and to the satisfaction of the Superintending Officer</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 4 - GENERAL NOTE (Cont)</u></p> <p><u>(Cont) NOTES</u></p> <p>All making good shall be executed with materials and workmanship to match in every respect of the surrounding work and shall be properly done thereto to the complete satisfaction of the S.O.</p> <p>Unless otherwise specified, all materials and debris resulting from the clearing shall be stacked and removed completely from the site. On no account shall cleared timber or other materials be deposited in areas to be filled. Burning on site shall be prohibited</p> <p>No tipping on the adjoining land shall be allowed in this contract. The Contractor is therefore to make his own arrangements for disposal of all surplus excavated materials where directed and is to pay all charges in connection therewith</p> <p>Tenderer shall make his own assessment from all drawings and specification issued at the time of tederer. Any discrepancies between drawing and Bill of Quantities, the drawings shall take precedence. No additional claim will be entertained</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - GENERAL NOTE (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 4 - GENERAL NOTE Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 4 - PILING</u></p> <p>PRECAST REINFORCED CONCRETE PILES (ALL PROVISIONAL)</p> <p>The system installation shall consist of 9.0 metre long precast concrete piles element forced into the ground using hydraulic jack method including cast in pile shoe</p> <p>The piles should conform to B.S. 8004 : 1986 and be approved by CPRU Min. of Development for use in Brunei Darussalam</p> <p>Steel reinforcement shall conform to B.S. 4449</p> <p>End plate should be manufactured to conform to B.S. 4360</p> <p>Concrete strength during transfer should correspond to a cube strength of minimum 25 Mpa</p> <p>The 28-day strength of concrete shall not be less than 50 Mpa</p> <p>Joint between the consecutive pile element shall be in full weld on each side of the end plates brought in contact</p> <p>The setting pressure of twice the working load shall be held for a minimum of ten seconds before release</p> <p>Each pile shall not deviate by more than 75 mm from the vertical or more than 74 mm from its designed position at the level of the piling chamber</p> <p>The paylengths for the supply and inject complete of each pile shall be measured from pile toe to cut-off level</p> <p>A Provide and erect on site all necessary plant and equipment for installation of precast concrete piles, and dismantle and clear away on completion</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Item</p>			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - PILING (Cont)</u>					
	(Cont) PRECAST REINFORCED CONCRETE PILES (ALL PROVISIONAL)					
A	<p>Allow for moving and handling piling frame and equipment inclusive of assembling and dismantling about at site from position to position including use of Selangan timber matt and hiring of Kobelco for the full duration</p> <p><u>Supply, transport, handle, pitch, inject, weld, extend, cut-off head, etc. precast reinforced (Grade 45) concrete piles, all in strict accordance with the pile specification.</u></p>		Item			
B	<p>250 mm square piles</p> <p><u>Provide the necessary kentledge, jack and dial gauges for the application and release of the load test. The rates include all supervision and labour, watching and lighting and removal of kentledge and equipment</u></p>	680	m			
C	<p>Load test twice the working load for 250 mm square piles</p> <p><u>OTHER WORKS NECESSARY</u></p>	2	no			
D	<p>Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - PILING (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 4 - PILING Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - SUBSTRUCTURE</u>					
	EXCAVATION					
A	Excavate pit for pile cap, commencing from platform level, exceeding 2.00 m deep, get out part return, fill in, ram and surplus cart away excavated material where directed	67	m3			
B	Excavate trench for ground beam, commencing from platform level, not exceeding 2.00 m deep, get out and cart away excavated material where directed	25	m3			
C	Excavate for ground slab and apron slab commencing from platform level, not exceeding 300 mm, average 200 mm deep, get out and cart away excavated material where directed	354	m2			
	ANTI-TERMITE TREATMENT					
D	Prepare and apply one coat of organic chlorine or other equal and approved anti-termite chemical treatment to general surfaces as specified (measured flat over ground floor slab and apron slab area; rate to include for treating surfaces of ground beam, footing and the like and for appointing a registered pest control company to carry out the work and also for providing a ten (10) year warranty)	354	m2			
	DAMP PROOF MEMBRANE					
E	"POLY-FILM 1000" or other equal and approved damp proof membrane laid on prepared bed, seal laps with approved pressure sensitive tape (measured flat over ground floor slab - rate to include for laps, cutting and waste)	354	m2			
	CONCRETE WORKS					
	<u>50 mm thick lean concrete (grade 15) to underside of</u>					
F	Pile cap	30	m2			
G	Ground beam	44	m2			
H	Ground floor slab	354	m2			
J	Apron slab	36	m2			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - SUBSTRUCTURE (Cont)</u>					
	(Cont) CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	Pile cap	22	m3			
B	Stump	11	m3			
C	Ground beam	33	m3			
D	150 mm thick ground floor slab	354	m2			
E	150 mm thick apron slab	36	m2			
F	<u>Extra over</u> for non-slip groove line to ramp		Item			
	<u>10 mm to 25 mm diameter mild steel / high tensile reinforcement bar in</u>					
G	Pile cap	2112	kg			
H	Stump	2662	kg			
J	Ground beam	4422	kg			
K	Ground floor slab	2762	kg			
L	Apron slab	281	kg			
	<u>Formwork to</u>					
M	Sides of pile cap	113	m2			
N	Sides of stump	88	m2			
P	Sides of ground beam	256	m2			
Q	Drop in ground slab and edge of ground slab		Item			
R	Drop in ramp and edge of ramp		Item			
S	Movement/Expansion joint, filled with 25 mm wide x 50 mm deep 'Expandite 99' or other equal and approved expansion / movement joint complete with 25 mm thick softboard filler including slip membrane and additional use of formwork, all as detailed on drawings and in specification		Item			

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 4 - SUBSTRUCTURE (Cont)</u></p> <p>OTHER WORKS NECESSARY</p> <p>A Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - SUBSTRUCTURE (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>BILL 4 - SUBSTRUCTURE Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - FRAME</u>					
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	Suspended beam	63	m3			
B	Column	117	m3			
	<u>10 mm to 32 mm diameter mild steel / high tensile reinforcement bar in</u>					
C	Suspended beam	7429	kg			
D	Column	18980	kg			
	<u>Formwork to</u>					
E	Sides and soffit of suspended beam	487	m2			
F	Sides of column	1138	m2			
	OTHER WORKS NECESSARY					
G	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - FRAME (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 4 - FRAME Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - UPPER FLOOR</u>					
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	125 mm thick suspended slab	347	m2			
B	150 mm thick suspended slab	233	m2			
C	275 mm thick suspended slab	7	m2			
	<u>10 mm and 12 mm diameter mild steel / high tensile reinforcement bar in</u>					
D	Suspended floor slab	4844	kg			
	<u>Formwork to</u>					
E	Sides and soffit of suspended slab	587	m2			
F	Drop in slab and edge of floor slab		Item			
G	Movement/Expansion joint, filled with 25 mm wide x 50 mm deep 'Expandite 99' or other equal and approved expansion / movement joint complete with 25 mm thick softboard filler including slip membrane and additional use of formwork, all as detailed on drawings and in specification		Item			
	OTHER WORKS NECESSARY					
H	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - UPPER FLOOR (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 4 - UPPER FLOOR Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - ROOF</u>					
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	Roof beam	29	m3			
B	Gutter beam	18	m3			
C	125 mm thick gutter slab	27	m2			
D	150 mm thick gutter slab	2	m2			
	<u>10 mm to 25 mm diameter mild steel / high tensile reinforcement bar in</u>					
E	Roof beam	2639	kg			
F	Gutter beam	1638	kg			
G	Gutter slab	604	kg			
	<u>Formwork to</u>					
H	Sides and soffit of roof beam	291	m2			
J	Sides and soffit of gutter beam	228	m2			
K	Soffit of gutter slab	29	m2			
L	Drop in slab and edge of slab		Item			
M	<u>Extra over</u> to gutter wall to form decorative feature		Item			
N	Reinforced concrete ledge in various thickness including all necessary formwork, reinforcement, finished with all exposed concrete surfaces with approved paint in approved color, waterproofing membrane and etc., all as per Architectural and Engineer's details drawings	240	m2			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - ROOF (Cont)</u>					
	STRUCTURAL STEEL ROOF MEMBER					
	All steel works members shall be high tensile galvanised steel, welded and bolted together, including all shop and site welding, filling smooth junction, raking and cutting, hoisted and placed in position all as detailed on drawings					
			Note			
	Rate to include submission of shop drawings					
			Note			
	Rate to included for sand blast clean to BS4232, degrease and wash clean all steel area and repair all damaged including approved paint to Engineer's approval					
			Note			
	All steel works members, plates, cleats and bolts shall be high tensile galvanised steel including all necessary approved painting as specified					
			Note			
	<u>Supply, install and erect the following structural steelworks hoisted and fixed in position to level as accordance to drawing in bolted and welded connection with and including all cutting, drilling, welding and approved metal paint finished (to all expose surfaces), all as detailed on Engineer's drawings</u>					
A	RHS 120 x 80 x 6.3 mm thick	3905	kg			
B	SHS 70 x 70 x 5 mm thick	1510	kg			
C	RHS 75 x 125 x 6 mm thick	838	kg			
D	C15016 lipped C purlin	441	m			
E	Plates / splicing		Item			
F	Angle Cleat including fasteners		Item			
G	Bolts / anchor bolts including nuts and washers		Item			
H	Holding down bolts		Item			
J	Non shrink grout		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - ROOF (Cont)</u>					
	ROOF COVERING					
	Rate to include a ten (10) years warranty for materials		Note			
A	'Lysaght' or other equal and approved Kliplock Hi-Ten 406 0.47 mm thick TCT in clean colorbond XRW fixed to steel purlins (purlins measured separately), laid in full length to fall complete with damping felt and self-adhesive bitumen felt, all clips and including all others matching fixing devices and accessories, all in accordance to the manufacturer's instruction (measured nett- rate to include for laps, cutting and waste) to sloping roof covering	353	m2			
B	'Lysaght' or other equal and approved clean colorbond gable end including flashing, clip, channel, thermal barrier pad and all fixing accessorise and sealant all as detailed on Architectural drawings		Item			
C	'Lysaght' or other equal and approved clean colorbond eave including flashing, foam filler, drip angle, thermal barrier pad and all fixing accessorise and sealant all as detailed on Architectural drawings		Item			
D	'Lysaght' or other equal and approved clean colorbond flashing between wall and roof, one end chase into brickwall filled with approved non-setting silicone sealant including all fixing accessorise all as per detailed on drawings		Item			
	ROOF INSULATION					
E	50 mm thick 'Lysaght' ROXUL MPB100 or orther equal and approved rockwool insulation at 40kg/m3 including all other fixing accessories (measured nett - rate to include for laps, cutting and waste)	353	m2			
F	BRC 3315 wire mesh including all other fixing accessories	353	m2			
G	Meta aluminium double sided foil including all other fixing accessories	353	m2			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - ROOF (Cont)</u>					
	ROOF WATERPROOFING SYSTEM					
	<u>30 mm thick cement and sand (1:3) screed laid to falls to receive waterproofing system to</u>					
A	Gutter slab	117	m2			
B	Sides of gutter wall	171	m2			
C	300 mm high upturn skirting	150	m			
D	Down pipe and outlet		Item			
	<u>'FOSROC' Polyurea or other equal and approved (high quality, environmentally safe, energy saving and elastometric) waterproofing membrane on high-tech polymer chemistry formulation and acrylic polymers forming seamless joint, free water and weather light elastic membrane with heat insulation properties including cement and sand (1:3) screed, laid to fall and all necessary surface preparation with 'FOSROC' or other equal and approved primer 195 (Rate to include for providing a ten (10) years guarantee as specified hereinbefore) to</u>					
E	Gutter slab	117	m2			
F	Sides of gutter wall	171	m2			
G	300 mm high upturn skirting	150	m			
H	Down pipe and outlet		Item			
	RAINWATER GOODS					
J	<u>'TERRAIN' or other equal and approved 100 mm diameter rainwater downpipe with cement solvent joint fixed to concrete or brickwork with and including holderbats, brackets, straps, hangers, bends and the like, finish with approved finishes, to specification, engineer's, manufacturer's and specialist detail, recommendation and architect's approval, all as detailed on drawings</u>	130	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - ROOF (Cont)</u>					
	(Cont) RAINWATER GOODS					
A	'TERRAIN' or other equal and approved 100 mm diameter upvc rainwater downpipe with cement solvent joint laid under floor with and including brackets, straps, bends, excavation, backfill, 100 mm thick concrete (grade 20) surround reinforced with one layer BRC A6, formwork and 50 mm thick lean concrete (grade 15) under, all as detailed on drawings	78	m			
B	'TERRAIN' Geberit or other equal and approved 82 mm diameter domed roof outlet to suit 100 mm diameter upvc rainwater downpipe complete with all fixing accessories, all as detailed on drawings	12	no			
C	'TERRAIN' or other equal and approved 75 mm diameter upvc overflow pipe casted in reinforced concrete gutter wall, including all fixing accessories, finished with approved finishes to specification and architect's approval, all as detailed on drawings		Item			
	<u>FINISHES</u>					
	<u>20 mm thick cement and sand (1:3) plainface plaster including trowelling smooth to</u>					
D	Sides of gutter wall	171	m2			
E	Soffit of gutter slab	117	m2			
F	<u>Extra over</u> for drip mould		Item			
	<u>(3.9) 'KCC' textcoat with 'Wattyl Solagard' or other equal and approved paint to plainface plastered (plaster measured separately) to</u>					
G	Sides of gutter wall	171	m2			
H	Soffit of gutter slab	117	m2			
J	<u>Extra over</u> for drip mould		Item			

Description	Qty	Unit	Rate	\$	c
<p style="text-align: center;"><u>BILL 4 - ROOF (Cont)</u></p> <p><u>OTHER WORKS NECESSARY</u></p> <p>A Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - ROOF (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>Page No. BQ/5</p> <p>Page No. BQ/6</p> <p>BILL 4 - ROOF Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - STAIRCASES</u>					
	Contractor to refer Schedule of Finishes for specification and description		Note			
	Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
	<u>CONCRETE WORKS</u>					
	<u>Reinforced concrete (grade 30) in</u>					
A	Staircase	11	m3			
B	200 mm thick landing slab	21	m2			
	<u>10 to 12 mm diameter high tensile steel reinforcement in</u>					
C	Staircase	1837	kg			
D	Landing slab	1239	kg			
	<u>Formwork to</u>					
E	Soffit of staircase	39	m2			
F	Soffit of landing slab	21	m2			
G	Side of stair open stringer 335 mm (maximum) cut to suit profile treads and risers	55	m			
H	Side of undercut riser 150 mm high	138	m			
	<u>HANDRAILING AND BALUSTRADING</u>					
J	900 mm overall high decorative stainless steel in hairline natural finish handrailing and balustrading (straight and curved-on-plan) in welded connection complete with 50 mm diameter stainless steel hollow section as described top rail with 50 mm diameter short connection to railing post, 5 nos of 20 mm diameter stainless steel rod to center welded to 35 mm x 50 mm stainless steel hollow section railing post with and including all base plates, anchor bolts, bends, ramps, wreath, end caps and all fixing accessories as detailed on drawing and in specification	65	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - STAIRCASES (Cont)</u>					
	(Cont) HANDRAILING AND BALUSTRADING					
A	1000 mm overall high decorative stainless steel in hairline natural finish handrailing and balustrading (straight and curved-on-plan) in welded connection complete with 50 mm diameter stainless steel hollow section as described top rail with 50 mm diameter short connection to railing post, 5 nos of 20 mm diameter stainless steel rod to center welded to 35 mm x 50 mm stainless steel hollow section railing post with and including all base plates, anchor bolts, bends, ramps, wreath, end caps and all fixing accessories as detailed on drawing and in specification	1	m			
	<u>FINISHES</u>					
	<u>20 mm thick cement and sand (1:3) plainface plaster trowelled smooth to</u>					
B	Sloping soffit of staircase	39	m ²			
C	Soffit of landing slab	21	m ²			
D	Sides of open stringer 335 mm (maximum) wide to suit profile of treads and risers	55	m			
	<u>30 mm thick cement and sand (1:3) screed to receive tiles to</u>					
E	Landing slab	21	m ²			
F	325 mm wide tread	138	m			
G	150 mm high undercut riser	138	m			
H	150 mm high tiles skirting	39	m			
	<u>(1.4) 'Cicogress' or other equal and approved 600 mm x 600 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
J	Landing slab	21	m ²			
K	325 mm wide tread	138	m			
L	150 mm high undercut riser	138	m			

Description	Qty	Unit	Rate	\$	c
<u>BILL 4 - STAIRCASES (Cont)</u>					
(Cont) FINISHES					
<u>(Cont) (1.4) 'Cicogress' or other equal and approved 600 mm x 600 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
A <u>Extra over</u> for forming non-slip nosing tiles	138	m			
B (2.2) 'Cicogres' or other equal and approved tile skirting, 150 mm x 600 mm	39	m			
<u>(3.1) 'ICI Dulux' all-in-one or other equal and approved paint to plainface (plaster measured separately) to</u>					
C Sloping soffit of staircase	39	m2			
D Soffit of landing slab	21	m2			
E Sides of open stringer 335 mm (maximum) wide to suit profile of treads and risers	55	m			
OTHER WORKS NECESSARY					
F Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
1) _____					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - STAIRCASES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>BILL 4 - STAIRCASES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - EXTERNAL WALLS</u>					
	BRICKWALL					
	<u>Common brickwall in cement and sand (1:3) mortar with and including 'Exmet' reinforcement at every fourth course</u>					
A	115 mm thick brickwall	525	m2			
B	230 mm thick brickwall	34	m2			
	DECORATIVE SCREEN					
C	Supply and install of decorative Archifacade Lightweight Architectural Screen with metal framing finished with spray coated paint SKK stone finish, complete with bracket, all fixing accessories etc, all as detail on Architectural's drawing and in strick accordance with the manufacturer's instructions and specifications	223	m2			
	GLASS BALUSTRADE					
D	1000 mm high decorative stainless steel in hairline natural finish balustrading (straight and curved-on-plan) in welded connection complete with 50 mm diameter stainless steel hollow section as described top rail with 50 mm diameter short connection to railing post, 10 mm thick tempered glass balustrade fixed to 35 mm x 50 mm stainless steel hollow section railing post with and including all base plates, anchor bolts, bends, ramps, wreath, end caps and all fixing accessories as detailed on drawing and in specification	16	m			
E	115 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
F	230 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - EXTERNAL WALLS (Cont)</u>					
	(Cont) GLASS BALUSTRADE					
A	6 mm diameter x 450 mm long mild steel bonding ties, one end cast into concrete column and hooked around column reinforcement and other end built into joints of brickwork including forming perforation in formwork		Item			
	OTHER WORKS NECESSARY					
B	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - EXTERNAL WALLS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 4 - EXTERNAL WALLS Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 4 - WINDOWS</u></p> <p>The Contractor must verify exact size of windows, doors and curtain walling on site prior to fabrication</p> <p>The Contractor to submit shop drawings and full details of aluminium sections for various units, methods of fixings, details of ironmongeries, details of bolts, fixing etc for approval</p> <p>All aluminium profiles shall be "TECHNAL", "REYNAERS" OR SCHUCO" aluminium section or other equivalent and approved European system in powder coating finish in accordance to latest regulation; with (10) TEN years warranty.</p> <p>All aluminium profiles should be extruded from aluminium alloy and backed by a certificate from the extruder indicating its genuiness. All aluminium profiles and sections shall comply with the architect's drawings and details. All glazing shall be internally glazed using green Tinted and / or Processed glasses which samples are to be submitted and approved by the Project Architect.</p> <p>All aluminium curtain walling, windows and doors shall include with 25mm x 38mm aluminium sub framing and weatherseal sealant applied to perimeter of windows.</p> <p>All aluminium windows and doors hardware and locking mechanism shall be approved equivalent and hardware system from Europe.</p> <p>All shops drawings details and methods of fixing must be submitted by the Contractor and shall be approved in writing by the Project Architect prior to work proceed.</p> <p>All products / materials shall be supported by a Certificate of origin indicating its genuiness.</p> <p>A 10 years warranty as to the windows and doors performance is to be issued in joint names with the systems and hardware supplier.</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

Description	Qty	Unit	Rate	\$	c
<u>BILL 4 - WINDOWS (Cont)</u>					
<p>The Contractor is to submit relevant test reports or certificate indicating the aluminium system's compliance with the following performance standards and values</p>		Note			
<p>All shop drawings details shall be approved in writing by the Architect prior for work proceed. The number and sizes of all bolts, fixing etc shall be clearly indicated on the shop drawings</p>		Note			
<p>ALUMINIUM GLAZED SYSTEM</p>					
<p><u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u></p>					
<p>A Overall size 1285 mm wide x 2800 mm high complete with fixed glass panel and sliding windows (W2)</p>	30	no			
<p>B Overall size 1800 mm wide x 2800 mm high complete with fixed glass panel and sliding windows (W3)</p>	4	no			
<p>C Overall size 4430 mm wide x 2800 mm high complete with fixed glass panels and sliding door panels (W5)</p>	2	no			
<p>D Overall size 3485 mm wide x 2800 mm high complete with fixed glass panels and sliding door panels (W6)</p>	2	no			
<p>E Overall size 950 mm wide x 2800 mm high complete with fixed glass panel and sliding door panel (W7)</p>	2	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - WINDOWS (Cont)</u>					
	(Cont) ALUMINIUM GLAZED SYSTEM					
	<u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
A	Overall size 1000 mm wide x 2800 mm high complete with fixed glass panel and single leaf swing glass door (W1)	2	no			
B	Overall size 450 mm wide x 2800 mm high complete with fixed glass panel and side hung windows (W4)	36	no			
C	Precast reinforced concrete (grade 20) lintol, in various sizes including reinforcement, bedded and jointed in cement and sand (1:3) mortar, hoisted and fixed in position, finished fair on all exposed surfaces, all as detailed on drawings and in specification		Item			
	<u>OTHER WORKS NECESSARY</u>					
D	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - WINDOWS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>BILL 4 - WINDOWS Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - INTERNAL WALLS</u>					
	BRICKWALL					
	<u>Common brickwall in cement and sand (1:3) mortar with and including 'Exmet' reinforcement at every fourth course</u>					
A	100 mm thick brickwall	20	m2			
B	115 mm thick brickwall	706	m2			
C	230 mm thick brickwall	233	m2			
	<u>Decorative stainless steel in hairline natural finish handrailing and balustrading (straight and curved-on-plan) in welded connection complete with 50 mm diameter stainless steel hollow section as described top rail with 50 mm diameter short connection to railing post, 5 nos of 20 mm diameter stainless steel rod to center welded to 35 mm x 50 mm stainless steel hollow section railing post with and including all base plates, anchor bolts, bends, ramps, wreath, end caps and all fixing accessories as detailed on drawing and in specification</u>					
D	1100 mm high	31	m			
E	100 mm wide with 150 mm high upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
F	115 mm wide with 150 mm high upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
G	230 mm wide with 150 mm high upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
H	6 mm diameter x 450 mm long mild steel bonding ties, one end cast into concrete column and hooked around column reinforcement and other end built into joints of brickwork including forming perforation in formwork		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - INTERNAL WALLS (Cont)</u></p> <p>OTHER WORKS NECESSARY</p> <p>A Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - INTERNAL WALLS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 4 - INTERNAL WALLS Carried to Summary</p>					

	Qty	Unit	Rate	\$	c
<u>BILL 4 - DOORS</u>					
The Contractor must verify the exact sizes of doors and opening on site prior to fabrication		Note			
Shop drawings should be submitted by Contractor prior to fabrication and installation for Architect approval		Note			
The Contractor must submit sample / mock-up for Architect approval		Note			
All door frame and architrave shall finished with 'ICI' or other equal and approved spray gloss paint		Note			
All finished doors, linings, door frames and architrave shall be well-seasoned treated hardwood, planed, smoothed and sanded		Note			
All door shall include kontras, beading and moulding		Note			
All door finishes details shall refer to Architectural drawings and as in specification		Note			
SOLID TIMBER CORE FLUSH DOORS					
A Single leaf door, overall size 950 x 2100 mm high (D1)	18	no			
B Single leaf door, overall size 800 x 2100 mm high (D3)	24	no			
FIRE RATED SOLID HARDWOOD TIMBER DOOR					
C One hour fire rated single leaf door, overall size 950 x 2100 mm high (D4)	6	no			
<u>Wrot treated hardwood door frame and accessories in approved paint finished</u>					
D Door frame	213	m			
E Architrave	426	m			
F Timber subframe	213	m			
G Fire rated door frame	31	m			
H Fire rated architrave	62	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - DOORS (Cont)</u>					
	(Cont) FIRE RATED SOLID HARDWOOD TIMBER DOOR					
	<u>(Cont) Wrot treated hardwood door frame and accessories in approved paint finished</u>					
A	Fire rated timber subframe	31	m			
B	Precast reinforced concrete (grade 20) lintol in various sizes including reinforcement, bedded and jointed in cement and sand (1:3) mortar, hoisted and fixed in position, finished fair on all exposed surfaces, all as detailed on drawings and in specification		Item			
C	150 x 50 x 100 mm high heelstone cast to suit the profile of door jamb with one end built into door jamb and other end cast into heelstone and finish to match floor finishes		Item			
D	150 x 25 x 3 mm thick mild steel lugs with one end fishtailed built into joints of brickwork and the other end turned up, holed and screwed to back of timber door frame		Item			
E	6 mm wide approved silicone sealant pointing to gap between frame and tile		Item			
	IRONMONGERY					
	<u>Supply and fix the following or other equal and approved stainless steel ironmongery to doors and frames including all matching screws unless otherwise stated</u>					
F	'Kawajun' 503.12.101 or other equal and approved Hinge	126	no			
G	'Hafele' 502.11.120 or other equal and approved Mortise roller lock SS matte forend width 24mm	6	no			
H	'Kawajun' 503.11.110 or other equal and approved 65mm Key-Thumb Turn Profile Cylinder	24	no			
J	'Kawajun' 503.11.107 or other equal and approved Square Escutcheon *Shot black	48	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - DOORS (Cont)</u>					
	(Cont) IRONMONGERY					
	<u>(Cont) Supply and fix the following or other equal and approved stainless steel ironmongery to doors and frames including all matching screws unless otherwise stated</u>					
A	'Kawajun' 503.10.238 or other equal and approved C1 Lever Handle on Square Rose & Escutcheon Finish: Shot Black	48	no			
B	'Hafele' 502.11.103 or other equal and approved mortise lock for profile cylinders	42	no			
C	'Kawajun' 503.11.117 or other equal and approved Thumb Turn & Coin Turn profile *For Toilet	24	no			
D	'Hafele' 502.12.112 or other equal and approved HEAVY DUTY BUTT HINGE	90	no			
E	'Hafele' 502.13.106 or other equal and approved Concealed door closer DCL 34 *Suitable for Fire-Rated Doors	18	no			
F	'Hafele' 502.16.120 or other equal and approved Door Stoper	48	no			
G	'Hafele' 502.13.105 or other equal and approved Door Closer (without hold open - standard arm)	42	no			
	<u>MASTER KEY SYSTEM</u>					
H	Allow for all locks to be keyed in one master key to the approval of the Superintending Officer		Item			
	<u>OTHER WORKS NECESSARY</u>					
J	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - DOORS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>BILL 4 - DOORS Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<u>BILL 4 - INTERNAL WALL FINISHES</u>					
Contractor to refer Schedule of Finishes for complete specification and description		Note			
Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
A 20 mm thick cement and sand (1:3) plainface plaster including trowelling smooth to wall and column	1221	m2			
B 20 mm thick cement and sand (1:3) backing screed to receive ceramic wall tiles to wall and column	505	m2			
C Approved Skim coat on plastered wall surface to received finishes including all surface preparation	1221	m2			
D (3.1) 'ICI Dulux' all-in-one or other equal and approved paint to plainface plastered (plaster measured seperately) wall and column	1094	m2			
E (3.2) 'ICI Dulux' pentelite or other equal and approved paint to plainface plastered (plaster measured seperately) wall and column	127	m2			
F (3.3) 'Cicogress' or other equal and approved 300 mm x 600 mm wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column	505	m2			
G 'Fosroc' brushbond or other equal and approved cementious waterproofing to concrete surfaces, applied strictly in accordance with the manufacturer's instruction to wall and column (Rate to include for providing a ten (10) years guarantee as specified hereinbefore)	505	m2			
OTHER WORKS NECESSARY					
H Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
1) _____					
2) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - INTERNAL WALL FINISHES (Cont)</u></p> <p>(Cont) OTHER WORKS NECESSARY</p> <p>3) _____</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - INTERNAL WALL FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 4 - INTERNAL WALL FINISHES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - INTERNAL FLOOR FINISHES</u>					
	Contractor to refer Schedule of Finishes for complete specification and description		Note			
	Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
	<u>30 mm thick cement and sand (1:3) backing screed to floor to receive</u>					
A	Floor tiles	591	m2			
B	150 mm high tiles skirting	487	m			
C	Drop in slab		Item			
	<u>(1.3) 'Cicogress' or other equal and approved 300 mm x 600 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
D	Floor	82	m2			
E	Drop in slab		Item			
	<u>(1.4) 'Cicogress' or other equal and approved 600 mm x 600 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
F	Floor	509	m2			
G	Drop in slab		Item			
	<u>The following skirting, laid on cement and sand screed (screed measured separately)</u>					
H	(2.2) 'Cicogress' or other equal and approved tiles skirting, 150 mm x 600 mm	487	m			
J	Selective Aluminium U-Channel termination accessories with natural anodised finish to Architect's approval, install strictly in accordance with the manufacturer's instruction	487	m			

Description	Qty	Unit	Rate	\$	c
<u>BILL 4 - INTERNAL FLOOR FINISHES (Cont)</u>					
A 'Fosroc' brushbond or other equal and approved cementitious waterproofing to concrete surfaces, applied strictly in accordance with the manufacturer's instruction (Rate to include for providing a ten (10) years guarantee as specified hereinbefore)	82	m2			
B Approved aluminium edge strip and dividing strip, fixed strictly in accordance with manufacturer's instruction		Item			
C Approved stainless steel divider strip, fixed strictly in accordance with manufacturer's instruction		Item			
OTHER WORKS NECESSARY					
D Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
1) _____					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - INTERNAL FLOOR FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 4 - INTERNAL FLOOR FINISHES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - INTERNAL CEILING FINISHES</u>					
	Contractor to refer Schedule of Finishes for complete specification and description			Note		
A	(4.1) 'Gyproc' or other equal and approved gypsum board ceiling with square edge complete with standard fixing accessories all as per manufacturer's detail, recommendation and approval as detailed on drawings.	482	m2			
B	(4.2) 'Gyproc' or other equal and approved gypsum moisture resistant board ceiling with square edge complete with standard fixing accessories all as per manufacturer's detail, recommendation and approval as detailed on drawings.	108	m2			
	<u>Prepare, prime and apply 'ICI DULUX' or other equal and approved paint finish to</u>					
C	Gypsum board	590	m2			
D	Shadow gap including paint		Item			
E	Drop in ceiling including paint		Item			
F	<u>Extra for forming ceiling access opening including all frame and painting</u>		Item			
	OTHER WORKS NECESSARY					
G	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - INTERNAL CEILING FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 4 - INTERNAL CEILING FINISHES Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<u>BILL 4 - EXTERNAL WALL FINISHES</u>					
Contractor to refer Schedule of Finishes for complete specification and description		Note			
Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
A 20 mm thick cement and sand (1:3) plainface plaster including trowelling smooth to wall and column	1206	m2			
B 20 mm thick cement and sand (1:3) backing screed to receive ceramic wall tiles to wall and column	439	m2			
C (3.6) Red Sandstone wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column including primed A5631 or other equalvalent, bracket and all other fixing accessories	439	m2			
D (3.9) 'KCC' textcoat with 'Wattyl Solagard' or other equal and approved paint to plainface plastered (plaster measured separately) wall and column	1206	m2			
OTHER WORKS NECESSARY					
E Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
1) _____					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - EXTERNAL WALL FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 4 - EXTERNAL WALL FINISHES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - EXTERNAL FLOOR FINISHES</u>					
	Contractor to refer Schedule of Finishes for complete specification and description		Note			
	Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
	<u>30 mm thick cement and sand (1:3) backing screed to floor to receive</u>					
A	Floor tiles	68	m2			
B	Block	212	m2			
C	150 mm high tiles skirting	193	m			
D	Drop in slab		Item			
	<u>(1.5) 'Cicogress' wood series or other equal and approved 200 mm x 1200 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
E	Floor	68	m2			
F	Drop in slab		Item			
	<u>(1.8) 'CIFRE CERAMICA' Extend Series or other equal and approved 20 mm thick floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
G	Floor	212	m2			
H	Drop in slab		Item			
	<u>The following skirting, laid on cement and sand screed (screed measured separately)</u>					
J	(2.3) 'Cicogress' wood series or other equal and approved tiles skirting, 200 mm x 1200 mm	108	m			
K	(2.6) 20 mm thick CIFRE CERAMICA Extend Series tiles skirting	85	m			
L	Selective Aluminium U-Channel termination accessories with natural anodised finish to Architect's approval, install strictly in accordance with the manufacturer's instruction	193	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - EXTERNAL FLOOR FINISHES (Cont)</u>					
A	'Fosroc' brushbond or other equal and approved cementitious waterproofing to concrete surfaces, applied strictly in accordance with the manufacturer's instruction (Rate to include for providing a ten (10) years guarantee as specified hereinbefore)	68	m2			
	OTHER WORKS NECESSARY					
B	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - EXTERNAL FLOOR FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 4 - EXTERNAL FLOOR FINISHES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - EXTERNAL CEILING FINISHES</u>					
	Contractor to refer Schedule of Finishes for complete specification and description		Note			
A	(4.6) 'SIAM' or other equal and approved gypsum weatherbloc ceiling with square edge complete with standard fixing accessories finished, all as per manufacturer's detail, recommendation and approval as detailes on drawings.	279	m2			
	<u>Prepare, prime and apply 'Wattyl Solagard' or other equal and approved paint finish to</u>					
B	Gypsum weatherbloc board	279	m2			
C	<u>Extra for forming ceiling access opening including all frame and painting</u>		Item			
	OTHER WORKS NECESSARY					
D	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - EXTERNAL CEILING FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 4 - EXTERNAL CEILING FINISHES Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 4 - FURNISHING FITTINGS</u></p> <p>All sizes shall be checked on site prior to fabrication</p> <p>All external surfaces shall be of selective Lamitak laminated finish or of equal equivalent unless otherwise stated, face pattern and colour as selected by the Architect</p> <p>All internal surfaces shall be of selective Lamitak laminated finish or of equal equivalent unless otherwise stated, face pattern and colour as selected by the Architect</p> <p>All hardwood edging and lipping shall be painted with 2 coats of approved transcolor preservative wood stain finishing or of equal equivalent, colour as selected by Architect</p> <p>All cabinet doors, shelves and drawers shall be provided with and including approved ironmongeries (Lock set to drawer refer to Architectural drawings denoted as circular keyhole in elevation)</p> <p>All counter top finished with 12.3 mm thick 'Samsung Staron' or other equal and approved solid surface material back with plywood and 'Non-drip' edge profile on front and sides of appoved colour as selected by the Architect</p> <p>Unless otherwise stated, all finishes and details as shown/detailed on Architectural drawings</p> <p>Tenderer shall make his own assessment from all drawings and specification issued at the time of tederer. Any discrepancies between drawing and Bill of Quantities, the drawings shall take precedence. No additional claim will be entertained</p> <p>Mock up units shall be provided when require</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - FURNISHING FITTINGS (Cont)</u>					
	KITCHEN LOW AND HIGH CABINETRY					
A	Low Cabinet, overall size 2520 + 1705 mm long x 600 mm deep x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, splashboard, sink top, forming opening for sink, skirting, all ironmongeries and etc, all as per details on Architectural drawings	2	no			
B	High Cabinet, overall size 720 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	2	no			
C	High Cabinet, overall size 740 mm long x 300 mm deep x 1125 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	2	no			
D	High Cabinet, overall size 1680 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	2	no			
E	Low Cabinet, overall size 2535 +4215 + 1577 mm long x 600 mm deep x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, splashboard, sink top, forming opening for sink, skirting, all ironmongeries and etc, all as per details on Architectural drawings	2	no			
F	High Cabinet, overall size 4215 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	2	no			
G	High Cabinet, overall size 2177 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	2	m			

Description	Qty	Unit	Rate	\$	c
<u>BILL 4 - FURNISHING FITTINGS (Cont)</u>					
PANTRY LOW AND HIGH CABINETS					
A Low Cabinet, overall size 2085 mm long x 600 mm deep x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	2	no			
B High Cabinet, overall size 2085 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	2	no			
WARDROBE					
C Overall size 1800 mm long x 600 mm deep x 2800 mm high comprised of wardrobe doors, drawers, open shelves, adjustable shelves, hanging rod, LED strip lighting, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings (bedroom & master's bedroom - wardrobe 1)	10	no			
D Overall size 1545 mm long x 600 mm deep x 2800 mm high comprised of wardrobe doors, drawers, open shelves, adjustable shelves, hanging rod, LED strip lighting, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings (master's bedroom - wardrobe 2)	2	no			
MIRROR					
<u>8 mm thick bronze tinted mirror with 10 mm thick plywood backing complete with powder coated aluminium frame and all fixing equipment and accessories</u>					
E Overall size 500 mm long x 800 mm high	14	no			
OTHER WORKS NECESSARY					
F Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
1) _____					
2) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - FURNISHING FITTINGS (Cont)</u></p> <p>(Cont) OTHER WORKS NECESSARY</p> <p>3) _____</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - FURNISHING FITTINGS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>BILL 4 - FURNISHING FITTINGS Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - PLUMBING</u>					
	<u>PLUMBING</u>					
	Fire Hosereel and all associated tanks, pump sets and plumbing works measured in Bill 8B		Note			
	All bends, junctions, tees and the like shall be with access eye opening of pipe diameter		Note			
	All soil and waste pipes shall be connected to gully trap and first manhole		Note			
	SOIL, WASTE AND VENT PIPES					
A	Waste, soil and vent piping system, including all connection and fittings, all as detailed on drawings and in specification		Item			
B	Floor trap including all connection, fittings and gratings, all as detailed on drawings and in specification		Item			
	GULLY TRAP					
C	Gully trap and chamber size 300 x 300 mm in various depth internally with multiple inlets comprising 125 mm thick concrete (grade 20) wall and base, upvc gully trap to B.S.4660 with perforated grating, 300 x 300 mm stainless steel grating with hinge, etc. finished with cement and sand render internally, epoxy painting, inlet and outlet, jointing to waste pipes, including excavation, disposal, backfilling, formwork, etc, the whole as per detail shown on Engineer's drawing		Item			
	COLD AND HOT WATER SERVICES					
D	Cold water and piping including all fittings and connections, all as detailed on drawings and in specification		Item			
E	Hot water and piping including all fittings and connections, all as detailed on drawings and in specification		Item			

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 4 - PLUMBING (Cont)</u></p>					
<p><u>(Cont) PLUMBING</u></p>					
<p>TESTING</p>					
<p>A Allow for testing the whole of the plumbing system to the approval of the relevant authorities and to the satisfaction of the Superintending Officer</p>		Item			
<p><u>OTHER WORKS NECESSARY</u></p>					
<p>B Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p>		Item			
<p>1) _____</p>					
<p>2) _____</p>					
<p>3) _____</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - PLUMBING (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 4 - PLUMBING Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - SANITARY FITTINGS</u>					
	<u>Supply and fix the following or other equal and approved vitreous china (unless otherwise stated) sanitary fittings including setting and bedding in positions, building in all brackets, grouting solid, making all connection to supply, vent, waste, overflow drains and for providing all necessary fixing accessories in strict accordance with the sanitary schedule and manufacturer's instruction</u>					
A	DURAVIT 21180900002-G D-Code Closed-Coupled Washdown W.C., 0927100004-G Cistern With 6/3L Dual Flush Fittings, U7070S+P202+I107 Seat & Cover (Soft Close), Bend Connector (S-Trap : 170mm), 1/2" Stop Valve, 3/8" x 1/2" Flexible Hose	10	no			
B	JOHNSON SUISSE WBAENW211WW Windsor 250 BO WC, WBALTN111WW Trend Cistern With Lid, WBFT400335XX Trend 6/3L Flush Fittings, SC402 Seat & Cover (Soft Close), WBFT400101XX Fixing Bolt (X2),P450 Straight Connector (S-Trap : 250mm), AV300 1/2" Stop Valve With Flange, DA650-N 1/2" Flexible Hose	4	no			
C	DCODE 23105500002 D-Code Wall-Hung Basin With 1 Tap Hole W/Overflow Hole Size (550 X 430 X 175)mm, WBFT400099XX Fixing Bolt (X2), 32mm - 1/4" UPVC Bottle Trap, 08571800002 Half Pedestal With Fixings, AV300 1/2" Stop Valve With Flange (X2)	10	no			
D	JOHNSON SUISSE WBAABS201WW Boston 500 Wall-Hung Basin With 1 Tap Hole W/Overflow Hole Size (500 X 430 X 210)mm, WBFT400099XX Fixing Bolt (X2), WBABHP000WW Half Pedestal, WBFT400101XX Fixing Bolt (X2), 32mm - 1 1/4" Upvc Bottle Trap, AV300 1/2" Stop Valve With Flange (X2)	4	no			
E	FIMA CARLO FRATTINI F3831CR.2 Serie 22 Deck Mounted Basin Mixer (Hot & Cold), Click Clack Pop-Up Waste, 1/2" Supply Hose (X2)	10	no			
F	JOHNSON SUISSE WBFA301434CP Turin Deck Mounted Basin Mixer (Hot & Cold), Chrome Plated Waste, Plug & Chain, 1/2" Supply Hose (X2)	4	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - SANITARY FITTINGS (Cont)</u>					
	<u>(Cont) Supply and fix the following or other equal and approved vitreous china (unless otherwise stated) sanitary fittings including setting and bedding in positions, building in all brackets, grouting solid, making all connection to supply, vent, waste, overflow drains and for providing all necessary fixing accessories in strict accordance with the sanitary schedule and manufacturer's instruction</u>					
A	JOHNSON SUISSE WBFA300933CP Fermo Deck Mounted Sink Tap (Cold Only)	4	no			
B	JOHNSON SUISSE WBFA300526CP Ravenna Twashing Machine Tap With Screw Collar & Flange (Cold Only)	2	no			
C	FIMA CARLO FRATTINI F3165/RP251CR Serie 22 Shower Column Mixer With Diverter (Hot & Cold), ABS Overhead Shower (Dia : 200mm), Anti-Limestone Handshower (1 Spray Mode), 1500mm Brass Flex Hose	2	no			
D	FIMA CARLO FRATTINI F3834/1CR Serie 22 Wall Mounted Exposed Bath & Shower Mixer With Diverter (Hot & Cold), F2297CR 696mm ABS Sliding Rail With 1500mm Brass Flex Hose & Anti-Limestone Handshower (1 Spray Mode)	6	no			
E	JOHNSON SUISSE WBFA301439CP Turin Exposed Bath & Shower Mixer With Diverter (Hot & Cold), WBFA300694CP Wall-Mounted Sliding Bar (L-600mm), WBFA300723CP Caspian II Hand Shower (1 Spray Mode), WBFA300583CP Double Interlock Shower Hose (L-1.5m)	4	no			
F	FIMA CARLO FRATTINI F6005/1CR Rotola Toilet Paper Holder	10	no			
G	JOHNSON SUISSE WBBA100264CP Trendy Paper Holder With Cover	4	no			
H	FIMA CARLO FRATTINI F6004/2CR Rotola Double Robe Hook	10	no			
J	JOHNSON SUISSE WBBA100257CP Trendy Single Robe Hook	4	no			
K	FIMA CARLO FRATTINI F6000/60CR Rotola Towel Rail (L-600mm)	8	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 4 - SANITARY FITTINGS (Cont)</u>					
	<u>(Cont) Supply and fix the following or other equal and approved vitreous china (unless otherwise stated) sanitary fittings including setting and bedding in positions, building in all brackets, grouting solid, making all connection to supply, vent, waste, overflow drains and for providing all necessary fixing accessories in strict accordance with the sanitary schedule and manufacturer's instruction</u>					
A	JOHNSON SUISSE WBBA100265CP Trendy Single Towel Rail (Length : 600mm)	4	no			
B	FIMA CARLO FRATTINI F2840/7CR Collettivita Bidet Angle Valve (Cold Only), ABS Hand Bidet Spray, 1200mm Flexible Stainless Steel Hose, Spray Holder	14	no			
C	TORA TR-KS-NH-00146-PolishedDouble Bowl Double Drainer Insert Type Stainless Steel Kitchen Sink Size (1370 X 455 X 180)mm, Waste (X2), 40mm 1/2" UPVC Bottle Trap (X2), AV300 1/2" Stop Valve With Flange, DA650-N 1/2" Flexible Hose	4	no			
D	NOVATEC FT201-6 Stainless Steel Decorative Tile Insert Floor Grating Size (153 X 153)mm, FLV Anti Insect & Odor Flow Valve	32	no			
	OTHER WORKS NECESSARY					
E	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 4 - SANITARY FITTINGS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>BILL 4 - SANITARY FITTINGS Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 5 - GENERAL NOTE</u></p> <p><u>NOTES</u></p> <p>The bills are to be read and priced in conjunction with the drawings, specification and include all works described / shown in bills and drawings</p> <p>The Contractor is to comply with the conditions of contract, specification, all preliminaries, etc. necessary for the complete execution of the works</p> <p>The Contractor shall be responsible for applying and obtaining all required permits from the relevant authorities for temporary accesses, etc. and for payment of fees thereof</p> <p>The Contractor must visit the site so as to take into consideration existing conditions and to have satisfied himself as to the nature of the site, soil condition, facilities for access, mobilisation of plants, etc. required under this contract. No claims will be allowed on the grounds of ignorance of the conditions under which the works will be executed</p> <p>Prior to the commencement of any work, the levels of the original surface of the site including all slopes shall be agreed by the Superintending Officer in accordance with Preliminaries under 'Setting Out and Site Levels' and on completion of this works, the Contractor must submit as built drawings as required in Preliminaries under 'Completion Joint-Survey and As Built Drawing' which shall form the basis of measurement</p> <p>The Contractor shall take all measures to protect the existing cables and services that is not affected by his scope of work. Any such damage caused by the Contractor shall be made good at the expense of the Contractor and to the satisfaction of the Superintending Officer</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 5 - GENERAL NOTE (Cont)</u></p> <p><u>(Cont) NOTES</u></p> <p>All making good shall be executed with materials and workmanship to match in every respect of the surrounding work and shall be properly done thereto to the complete satisfaction of the S.O.</p> <p>Unless otherwise specified, all materials and debris resulting from the clearing shall be stacked and removed completely from the site. On no account shall cleared timber or other materials be deposited in areas to be filled. Burning on site shall be prohibited</p> <p>No tipping on the adjoining land shall be allowed in this contract. The Contractor is therefore to make his own arrangements for disposal of all surplus excavated materials where directed and is to pay all charges in connection therewith</p> <p>Tenderer shall make his own assessment from all drawings and specification issued at the time of tederer. Any discrepancies between drawing and Bill of Quantities, the drawings shall take precedence. No additional claim will be entertained</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - GENERAL NOTE (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 5 - GENERAL NOTE Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - PILING</u></p>					
<p>PRECAST REINFORCED CONCRETE PILES (ALL PROVISIONAL)</p>					
<p>The system installation shall consist of 9.0 metre long precast concrete piles element forced into the ground using hydraulic jack method including cast in pile shoe</p>		Note			
<p>The piles should conform to B.S. 8004 : 1986 and be approved by CPRU Min. of Development for use in Brunei Darussalam</p>		Note			
<p>Steel reinforcement shall conform to B.S. 4449</p>		Note			
<p>End plate should be manufactured to conform to B.S. 4360</p>		Note			
<p>Concrete strength during transfer should correspond to a cube strength of minimum 25 Mpa</p>		Note			
<p>The 28-day strength of concrete shall not be less than 50 Mpa</p>		Note			
<p>Joint between the consecutive pile element shall be in full weld on each side of the end plates brought in contact</p>		Note			
<p>The setting pressure of twice the working load shall be held for a minimum of ten seconds before release</p>		Note			
<p>Each pile shall not deviate by more than 75 mm from the vertical or more than 74 mm from its designed position at the level of the piling chamber</p>		Note			
<p>The paylengths for the supply and inject complete of each pile shall be measured from pile toe to cut-off level</p>		Note			
<p>A Provide and erect on site all necessary plant and equipment for installation of precast concrete piles, and dismantle and clear away on completion</p>		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - PILING (Cont)</u>					
	(Cont) PRECAST REINFORCED CONCRETE PILES (ALL PROVISIONAL)					
A	Allow for moving and handling piling frame and equipment inclusive of assembling and dismantling about at site from position to position including use of Selangan timber matt and hiring of Kobelco for the full duration <u>Supply, transport, handle, pitch, inject, weld, extend, cut-off head, etc. precast reinforced (Grade 45) concrete piles, all in strict accordance with the pile specification.</u>		Item			
B	250 mm square piles <u>Provide the necessary kentledge, jack and dial gauges for the application and release of the load test. The rates include all supervision and labour, watching and lighting and removal of kentledge and equipment</u>	1215	m			
C	Load test twice the working load for 250 mm square piles <u>OTHER WORKS NECESSARY</u>	2	no			
D	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein) 1) _____ 2) _____ 3) _____		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - PILING (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 5 - PILING Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - SUBSTRUCTURE</u>					
	EXCAVATION					
A	Excavate pit for pile cap and lift pit, commencing from platform level, not exceeding 2.00 m deep, get out part return, fill in, ram and surplus cart away excavated material where directed	113	m3			
B	Excavate trench for ground beam, commencing from platform level, not exceeding 2.00 m deep, get out and cart away excavated material where directed	34	m3			
C	Excavate for ground slab and apron slab commencing from platform level, not exceeding 300 mm, average 200 mm deep, get out and cart away excavated material where directed	382	m2			
	ANTI-TERMITE TREATMENT					
D	Prepare and apply one coat of organic chlorine or other equal and approved anti-termite chemical treatment to general surfaces as specified (measured flat over ground floor slab and apron slab area; rate to include for treating surfaces of ground beam, footing and the like and for appointing a registered pest control company to carry out the work and also for providing a ten (10) year warranty)	382	m2			
	DAMP PROOF MEMBRANE					
E	"POLY-FILM 1000" or other equal and approved damp proof membrane laid on prepared bed, seal laps with approved pressure sensitive tape (measured flat over ground floor slab - rate to include for laps, cutting and waste)	382	m2			
	CONCRETE WORKS					
	<u>50 mm thick lean concrete (grade 15) to underside of</u>					
F	Pile cap	49	m2			
G	Ground beam	48	m2			
H	Ground floor slab	382	m2			
J	Lift pit	16	m2			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - SUBSTRUCTURE (Cont)</u>					
	(Cont) CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	Pile cap	37	m3			
B	Stump	10	m3			
C	Ground beam	34	m3			
D	150 mm thick ground floor slab	382	m2			
E	230 mm thick lift pit wall	22	m2			
F	<u>Extra over</u> lift pit wall for thickening including additional formwork and reinforcement	12	m			
G	300 x 300 x 300 mm deep lift sump pit, 230 mm thick to wall and slab including formwork and reinforcement	1	no			
H	<u>Extra over</u> for non-slip groove line to ramp		Item			
	<u>10 mm to 25 mm diameter mild steel / high tensile reinforcement bar in</u>					
J	Pile cap	4619	kg			
K	Stump	1907	kg			
L	Ground beam	4079	kg			
M	Ground floor slab	2309	kg			
N	Lift pit wall	512	kg			
	<u>Formwork to</u>					
P	Sides of pile cap	94	m2			
Q	Sides of stump	75	m2			
R	Sides of ground beam	329	m2			
S	Sides of lift pit wall	41	m2			
T	Drop in ground slab and edge of ground slab		Item			
U	Drop in ramp and edge of ramp		Item			

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 5 - SUBSTRUCTURE (Cont)</u></p>					
<p>(Cont) CONCRETE WORKS</p>					
<p>A Movement/Expansion joint, filled with 25 mm wide x 50 mm deep 'Expandite 99' or other equal and approved expansion / movement joint complete with 25 mm thick softboard filler including slip membrane and additional use of formwork, all as detailed on drawings and in specification</p>		Item			
<p>OTHER WORKS NECESSARY</p>					
<p>B Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p>		Item			
<p>1) _____</p>					
<p>2) _____</p>					
<p>3) _____</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - SUBSTRUCTURE (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>BILL 5 - SUBSTRUCTURE Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - FRAME</u>					
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	Suspended beam	102	m3			
B	Column	159	m3			
C	230 mm thick lift core wall	170	m2			
D	<u>Extra over</u> for lift core wall thickening including additional formwork and reinforcement	36	m			
	<u>10 mm to 32 mm diameter mild steel / high tensile reinforcement bar in</u>					
E	Suspended beam	12293	kg			
F	Column	25224	kg			
G	Lift core wall	3950	kg			
	<u>Formwork to</u>					
H	Sides and soffit of suspended beam	966	m2			
J	Sides of column	1386	m2			
K	Sides of lift core wall	163	m2			
L	<u>Extra over</u> for edge of lift core wall opening not exceeding 300 mm wide		Item			
	OTHER WORKS NECESSARY					
M	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - FRAME (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 5 - FRAME Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - UPPER FLOOR</u>					
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	115 mm thick suspended slab	11	m2			
B	125 mm thick suspended slab	587	m2			
C	150 mm thick suspended slab	508	m2			
D	165 mm thick suspended slab	5	m2			
	<u>10 mm and 12 mm diameter mild steel / high tensile reinforcement bar in</u>					
E	Suspended floor slab	7228	kg			
	<u>Formwork to</u>					
F	Sides and soffit of suspended slab	858	m2			
G	Drop in slab and edge of floor slab		Item			
H	Movement/Expansion joint, filled with 25 mm wide x 50 mm deep 'Expandite 99' or other equal and approved expansion / movement joint complete with 25 mm thick softboard filler including slip membrane and additional use of formwork, all as detailed on drawings and in specification		Item			
	OTHER WORKS NECESSARY					
J	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - UPPER FLOOR (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 5 - UPPER FLOOR Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - ROOF</u>					
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	Roof beam	31	m3			
B	Gutter beam	21	m3			
C	150 mm thick gutter slab	103	m2			
D	230 mm thick lift core top slab	10	m2			
	<u>10 mm to 25 mm diameter mild steel / high tensile reinforcement bar in</u>					
E	Roof beam	2945	kg			
F	Gutter beam	1961	kg			
G	Gutter slab	596	kg			
H	Lift core top slab	555	kg			
	<u>Formwork to</u>					
J	Sides and soffit of roof beam	369	m2			
K	Sides and soffit of gutter beam	236	m2			
L	Soffit of gutter slab	103	m2			
M	Soffit of lift core top slab	10	m2			
N	Drop in slab and edge of slab		Item			
P	Edge of lift core top slab		Item			
Q	<u>Extra over to gutter wall to form decorative feature</u>		Item			
R	Reinforced concrete ledge in various thickness including all necessary formwork, reinforcement, finished with all exposed concrete surfaces with approved paint in approved color, waterproofing membrane and etc., all as per Architectural and Engineer's details drawings	251	m2			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - ROOF (Cont)</u>					
	STRUCTURAL STEEL ROOF MEMBER					
	All steel works members shall be high tensile galvanised steel, welded and bolted together, including all shop and site welding, filling smooth junction, raking and cutting, hoisted and placed in position all as detailed on drawings					
			Note			
	Rate to include submission of shop drawings					
			Note			
	Rate to included for sand blast clean to BS4232, degrease and wash clean all steel area and repair all damaged including approved paint to Engineer's approval					
			Note			
	All steel works members, plates, cleats and bolts shall be high tensile galvanised steel including all necessary approved painting as specified					
			Note			
	<u>Supply, install and erect the following structural steelworks hoisted and fixed in position to level as accordance to drawing in bolted and welded connection with and including all cutting, drilling, welding and approved metal paint finished (to all expose surfaces), all as detailed on Engineer's drawings</u>					
A	75 x 125 x 6 mm thick x 17 kg/m RHS	874	kg			
B	120 x 80 x 6.3 mm thick x 18.4 kg/m RHS	1707	kg			
C	70 x 70 x 5 mm thick x 10.1 kg/m SHS	267	kg			
D	C15016 GI purlins	435	m			
E	Plates / splicing		Item			
F	Angle Cleat including fasteners		Item			
G	Bolts / anchor bolts including nuts and washers		Item			
H	Holding down bolts		Item			
J	Non shrink grout		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - ROOF (Cont)</u>					
	ROOF COVERING					
	Rate to include a ten (10) years warranty for materials		Note			
A	'Lysaght' or other equal and approved Kliplock Hi-Ten 406 0.47 mm thick TCT in clean colorbond XRW fixed to steel purlins (purlins measured separately), laid in full length to fall complete with damping felt and self-adhesive bitumen felt, all clips and including all others matching fixing devices and accessories, all in accordance to the manufacturer's instruction (measured nett- rate to include for laps, cutting and waste) to sloping roof covering	357	m2			
B	'Lysaght' or other equal and approved clean colorbond gable end including flashing, clip, channel, thermal barrier pad and all fixing accessorise and sealant all as detailed on Architectural drawings		Item			
C	'Lysaght' or other equal and approved clean colorbond eave including flashing, foam filler, drip angle, thermal barrier pad and all fixing accessorise and sealant all as detailed on Architectural drawings		Item			
D	'Lysaght' or other equal and approved clean colorbond flashing between wall and roof, one end chase into brickwall filled with approved non-setting silicone sealant including all fixing accessorise all as per detailed on drawings		Item			
	ROOF INSULATION					
E	50 mm thick 'Lysaght' ROXUL MPB100 or orther equal and approved rockwool insulation at 40kg/m3 including all other fixing accessories (measured nett - rate to include for laps, cutting and waste)	357	m2			
F	BRC 3315 wire mesh including all other fixing accessories	357	m2			
G	Meta aluminium double sided foil including all other fixing accessories	357	m2			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - ROOF (Cont)</u>					
	ROOF WATERPROOFING SYSTEM					
	<u>30 mm thick cement and sand (1:3) screed laid to falls to receive waterproofing system to</u>					
A	Gutter slab	64	m2			
B	Lift core top slab	10	m2			
C	Sides of gutter wall	105	m2			
D	300 mm high upturn skirting	78	m			
E	Down pipe and outlet		Item			
	<u>'FOSROC' Polyurea or other equal and approved (high quality, environmentally safe, energy saving and elastometric) waterproofing membrane on high-tech polymer chemistry formulation and acrylic polymers forming seamless joint, free water and weather light elastic membrane with heat insulation properties including cement and sand (1:3) screed, laid to fall and all necessary surface preparation with 'FOSROC' or other equal and approved primer 195 (Rate to include for providing a ten (10) years guarantee as specified hereinbefore) to</u>					
F	Gutter slab	64	m2			
G	Lift core top slab	10	m2			
H	Sides of gutter wall	105	m2			
J	300 mm high upturn skirting	78	m			
K	Down pipe and outlet		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - ROOF (Cont)</u>					
	RAINWATER GOODS					
A	'TERRAIN' or other equal and approved 100 mm diameter rainwater downpipe with cement solvent joint fixed to concrete or brickwork with and including holderbats, brackets, straps, hangers, bends and the like, finish with approved finishes, to specification, engineer's, manufacturer's and specialist detail, recommendation and architect's approval, all as detailed on drawings	310	m			
B	'TERRAIN' or other equal and approved 100 mm diameter upvc rainwater downpipe with cement solvent joint laid under floor with and including brackets, straps, bends, excavation, backfill, 100 mm thick concrete (grade 20) surround reinforced with one layer BRC A6, formwork and 50 mm thick lean concrete (grade 15) under, all as detailed on drawings	140	m			
C	'TERRAIN' Geberit or other equal and approved 82 mm diameter domed roof outlet to suit 100 mm diameter upvc rainwater downpipe complete with all fixing accessories, all as detailed on drawings	18	no			
D	'TERRAIN' or other equal and approved 75 mm diameter upvc overflow pipe casted in reinforced concrete gutter wall, including all fixing accessories, finished with approved finishes to specification and architect's approval, all as detailed on drawings		Item			
	FINISHES					
	<u>20 mm thick cement and sand (1:3) plainface plaster including trowelling smooth to</u>					
E	Sides of gutter wall and soffit of slab	259	m2			
F	<u>Extra over</u> for drip mould		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - ROOF (Cont)</u>					
	(Cont) FINISHES					
	(3.9) 'KCC' textcoat with 'Wattyl Solagard' or other equal and approved paint to plainface plastered (plaster measured separately) to					
A	Sides of gutter wall and soffit of slab	259	m2			
B	<u>Extra over</u> for drip mould		Item			
	<u>OTHER WORKS NECESSARY</u>					
C	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)					
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - ROOF (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>Page No. BQ/5</p> <p>Page No. BQ/6</p> <p>BILL 5 - ROOF Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - STAIRCASES</u>					
	Contractor to refer Schedule of Finishes for specification and description		Note			
	Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
	CONCRETE WORKS					
	<u>Reinforced concrete (grade 30) in</u>					
A	Staircase	9	m3			
B	150 mm thick landing slab	13	m2			
	<u>10 to 12 mm diameter high tensile steel reinforcement in</u>					
C	Staircase	1521	kg			
D	Landing slab	576	kg			
	<u>Formwork to</u>					
E	Soffit of staircase	34	m2			
F	Soffit of landing slab	13	m2			
G	Side of stair open stringer 335 mm (maximum) cut to suit profile treads and risers	24	m			
H	Side of undercut riser 150 mm high	99	m			
	HANDRAILING AND BALUSTRADING					
J	900 mm overall high decorative stainless steel in hairline natural finish handrailing and balustrading (straight and curved-on-plan) in welded connection complete with 50 mm diameter stainless steel hollow section as described top rail with 50 mm diameter short connection to railing post, 5 nos of 20 mm diameter stainless steel rod to center welded to 35 mm x 50 mm stainless steel hollow section railing post with and including all base plates, anchor bolts, bends, ramps, wreath, end caps and all fixing accessories as detailed on drawing and in specification	27	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - STAIRCASES (Cont)</u>					
	(Cont) HANDRAILING AND BALUSTRADING					
A	1000 mm overall high decorative stainless steel in hairline natural finish handrailing and balustrading (straight and curved-on-plan) in welded connection complete with 50 mm diameter stainless steel hollow section as described top rail with 50 mm diameter short connection to railing post, 5 nos of 20 mm diameter stainless steel rod to center welded to 35 mm x 50 mm stainless steel hollow section railing post with and including all base plates, anchor bolts, bends, ramps, wreath, end caps and all fixing accessories as detailed on drawing and in specification	2	m			
	<u>FINISHES</u>					
	<u>20 mm thick cement and sand (1:3) plainface plaster trowelled smooth to</u>					
B	Sloping soffit of staircase	34	m2			
C	Soffit of landing slab	13	m2			
D	Sides of open stringer 335 mm (maximum) wide to suit profile of treads and risers	24	m			
	<u>30 mm thick cement and sand (1:3) screed to receive tiles to</u>					
E	Landing slab	13	m2			
F	300 mm wide tread	92	m			
G	150 mm high undercut riser	99	m			
H	150 mm high tiles skirting	39	m			
	<u>(1.8) 'CIFRE CERAMICA' Extend Series or other equal and approved 20 mm thick floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
J	Landing slab	13	m2			
K	300 mm wide tread	92	m			
L	150 mm high undercut riser	99	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - STAIRCASES (Cont)</u>					
	(Cont) FINISHES					
	(Cont) (1.8) 'CIFRE CERAMICA' Extend Series or other equal and approved 20 mm thick floor tiles, laid in pattern on cement and sand screed (screed measured separately) to					
A	Extra over for forming non-slip nosing tiles	92	m			
B	(2.6) 20 mm thick CIFRE CERAMICA Extend Series tiles skirting	39	m			
	(3.9) 'KCC' textcoat with 'Wattyl Solagard' or other equal and approved paint to plainface plastered (plaster measured separately) wall and column					
C	Sloping soffit of staircase	34	m2			
D	Soffit of landing slab	13	m2			
E	Sides of open stringer 335 mm (maximum) wide to suit profile of treads and risers	24	m			
	OTHER WORKS NECESSARY					
F	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - STAIRCASES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>BILL 5 - STAIRCASES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - EXTERNAL WALLS</u>					
	BRICKWALL					
	<u>Common brickwall in cement and sand (1:3) mortar with and including 'Exmet' reinforcement at every fourth course</u>					
A	115 mm thick brickwall	415	m2			
B	230 mm thick brickwall	4	m2			
	DECORATIVE SCREEN					
C	Supply and install of decorative Archifacade Lightweight Architectural Screen with metal framing finished with spray coated paint SKK stone finish, complete with bracket, all fixing accessories etc, all as detail on Architectural's drawing and in strick accordance with the manufacturer's instructions and specifications	402	m2			
	GLASS BALUSTRADE					
D	1000 mm high decorative stainless steel in hairline natural finish balustrading (straight and curved-on-plan) in welded connection complete with 50 mm diameter stainless steel hollow section as described top rail with 50 mm diameter short connection to railing post, 10 mm thick tempered glass balustrade fixed to 35 mm x 50 mm stainless steel hollow section railing post with and including all base plates, anchor bolts, bends, ramps, wreath, end caps and all fixing accessories as detailed on drawing and in specification	33	m			
E	115 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
F	230 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - EXTERNAL WALLS (Cont)</u>					
	(Cont) GLASS BALUSTRADE					
A	6 mm diameter x 450 mm long mild steel bonding ties, one end cast into concrete column and hooked around column reinforcement and other end built into joints of brickwork including forming perforation in formwork		Item			
	OTHER WORKS NECESSARY					
B	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - EXTERNAL WALLS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 5 - EXTERNAL WALLS Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 5 - WINDOWS</u></p> <p>The Contractor must verify exact size of windows, doors and curtain walling on site prior to fabrication</p> <p>The Contractor to submit shop drawings and full details of aluminium sections for various units, methods of fixings, details of ironmongeries, details of bolts, fixing etc for approval</p> <p>All aluminium profiles shall be "TECHNAL", "REYNAERS" OR SCHUCO" aluminium section or other equivalent and approved European system in powder coating finish in accordance to latest regulation; with (10) TEN years warranty.</p> <p>All aluminium profiles should be extruded from aluminium alloy and backed by a certificate from the extruder indicating its genuiness. All aluminium profiles and sections shall comply with the architect's drawings and details. All glazing shall be internally glazed using green Tinted and / or Processed glasses which samples are to be submitted and approved by the Project Architect.</p> <p>All aluminium curtain walling, windows and doors shall include with 25mm x 38mm aluminium sub framing and weatherseal sealant applied to perimeter of windows.</p> <p>All aluminium windows and doors hardware and locking mechanism shall be approved equivalent and hardware system from Europe.</p> <p>All shops drawings details and methods of fixing must be submitted by the Contractor and shall be approved in writing by the Project Architect prior to work proceed.</p> <p>All products / materials shall be supported by a Certificate of origin indicating its genuiness.</p> <p>A 10 years warranty as to the windows and doors performance is to be issued in joint names with the systems and hardware supplier.</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - WINDOWS (Cont)</u>					
	The Contractor is to submit relevant test reports or certificate indicating the aluminium system's compliance with the following performance standards and values					
	All shop drawings details shall be approved in writing by the Architect prior for work proceed. The number and sizes of all bolts, fixing etc shall be clearly indicated on the shop drawings					
	ALUMINIUM GLAZED SYSTEM					
	<u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
A	Overall size 1410 mm wide x 2800 mm high complete with fixed glass panel and sliding windows (W1)	37	no			
B	Overall size 1800 mm wide x 2800 mm high complete with fixed glass panel and sliding windows (W3)	1	no			
C	Overall size 1660 mm wide x 2800 mm high complete with fixed glass panel and sliding windows (W4)	5	no			
D	Overall size 1160 mm wide x 2800 mm high complete with fixed glass panel and sliding windows (W5)	15	no			
E	Overall size 1455 mm wide x 2800 mm high complete with fixed glass panel and sliding windows (W7)	7	no			
F	Overall size 1315 mm wide x 2800 mm high complete with fixed glass panel and sliding windows (W9)	10	no			
G	Overall size 1660 mm wide x 2800 mm high complete with fixed glass panel and sliding windows (W10)	1	no			
H	Overall size 1410 mm wide x 2800 mm high complete with fixed glass panel and sliding windows (W11)	2	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - WINDOWS (Cont)</u>					
	(Cont) ALUMINIUM GLAZED SYSTEM					
	<u>(Cont) Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
A	Overall size 3475 mm wide x 2800 mm high complete with fixed glass panel and sliding door panels (W13)	4	no			
B	Overall size 4940 mm wide x 2800 mm high complete with fixed glass panels and sliding door panels (W14)	1	no			
C	Overall size 4700 mm wide x 2800 mm high complete with fixed glass panels and sliding door panels (W15)	1	no			
	<u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 12.76 mm thick green tinted laminated glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
D	Overall size 1140 mm wide x 2800 mm high complete with fixed glass panels window (W2)	1	no			
E	Overall size 1000 mm wide x 2800 mm high complete with fixed glass panel and single leaf swing glass door (W6)	1	no			
F	Overall size 450 mm wide x 2800 mm high complete with fixed glass panel and top hung windows (W8)	16	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - WINDOWS (Cont)</u>					
	(Cont) ALUMINIUM GLAZED SYSTEM					
	<u>Supply and install aluminium glazed system in standard approved powder coating finish complete with 6 mm thick green tinted Frosted glass including weatherseal sealant and all necessary fixing accessories, all in strict accordance with the manufacturer's instructions and specifications</u>					
A	Overall size 600 mm wide x 800 mm high top hung window (W12)	1	no			
B	Precast reinforced concrete (grade 20) lintol, in various sizes including reinforcement, bedded and jointed in cement and sand (1:3) mortar, hoisted and fixed in position, finished fair on all exposed surfaces, all as detailed on drawings and in specification		Item			
	<u>OTHER WORKS NECESSARY</u>					
C	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - WINDOWS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>BILL 5 - WINDOWS Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
<u>BILL 5 - INTERNAL WALLS</u>						
BRICKWALL						
<u>Common brickwall in cement and sand (1:3) mortar with and including 'Exmet' reinforcement at every fourth course</u>						
A	70 mm thick brickwall	95	m2			
B	115 mm thick brickwall	924	m2			
C	230 mm thick brickwall	7	m2			
D	300 mm thick cavity brickwall	58	m2			
E	70 mm wide with 150 mm high upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
F	115 mm wide with 150 mm high upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
G	230 mm wide with 150 mm high upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
H	300 mm wide with 150 mm high upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
J	6 mm diameter x 450 mm long mild steel bonding ties, one end cast into concrete column and hooked around column reinforcement and other end built into joints of brickwork including forming perforation in formwork		Item			
OTHER WORKS NECESSARY						
K	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - INTERNAL WALLS (Cont)</u></p>					
<p>(Cont) OTHER WORKS NECESSARY</p>					
<p>2) _____</p>					
<p>3) _____</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - INTERNAL WALLS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 5 - INTERNAL WALLS Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - DOORS</u>					
	The Contractor must verify the exact sizes of doors and opening on site prior to fabrication		Note			
	Shop drawings should be submitted by Contractor prior to fabrication and installation for Architect approval		Note			
	The Contractor must submit sample / mock-up for Architect approval		Note			
	All door frame and architrave shall finished with 'ICI' or other equal and approved spray gloss paint		Note			
	All finished doors, linings, door frames and architrave shall be well-seasoned treated hardwood, planed, smoothed and sanded		Note			
	All door shall include kontras, beading and moulding		Note			
	All door finishes details shall refer to Architectural drawings and as in specification		Note			
	SOLID TIMBER CORE FLUSH DOORS					
A	Single leaf door, overall size 900 x 2100 mm high (D1)	18	no			
B	Single leaf door, overall size 850 x 2100 mm high (D3)	38	no			
	FIRE RATED SOLID HARDWOOD TIMBER DOOR					
C	One hour fire rated double leaves door, overall size 1900 x 2100 mm high (D2A)	6	no			
D	One hour fire rated single leaf door, overall size 900 x 2100 mm high (D4)	11	no			
	<u>Wrot treated hardwood door frame and accessories in approved paint finished</u>					
E	Door frame	284	m			
F	Architrave	568	m			
G	Timber subframe	284	m			
H	Fire rated door frame	93	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - DOORS (Cont)</u>					
	(Cont) FIRE RATED SOLID HARDWOOD TIMBER DOOR					
	<u>(Cont) Wrot treated hardwood door frame and accessories in approved paint finished</u>					
A	Fire rated architrave	186	m			
B	Fire rated timber subframe	93	m			
C	Precast reinforced concrete (grade 20) lintol in various sizes including reinforcement, bedded and jointed in cement and sand (1:3) mortar, hoisted and fixed in position, finished fair on all exposed surfaces, all as detailed on drawings and in specification		Item			
D	150 x 50 x 100 mm high heelstone cast to suit the profile of door jamb with one end built into door jamb and other end cast into heelstone and finish to match floor finishes		Item			
E	150 x 25 x 3 mm thick mild steel lugs with one end fishtailed built into joints of brickwork and the other end turned up, holed and screwed to back of timber door frame		Item			
F	6 mm wide approved silicone sealant pointing to gap between frame and tile		Item			
	IRONMONGERY					
	<u>Supply and fix the following or other equal and approved stainless steel ironmongery to doors and frames including all matching screws unless otherwise stated</u>					
G	'Kawajun' 503.12.101 or other equal and approved Hinge	222	no			
H	'Hafele' 502.11.120 or other equal and approved Mortise roller lock SS matte forend width 24mm	55	no			
J	'Kawajun' 503.11.110 or other equal and approved 65mm Key-Thumb Turn Profile Cylinder	55	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - DOORS (Cont)</u>					
	(Cont) IRONMONGERY					
	<u>(Cont) Supply and fix the following or other equal and approved stainless steel ironmongery to doors and frames including all matching screws unless otherwise stated</u>					
A	'Kawajun' 503.11.107 or other equal and approved Square Escutcheon *Shot black	73	no			
B	'Kawajun' 503.10.238 or other equal and approved C1 Lever Handle on Square Rose & Escutcheon Finish: Shot Black	73	no			
C	'Hafele' 502.11.103 or other equal and approved mortise lock for profile cylinders	18	no			
D	'Kawajun' 503.11.117 or other equal and approved Thumb Turn & Coin Turn profile *For Toilet	18	no			
E	'Hafele' 502.12.112 or other equal and approved HEAVY DUTY BUTT HINGE	69	no			
F	'Hafele' 502.13.106 or other equal and approved Concealed door closer DCL 34 *Suitable for Fire-Rated Doors	23	no			
G	'Hafele' 502.16.112 or other equal and approved FLUSH BOLT 8" SS	12	no			
H	'Hafele' 502.16.113 or other equal and approved FLUSH BOLT 18" SS	12	no			
J	'Hafele' 502.16.111 or other equal and approved Floor Socket - 15mm dia	12	no			
K	'Hafele' 502.16.120 or other equal and approved DOOR STOPPER	68	no			
L	'Hafele' 502.13.105 or other equal and approved Door Closer (without hold open - standard arm)	56	no			
	MASTER KEY SYSTEM					
M	Allow for all locks to be keyed in one master key to the approval of the Superintending Officer		Item			

Description	Qty	Unit	Rate	\$	c
<p style="text-align: center;"><u>BILL 5 - DOORS (Cont)</u></p> <p><u>OTHER WORKS NECESSARY</u></p> <p>A Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - DOORS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>BILL 5 - DOORS Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - INTERNAL WALL FINISHES</u>					
	Contractor to refer Schedule of Finishes for complete specification and description		Note			
	Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
A	20 mm thick cement and sand (1:3) plainface plaster including trowelling smooth to wall and column	1729	m2			
B	20 mm thick cement and sand (1:3) backing screed to receive ceramic wall tiles to wall and column	769	m2			
C	Approved Skim coat on plastered wall surface to received finishes including all surface preparation	1729	m2			
D	(3.1) 'ICI Dulux' all-in-one or other equal and approved paint to plainface plastered (plaster measured seperately) wall and column	1221	m2			
E	(3.2) 'ICI Dulux' pentelite or other equal and approved paint to plainface plastered (plaster measured seperately) wall and column	322	m2			
F	(3.3) 'Cicogress' or other equal and approved 300 mm x 600 mm wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column	769	m2			
G	(3.9) 'KCC' textcoat with 'Wattyl Solagard' or other equal and approved paint to plainface plastered (plaster measured separately) wall and column	186	m2			
H	'Fosroc' brushbond or other equal and approved cementious waterproofing to concrete surfaces, applied strictly in accordance with the manufacturer's instruction to wall and column (Rate to include for providing a ten (10) years guarantee as specified hereinbefore)	769	m2			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - INTERNAL WALL FINISHES (Cont)</u></p> <p>OTHER WORKS NECESSARY</p> <p>A Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - INTERNAL WALL FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 5 - INTERNAL WALL FINISHES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - INTERNAL FLOOR FINISHES</u>					
	Contractor to refer Schedule of Finishes for complete specification and description		Note			
	Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
	<u>30 mm thick cement and sand (1:3) backing screed to floor to receive</u>					
A	Floor tiles	916	m2			
B	Block	39	m2			
C	150 mm high tiles skirting	515	m			
D	Drop in slab		Item			
	<u>(1.3) 'Cicogress' or other equal and approved 300 mm x 600 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
E	Floor	109	m2			
F	Drop in slab		Item			
	<u>(1.4) 'Cicogress' or other equal and approved 600 mm x 600 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
G	Floor	807	m2			
H	Drop in slab		Item			
	<u>(1.8) 'CIFRE CERAMICA' Extend Series or other equal and approved 20 mm thick floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
J	Floor	39	m2			
K	Drop in slab		Item			
	<u>The following skirting, laid on cement and sand screed (screed measured separately)</u>					
L	(2.2) 'Cicogress' or other equal and approved tiles skirting, 150 mm x 600 mm	499	m			
M	(2.6) 20 mm thick CIFRE CERAMICA Extend Series tiles skirting	16	m			

Description	Qty	Unit	Rate	\$	c
<u>BILL 5 - INTERNAL FLOOR FINISHES (Cont)</u>					
A Selective Aluminium U-Channel termination accessories with natural anodised finish to Architect's approval, install strictly in accordance with the manufacturer's instruction	515	m			
B 'Fosroc' brushbond or other equal and approved cementious waterproofing to concrete surfaces, applied strictly in accordance with the manufacturer's instruction (Rate to include for providing a ten (10) years guarantee as specified hereinbefore)	174	m2			
C Approved aluminium edge strip and dividing strip, fixed strictly in accordance with manufacturer's instruction		Item			
D Approved stainless steel divider strip, fixed strictly in accordance with manufacturer's instruction		Item			
OTHER WORKS NECESSARY					
E Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
1) _____					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - INTERNAL FLOOR FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 5 - INTERNAL FLOOR FINISHES Carried to Summary</p>					

Description	Qty	Unit	Rate	\$
<u>BILL 5 - INTERNAL CEILING FINISHES</u>				
Contractor to refer Schedule of Finishes for complete specification and description		Note		
A (4.1) 'Gyproc' or other equal and approved gypsum board ceiling with square edge complete with standard fixing accessories all as per manufacturer's detail, recommendation and approval as detailed on drawings.	743	m2		
B (4.2) 'Gyproc' or other equal and approved gypsum moisture resistant board ceiling with square edge complete with standard fixing accessories all as per manufacturer's detail, recommendation and approval as detailed on drawings.	174	m2		
C (4.6) 'SIAM' or other equal and approved gypsum weatherbloc ceiling with square edge complete with standard fixing accessories finished, all as per manufacturer's detail, recommendation and approval as detailed on drawings.	39	m2		
<u>Prepare, prime and apply 'ICI DULUX' or other equal and approved paint finish to</u>				
D Gypsum board <u>Prepare, prime and apply 'Wattyl Solagard' or other equal and approved paint finish to</u>	917	m2		
E Gypsum weatherbloc board	39	m2		
F Shadow gap including paint		Item		
G Drop in ceiling including paint		Item		
H <u>Extra for forming ceiling access opening including all frame and painting</u>		Item		
OTHER WORKS NECESSARY				
J Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein) 1) _____		Item		

BILL 5 - INTERNAL CEILING FINISHES

Description	Qty	Unit	Rate	\$	c
<u>BILL 5 - INTERNAL CEILING FINISHES (Cont)</u>					
(Cont) OTHER WORKS NECESSARY					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - INTERNAL CEILING FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 5 - INTERNAL CEILING FINISHES Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<u>BILL 5 - EXTERNAL WALL FINISHES</u>					
Contractor to refer Schedule of Finishes for complete specification and description		Note			
Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
A 20 mm thick cement and sand (1:3) plainface plaster including trowelling smooth to wall and column	1441	m2			
B 20 mm thick cement and sand (1:3) backing screed to receive ceramic wall tiles to wall and column	182	m2			
C (3.6) Red Sandstone wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column including primed A5631 or other equalvalent, bracket and all other fixing accessories	182	m2			
D (3.9) 'KCC' textcoat with 'Wattyl Solagard' or other equal and approved paint to plainface plastered (plaster measured separately) wall and column	1441	m2			
OTHER WORKS NECESSARY					
E Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
1) _____					
2) _____					
3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - EXTERNAL WALL FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 5 - EXTERNAL WALL FINISHES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - EXTERNAL FLOOR FINISHES</u>					
	Contractor to refer Schedule of Finishes for complete specification and description		Note			
	Rate to include 'Laticrete' tile adhesive and pointing with colour grout mixed with grout adhesive as per schedule		Note			
	<u>30 mm thick cement and sand (1:3) backing screed to floor to receive</u>					
A	Floor tiles	98	m2			
B	Block	205	m2			
C	150 mm high tiles skirting	214	m			
D	Red sandstone	12	m			
E	Drop in slab		Item			
	<u>(1.5) 'Cicogress' wood series or other equal and approved 200 mm x 1200 mm floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
F	Floor	98	m2			
G	Drop in slab		Item			
	<u>(1.8) 'CIFRE CERAMICA' Extend Series or other equal and approved 20 mm thick floor tiles, laid in pattern on cement and sand screed (screed measured separately) to</u>					
H	Floor	205	m2			
J	Drop in slab		Item			
	<u>The following skirting, laid on cement and sand screed (screed measured separately)</u>					
K	(2.3) 'Cicogress' wood series or other equal and approved tiles skirting, 200 mm x 1200 mm	126	m			
L	(2.6) 20 mm thick CIFRE CERAMICA Extend Series tiles skirting	88	m			
M	(2.7) Red sandstone tiles skirting	12	m			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - EXTERNAL FLOOR FINISHES (Cont)</u>					
A	Selective Aluminium U-Channel termination accessories with natural anodised finish to Architect's approval, install strictly in accordance with the manufacturer's instruction	226	m			
B	'Fosroc' brushbond or other equal and approved cementious waterproofing to concrete surfaces, applied strictly in accordance with the manufacturer's instruction (Rate to include for providing a ten (10) years guarantee as specified hereinbefore)	98	m2			
	OTHER WORKS NECESSARY					
C	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - EXTERNAL FLOOR FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 5 - EXTERNAL FLOOR FINISHES Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - EXTERNAL CEILING FINISHES</u>					
	Contractor to refer Schedule of Finishes for complete specification and description		Note			
A	(4.6) 'SIAM' or other equal and approved gypsum weatherbloc ceiling with square edge complete with standard fixing accessories finished, all as per manufacturer's detail, recommendation and approval as detailes on drawings.	288	m2			
	<u>Prepare, prime and apply 'Wattyl Solagard' or other equal and approved paint finish to</u>					
B	Gypsum weatherbloc board	288	m2			
C	<u>Extra for forming ceiling access opening including all frame and painting</u>		Item			
	OTHER WORKS NECESSARY					
D	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - EXTERNAL CEILING FINISHES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>BILL 5 - EXTERNAL CEILING FINISHES Carried to Summary</p>					

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 5 - FURNISHING FITTINGS</u></p> <p>All sizes shall be checked on site prior to fabrication</p> <p>All external surfaces shall be of selective Lamitak laminated finish or of equal equivalent unless otherwise stated, face pattern and colour as selected by the Architect</p> <p>All internal surfaces shall be of selective Lamitak laminated finish or of equal equivalent unless otherwise stated, face pattern and colour as selected by the Architect</p> <p>All hardwood edging and lipping shall be painted with 2 coats of approved transcolor preservative wood stain finishing or of equal equivalent, colour as selected by Architect</p> <p>All cabinet doors, shelves and drawers shall be provided with and including approved ironmongeries (Lock set to drawer refer to Architectural drawings denoted as circular keyhole in elevation)</p> <p>All counter top finished with 12.3 mm thick 'Samsung Staron' or other equal and approved solid surface material back with plywood and 'Non-drip' edge profile on front and sides of appoved colour as selected by the Architect</p> <p>Unless otherwise stated, all finishes and details as shown/detailed on Architectural drawings</p> <p>Tenderer shall make his own assessment from all drawings and specification issued at the time of tederer. Any discrepancies between drawing and Bill of Quantities, the drawings shall take precedence. No additional claim will be entertained</p> <p>Mock up units shall be provided when require</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

Description	Qty	Unit	Rate	\$	c
<u>BILL 5 - FURNISHING FITTINGS (Cont)</u>					
WASH HAND BASIN COUNTER TOP					
<u>Wash hand basin counter top and 150 mm high splashboard in approved colour finished with waterproofing, including forming opening to receive basin including mild steel bracket support and all necessary fixing accessories all as detailed on drawing and in specification</u>					
A Overall size 2103 mm long x 600 mm deep x 200 mm high	5	no			
KITCHEN LOW AND HIGH CABINETRY					
B Low Cabinet, overall size 3295 + 1190 mm long x 600 mm deep x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, splashboard, sink top, forming opening for sink, skirting, all ironmongeries and etc, all as per details on Architectural drawings	1	no			
C High Cabinet, overall size 1345 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	1	no			
D High Cabinet, overall size 2425 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	1	no			
E Low Cabinet, overall size 3477 mm long x 600 mm deep x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, splashboard, sink top, forming opening for sink, skirting, all ironmongeries and etc, all as per details on Architectural drawings	4	no			
F Low Cabinet, overall size 1180 mm long x 600 mm deep x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, splashboard, sink top, forming opening for sink, skirting, all ironmongeries and etc, all as per details on Architectural drawings	4	no			

	Description	Qty	Unit	Rate	\$	c
<u>BILL 5 - FURNISHING FITTINGS (Cont)</u>						
(Cont) KITCHEN LOW AND HIGH CABINetry						
A	High Cabinet, overall size 3477 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	4	no			
B	High Cabinet, overall size 1840 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	4	no			
C	Low Cabinet, overall size 4480 mm long x 600 mm deep x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, splashboard, sink top, forming opening for sink, skirting, all ironmongeries and etc, all as per details on Architectural drawings	1	no			
D	Low Cabinet, overall size 1660 mm long x 600 mm deep x 850 mm high comprised of cabinet doors, drawers, open shelves, adjustable shelves, splashboard, sink top, forming opening for sink, skirting, all ironmongeries and etc, all as per details on Architectural drawings	1	no			
E	High Cabinet, overall size 4480 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	1	no			
F	High Cabinet, overall size 2310 mm long x 300 mm deep x 1250 mm high comprised of cabinet doors, open shelves, adjustable shelves, all ironmongeries and etc, all as per details on Architectural drawings	1	no			
WARDROBE						
G	Overall size 2035 mm long x 600 mm deep x 2800 mm high comprised of wardrobe doors, drawers, open shelves, adjustable shelves, hanging rod, LED strip lighting, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings (bedroom & master's bedroom - wardrobe 1)	16	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - FURNISHING FITTINGS (Cont)</u>					
	(Cont) WARDROBE					
A	Overall size 2492 + 2035 mm long x 600 mm deep x 2800 mm high comprised of wardrobe doors, drawers, open shelves, adjustable shelves, hanging rod, LED strip lighting, skirting, all ironmongeries and etc, all as per detailed on Architectural drawings (master's bedroom - wardrobe 2)	1	no			
	MIRROR					
	<u>8 mm thick bronze tinted mirror with 10 mm thick plywood backing complete with powder coated aluminium frame and all fixing equipment and accessories</u>					
B	Overall size 665 mm long x 1000 mm high	14	no			
C	Overall size 2000 mm long x 1000 mm high	5	no			
	OTHER WORKS NECESSARY					
D	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item			
	1) _____					
	2) _____					
	3) _____					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - FURNISHING FITTINGS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>BILL 5 - FURNISHING FITTINGS Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - PLUMBING</u>					
	<u>PLUMBING</u>					
	Fire Hosereel and all associated tanks, pump sets and plumbing works measured in Bill 8B		Note			
	All bends, junctions, tees and the like shall be with access eye opening of pipe diameter		Note			
	All soil and waste pipes shall be connected to gully trap and first manhole		Note			
	SOIL, WASTE AND VENT PIPES					
A	Waste, soil and vent piping system, including all connection and fittings, all as detailed on drawings and in specification		Item			
B	Floor trap including all connection, fittings and gratings, all as detailed on drawings and in specification		Item			
	GULLY TRAP					
C	Gully trap and chamber size 300 x 300 mm in various depth internally with multiple inlets comprising 125 mm thick concrete (grade 20) wall and base, upvc gully trap to B.S.4660 with perforated grating, 300 x 300 mm stainless steel grating with hinge, etc. finished with cement and sand render internally, epoxy painting, inlet and outlet, jointing to waste pipes, including excavation, disposal, backfilling, formwork, etc, the whole as per detail shown on Engineer's drawing		Item			
	COLD AND HOT WATER SERVICES					
D	Cold water and piping including all fittings and connections, all as detailed on drawings and in specification		Item			
E	Hot water and piping including all fittings and connections, all as detailed on drawings and in specification		Item			

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>BILL 5 - PLUMBING (Cont)</u></p>					
<p><u>(Cont) PLUMBING</u></p>					
<p>TESTING</p>					
<p>A Allow for testing the whole of the plumbing system to the approval of the relevant authorities and to the satisfaction of the Superintending Officer</p>		Item			
<p><u>OTHER WORKS NECESSARY</u></p>					
<p>B Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p>		Item			
<p>1) _____</p>					
<p>2) _____</p>					
<p>3) _____</p>					

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - PLUMBING (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>BILL 5 - PLUMBING Carried to Summary</p>					

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - SANITARY FITTINGS</u>					
	<u>Supply and fix the following or other equal and approved vitreous china (unless otherwise stated) sanitary fittings including setting and bedding in positions, building in all brackets, grouting solid, making all connection to supply, vent, waste, overflow drains and for providing all necessary fixing accessories in strict accordance with the sanitary schedule and manufacturer's instruction</u>					
A	DURAVIT 21180900002-GD-Code Closed-Coupled Washdown W.C., 0927100004-GCistern With 6/3L Dual Flush Fittings, U7070S+P202+I107 Seat & Cover (Soft Close), Bend Connector (S-Trap : 170mm), 1/2" Stop Valve, 3/8" x 1/2" Flexible Hose	17	no			
B	JOHNSON SUISSE WBAENW211WW Windsor 250 BO WC, WBALTN111WW Trend Cistern With Lid, WBFT400335XX Trend 6/3L Flush Fittings, SC402 Seat & Cover (Soft Close), WBFT400101XX Fixing Bolt (X2), P450 Straight Connector (S-Trap : 250mm), AV300 1/2" Stop Valve With Flange, DA650N 1/2" Flexible Hose	2	no			
C	DCODE 23105500002 D-Code Wall-Hung Basin With 1 Tap Hole W/Overflow Hole Size (550 X 430X 175)mm, WBFT400099XX Fixing Bolt (X2), 32mm - 1/4" UPVC Bottle Trap, 08571800002 Half Pedestal With Fixings, AV300 1/2" Stop Valve With Flange (X2)	17	no			
D	JOHNSON SUISSE WBAABS201WW Boston 500 Wall-Hung Basin With 1 Tap Hole W/Overflow Hole Size (500 X 430 X 210)mm, WBFT400099XX Fixing Bolt (X2), WBABHP000WW Half Pedestal, WBFT400101XX Fixing Bolt (X2), 32mm - 1 1/4" UPVC Bottle Trap, AV300 1/2" Stop Valve With Flange (X2)	2	no			
E	FIMA CARLO FRATTINI F3831CR.2 Serie 22 Deck Mounted Basin Mixer (Hot & Cold), Click Clack Pop-Up Waste, 1/2" Supply Hose (X2)	17	no			
F	JOHNSON SUISSE WBFA301434CP Turin Deck Mounted Basin Mixer (Hot & Cold), Chrome Plated Waste, Plug & Chain, 1/2" Supply Hose (X2)	2	no			

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 5 - SANITARY FITTINGS (Cont)</u>					
	<u>(Cont) Supply and fix the following or other equal and approved vitreous china (unless otherwise stated) sanitary fittings including setting and bedding in positions, building in all brackets, grouting solid, making all connection to supply, vent, waste, overflow drains and for providing all necessary fixing accessories in strict accordance with the sanitary schedule and manufacturer's instruction</u>					
A	JOHNSON SUISSE WBFA300933CP Fermo Deck Mounted Sink Tap (Cold Only)	6	no			
B	JOHNSON SUISSE WBFA300526CP Ravenna Twashing Machine Tap With Screw Collar & Flange (Cold Only)	5	no			
C	FIMA CARLO FRATTINI F3165/RP251CR Serie 22 Shower Column Mixer With Diverter (hot & Cold), ABS Overhead Shower (Dia : 200mm), Anti-Limestone Handshower (1 Spray Mode), 1500mm Brass Flex Hose	5	no			
D	FIMA CARLO FRATTINI F3834/1CR Serie 22 Wall Mounted Exposed Bath & Shower Mixer With Diverter (Hot & Cold), F2297CR 696mm ABS Sliding Rail With 1500mm Brass Flex Hose & Anti Limestone Handshower (1 Spray Mode)	7	no			
E	JOHNSON SUISSE WBFA301439CP Turin Exposed Bath & Shower Mixer With Diverter (Hot & Cold), WBFA300694CP Wall-Mounted Sliding Bar (L-600mm), WBFA300723CP Caspian II Hand Shower (1 Spray Mode), WBFA300583CP Double Interlock Shower Hose (L-1.5m)	2	no			
F	FIMA CARLO FRATTINI F6005/1CR Rotola Toilet Paper Holder	17	no			
G	JOHNSON SUISSE WBBA100264CP Trendy Paper Holder With Cover	2	no			
H	FIMA CARLO FRATTINI F6004/2CR Rotola Double Robe Hook	17	no			
J	JOHNSON SUISSE WBBA100257CP Trendy Single Robe Hook	2	no			
K	FIMA CARLO FRATTINI F6000/60CR Rotola Towel Rail (L-600mm)	12	no			

	Description	Qty	Unit	Rate	\$
	<u>BILL 5 - SANITARY FITTINGS (Cont)</u>				
	<u>(Cont) Supply and fix the following or other equal and approved vitreous china (unless otherwise stated) sanitary fittings including setting and bedding in positions, building in all brackets, grouting solid, making all connection to supply, vent, waste, overflow drains and for providing all necessary fixing accessories in strict accordance with the sanitary schedule and manufacturer's instruction</u>				
A	JOHNSON SUISSE WBBA100265CP Trendy Single Towel Rail (Length : 600mm)	2	no		
B	FIMA CARLO FRATTINI F2840/7CR Collettivita Bidet Angle Valve (Cold Only), ABS Hand Bidet Spray, 1200mm Flexible Stainless Steel Hose, Spray Holder	19	no		
C	TORA TR-KS-NH-00146-PolishedDouble Bowl Double Drainer Insert Type Stainless Steel Kitchen Sink Size (1370 X 455 X 180)mm, Waste (X2), 40mm 1/2" UPVC Bottle Trap (X2), AV300 1/2" Stop Valve With Flange, DA650-N 1/2" Flexible Hose	6	no		
D	NOVATEC FT201-6 Stainless Steel Decorative Tile Insert Floor Grating Size (153 X 153)mm, FLV Anti Insect & Odor Flow Valve	44	no		
	OTHER WORKS NECESSARY				
E	Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)		Item		
	1) _____				
	2) _____				
	3) _____				

Description	Qty	Unit	Rate	\$	c
<p><u>BILL 5 - SANITARY FITTINGS (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>BILL 5 - SANITARY FITTINGS Carried to Summary</p>					

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
<u>BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)</u>					
<p><u>NOTES</u></p> <p>The bills are to be read and priced in conjunction with the drawings, specification and include all works described / shown in bills and drawings</p> <p>The Contractor is to comply with the conditions of contract, specification, all preliminaries, etc. necessary for the complete execution of the works</p> <p>The Contractor shall be responsible for applying and obtaining all required permits from the relevant authorities for temporary accesses, etc. and for payment of fees thereof</p> <p>The Contractor must visit the site so as to take into consideration existing conditions and to have satisfied himself as to the nature of the site, soil condition, facilities for access, mobilisation of plants, etc. required under this contract. No claims will be allowed on the grounds of ignorance of the conditions under which the works will be executed</p> <p>Prior to the commencement of any work, the levels of the original surface of the site including all slopes shall be agreed by the Superintending Officer in accordance with Preliminaries under 'Setting Out and Site Levels' and on completion of this works, the Contractor must submit as built drawings as required in Preliminaries under 'Completion Joint-Survey and As Built Drawing' which shall form the basis of measurement</p> <p>The Contractor shall take all measures to protect the existing cables and services that is not affected by his scope of work. Any such damage caused by the Contractor shall be made good at the expense of the Contractor and to the satisfaction of the Superintending Officer</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>(Cont) NOTES</u>					
<p>All making good shall be executed with materials and workmanship to match in every respect of the surrounding work and shall be properly done thereto to the complete satisfaction of the S.O.</p>		Note			
<p>Unless otherwise specified, all materials and debris resulting from the clearing shall be stacked and removed completely from the site. On no account shall cleared timber or other materials be deposited in areas to be filled. Burning on site shall be prohibited</p>		Note			
<p>No tipping on the adjoining land shall be allowed in this contract. The Contractor is therefore to make his own arrangements for disposal of all surplus excavated materials where directed and is to pay all charges in connection therewith</p>		Note			
<p>Tenderer shall make his own assessment from all drawings and specification issued at the time of tendering. Any discrepancies between drawing and Bill of Quantities, the drawings shall take precedence. No additional claim will be entertained</p>		Note			
<u>DEMOLITION</u>					
<p>A Allow for remove, transfer, redirect and reinstate existing utilities or services that affecting or obstructing the proper execution of works</p>		Item			
<p>B Allow for and maintain any temporary shorings and bracings that may be required during the process of demolition to ensure the stability of the existing structures / buildings and remove the same off site on completion</p>		Item			
<p>C Remove existing trees in accordance with Municipal Board procedure / requirements including deliver to government nursery, etc. all to the satisfactory of the Superintendance Officer</p>		Item			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>PRECAST REINFORCED PILES (ALL PROVISIONAL)</u>					
<p>The system installation shall consist of 6.3 and 12.9 metre long precast concrete piles element forced into the ground using drop hammer method including cast in pile shoe</p>		Note			
<p>The piles should conform to B.S. 8110 : 1985 and be approved by CPRU Min. of Development for use in Brunei Darussalam</p>		Note			
<p>Steel reinforcement shall conform to B.S. 4449</p>		Note			
<p>End plate should be manufactured to conform to B.S. 4360</p>		Note			
<p>Concrete strength during transfer should correspond to a cube strength of minimum 25 Mpa</p>		Note			
<p>The 28-day strength of concrete shall not be less than 50 Mpa</p>		Note			
<p>Joint between the consecutive pile element shall be in full weld on each side of the end plates brought in contact</p>		Note			
<p>The setting pressure of twice the working load shall be held for a minimum of ten seconds before release</p>		Note			
<p>Each pile shall not deviate by more than 75 mm from the vertical or more than 74 mm from its designed position at the level of the piling chamber</p>		Note			
<p>The paylengths for the supply and inject complete of each pile shall be measured from pile toe to cut-off level</p>		Note			
<p>Tenderer to refer Engineer's Piling Note for performance specification and details</p>		Note			
<p>Provide and erect on site all necessary plant and equipment for installation of precast concrete piles, and dismantle and clear away on completion</p>		Item			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
<u>BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
<u>(Cont) PRECAST REINFORCED PILES (ALL PROVISIONAL)</u>					
Allow for moving and handling piling frame and equipment inclusive of assembling and dismantling about at site from position to position including use of Selangan timber matt and hiring of Kobelco for the full duration		Item			
A Supply, transport, handle, pitch, hammer, weld, extend, cut-off head, etc. 125 mm square precast reinforced (Grade 45) concrete piles, all in strict accordance with the pile specification.	4092	m			
B Supply, transport, handle, pitch, hammer, weld, extend, cut-off head, etc. 150 mm square precast reinforced (Grade 45) concrete piles, all in strict accordance with the pile specification.	3576	m			
<u>Provide the necessary kentledge, jack and dial gauges for the application and release of the load test. The rates include all supervision and labour, watching and lighting and removal of kentledge and equipment</u>					
C Load test of 900 kN for 125 mm RC square piles with design working load of 600 kN	4	no			
D Load test of 900 kN for 150 mm RC square piles with design working load of 600 kN	4	no			
<u>SITE PREPARATION</u>					
E Clear site (on flat or sloping ground) ready for earthwork including cutting down all shrubs, lallang, bushes, trees (any size, height and age), undergrowth, strip top soil, etc. grubbing up roots, buried logs, breaking up any existing obstructions if encountered and backfilling void where required with approved materials together with all subsequent disposal of debris all to the approval of the S.O. (Approximate area 4,008 m2)		Item			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

	Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)						
<u>EARTHWORKS (ALL PROVISIONAL)</u>						
A	Imported earth fill with approved sand soil all as specified to be transported to site, deposit, spread, level, grade and well compacted in layers in making up formation level including forming slopes, ramps and embankments all as detailed on drawings and in the specification (Rate to include for payment of royalty to the Brunei Government Land Department)	4500	m3			
<u>SOILING AND TURFING</u>						
B	Supply and plant axonopus compressus (cow grass) in close turfing to flat and sloping surfaces as directed, including excavation, disposal, trimming, filling soft sports, top soil, lime, grading, rolling, raking, etc. to the approval of the Superintending Officer.	1298	m2			
C	Allow for maintenance of all turfing till the end of defect liability period including mowing, cutting, watering, weeding, spreading lime and fertilizer, replacement of dead or damaged plants, etc. as directed by the Superintending Officer. The Contractor to submit maintenance programme for approval		Item			
<u>RETAINING WALL</u>						
The Contractor is to provide all necessary temporary protection including method statement for Engineer approval before any excavation						
<u>REINFORCED CONCRETE RETAINING WALL (TYPE 1)</u>						
<u>50 mm thick lean concrete (grade 15) to underside of</u>						
D	Concrete slab	117	m2			
<u>Reinforced concrete (grade 30) in</u>						
E	Concrete slab	59	m3			
F	Retaining wall	72	m3			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

	Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)						
	<u>(Cont) RETAINING WALL</u>					
	<u>(Cont) REINFORCED CONCRETE RETAINING WALL (TYPE 1)</u>					
	<u>10 mm to 25 mm diameter mild steel / high tensile reinforcement bar in</u>					
A	Concrete slab	7080	kg			
B	Retaining wall	8640	kg			
	<u>Formwork to</u>					
C	Sides of retaining wall	294	m2			
D	Edge of concrete slab	22	m2			
E	20mm thick cement and sand (1:3) plainface plaster trowelled smooth to retaining wall including all approved paint and colour finish	157	m2			
F	Perforated 150 mm diameter upvc class 'D' sub-soil pipe surrounded with aggregates, all as per Engineer's details drawings	41	m			
G	Movement/Expansion joint, filled with 25 mm wide x 50 mm deep 'Expandite 99' or other equal and approved expansion / movement joint complete with 25 mm thick softboard filler including slip membrane and additional use of formwork, all as detailed on drawings and in specification		Item			
H	75 mm diameter pvc weep hole end with single size aggregates wrapped with filter cloth at 2500 mm centre, all as per Engineer's detail drawings		Item			
	GABION WALL (TYPE 1)					
	<u>Gabion wall in approved 75 to 200 mm well grade hard stones filling in galvanised wire mesh gabion, stacking up in courses as directed by Engineer, all as detailed on drawings and specification</u>					
J	Overall size 2000 mm wide x 3000 mm high	36	m			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
	<u>(Cont) RETAINING WALL</u>					
	<u>(Cont) GABION WALL (TYPE 1)</u>					
	<u>250 mm thick reinforced concrete strip footing with upturn kerb including reinforcement bars, formwork and all necessary excavation, compaction, disposal of surplus excavated materials off-site, backfilling and etc., all as detailed on Engineer's drawings</u>					
A	2600 mm wide	36	m			
B	Reinforced concrete stiffener, 200 mm x 200 mm x 3000 mm high including all reinforcement bars and all necessary formwork, finish all exposed surface with approved paint in approved colour, all as detailed on Engineer's drawings	13	no			
C	200 mm diameter approved perforated polypropylene primary subsoil pipe complete with approved geotextile and crushed gravel, all as detailed on Engineer's drawings	72	m			
	<u>DRIVEWAY AND PAVEMENT</u>					
D	Excavate for driveway and carpark commencing from formation level not exceeding 2.00 m deep, get out, cart away excavated material off-site to a tip to be provided by the Contractor at his expense	374	m3			
E	Prepare subgrade surface, grade and makeup to line level and camber to required maximum dry density, CBR value, fall and gradients, all as detailed on drawings and in specification	679	m2			
F	Compact surfaces of subgrade to 90% optimum dry density with minimum soaked CBR value of 4% all as specified, including necessary trimming and levelling surfaces to falls and gradients	679	m2			
G	Proof roll compacted surfaces to detect soft spots, excavate, remove, lay and compact approved sand filling in layer		Item			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

	Description	Qty	Unit	Rate	\$	c
<u>BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>						
<u>(Cont) DRIVEWAY AND PAVEMENT</u>						
A	Allow for carrying out Laboratory Compaction Test (4.5 kg hammer) including providing necessary instrument	1	no			
B	Allow for carrying Laboratory CBR Test including providing necessary instrument	1	no			
C	Allow for carrying out Field Density Test on prepared subgrade including providing necessary instrument	1	no			
D	Allow for carrying out CBR Test (BS1377 Pt9; 1990) on prepared subgrade including providing necessary instrument	1	no			
E	250 mm thick mechanically compacted granular sub-base of crushed rock, hard durable particles or fragments of rock crushed to size as specified, spread, level and finished to falls and gradients	679	m2			
F	200 mm thick mechanically compacted crusher run road base of crushed rock, hard durable particles or fragments of rock crushed to size as specified, spread, level and finished to falls and gradients	679	m2			
G	One (1) layer of reinforced base Type '1' laying of reinforced base on earthworks	679	m2			
H	Apply prime coat including sweeping and cleaning surfaces of subbase before application	679	m2			
J	60 mm thick asphaltic concrete binded course, spread, level and consolidate to the required gradients and cambers with power roller as specified	679	m2			
K	Apply bituminous tack coat at the approved rate including sweeping and cleaning surfaces of subbase before application	679	m2			
L	40 mm thick asphaltic concrete wearing course, spread, level and consolidate to the required gradients and cambers with power roller as specified	679	m2			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

	Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)						
<u>(Cont) DRIVEWAY AND PAVEMENT</u>						
A	Cut edge of existing tarmacadam driveway 250 mm wide x 300 mm deep including prepare surfaces to receive new works, make good surfaces disturbed and remove all debris off site		Item			
KERB						
B	125 mm wide x 300 mm high precast concrete kerb (grade 30) (straight and curved-on-plan) on 'L' shape foundation and haunch, laid in straight/curve alignment, reinforced with mild steel bar, all exposed surfaces finished fair and prepare and apply two coats of gloss reflective paint in alternating black and white colour, bedded and jointed in cement and sand mortar including all excavation and formwork, all as detailed on drawing	222	m			
C	100 mm diameter upvc pipe through kerb at 3000 mm centre		Item			
<u>Prepare and apply two coats of approved chlorinated rubber paint on asphaltic for demarcation and directional arrow sign</u>						
D	100 mm wide in straight line	20	m			
E	Straight arrow	2	no			
F	Turn right arrow	2	no			
G	Turn left arrow	2	no			
H	Turn left & right arrow	2	no			
J	Transverse 'Stop Line'	2	no			
<u>Supply and install approved diamond grade aluminium alloy reflective warning directional sign complete with all post, reinforced concrete footing, excavation, disposal, reinforcement, formwork and painting to approved colour complying to JKR Road Department regulation (Contractor to refer Engineer's drawing for signage details)</u>						
K	'KELUAR'	1	no			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
	<u>(Cont) DRIVEWAY AND PAVEMENT</u>					
	<u>(Cont) KERB</u>					
	<u>(Cont) Supply and install approved diamond grade aluminium alloy reflective warning directional sign complete with all post, reinforced concrete footing, excavation, disposal, reinforcement, formwork and painting to approved colour complying to JKR Road Department regulation (Contractor to refer Engineer's drawing for signage details)</u>					
A	'MASUK'	1	no			
B	'BERHENTI'	2	no			
	<u>SURFACE WATER DRAINAGE</u>					
	The contractor is to check and adjust drain levels on site			Note		
	The contractor is to maintain existing drains including make good all works disturbed			Note		
C	Allow for connection to existing drain and sump including all hacking and make good to works disturbed including matching existing invert level			Item		
	<u>OPEN DRAIN</u>					
	<u>Reinforced concrete (grade 30) water channel laid to falls in straight / curved alignment with 125 mm thick walls and 100 mm thick base, lean concrete (grade 15), 50 mm weep holes with filter stone, etc., finished on all exposed surfaces with cement and sand (1:3) plaster trowelled smooth, including all necessary excavation, backfilling, crusher run, formwork, reinforcement, forming angles, ends, outlet, junctions, etc. all as detailed on drawings (all dimensions stated are internal and depth to invert level)</u>					
D	350 mm wide x 500 mm deep (average)	40	m			
E	450 mm wide x 500 mm deep (average)	76	m			
F	450 mm wide x 515 mm deep (average)	25	m			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

	Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)						
<u>(Cont) SURFACE WATER DRAINAGE</u>						
<u>(Cont) OPEN DRAIN</u>						
<u>(Cont) Reinforced concrete (grade 30) water channel laid to falls in straight / curved alignment with 125 mm thick walls and 100 mm thick base, lean concrete (grade 15), 50 mm weep holes with filter stone, etc., finished on all exposed surfaces with cement and sand (1:3) plaster trowelled smooth, including all necessary excavation, backfilling, crusher run, formwork, reinforcement, forming angles, ends, outlet, junctions, etc. all as detailed on drawings (all dimensions stated are internal and depth to invert level)</u>						
A	450 mm wide x 605 mm deep (average)	36	m			
B	450 mm wide x 625 mm deep (average)	28	m			
C	450 mm wide x 650 mm deep (average)	28	m			
D	450 mm wide x 755 mm deep (average)	58	m			
E	450 mm wide x 780 mm deep (average)	91	m			
F	450 mm wide x 785 mm deep (average)	32	m			
GRATING						
<u>Hot dipped galvanised drain grating complete with angle with lugs embedded in concrete including all welding and painting, all as Engineer's details drawing for</u>						
G	450 mm wide drain	91	m			
<u>Precase reinforced concrete (grade 25) grating including all necessary reinforcement and formwork, laid in position all as per Architectural and Engineer's drawing for</u>						
H	350 mm wide drain	40	m			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
	<u>(Cont) SURFACE WATER DRAINAGE</u>					
	<u>(Cont) GRATING</u>					
A	Allow for making 'L' shape angle to existing drain to receive new drain grating including all hacking, cutting of reinforcement, replastering, and make good to all surface disturbed to match existing	182	m			
	<u>SUMP</u>					
	<u>Reinforced concrete (grade 30) sump, comprising 150 mm thick walls and base on and including lean concrete, reinforcement bar, splayed fillet at base corners, top of sump with rebate and angle framing to receive and including hot dipped galvanised steel sump grating, finished on all exposed surfaces with cement and sand (1:3) plaster trowelled smooth, including all excavation, backfilling, disposal, formwork, forming opening and connections of incoming and outgoing drain, all as detailed on drawings (all dimensions stated are internal and depth to invert level)</u>					
B	750 x 750 x 550 mm deep	1	no			
C	750 x 750 x 450 mm deep	2	no			
D	750 x 750 x 660 mm deep	1	no			
E	750 x 750 x 850 mm deep	1	no			
F	750 x 750 x 900 mm deep	1	no			
G	750 x 750 x 800 mm deep	1	no			
H	750 x 750 x 720 mm deep	1	no			
J	750 x 750 x 580 mm deep	1	no			
	<u>Hot dipped galvanised sump grating complete with angle with lugs embedded in concrete including all welding and painting, all as Engineer's details drawing for (all dimensions stated are internal)</u>					
K	750 mm square sump	9	no			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>SLOTTED DRAIN</u>					
<p>Reinforced concrete (grade 30) slotted surface water channel laid to falls in straight/ curved alignment with reinforcement bar and including 100 mm thick hardcore and 50 mm thick lean concrete (grade 15), 300 mm diameter half round slotted drain bolted to bothside of concrete drain, upvc weephole with hydrocell prefabricated wall drainage panel wrapped all sides with one layer Bonal Nwa non-woven geotextile at 3000 centre, finished on all exposed surfaces with 12 mm thick cement and sand (1:3) plaster trowelled smooth including all necessary excavation, backfilling, compacted subgrade, formwork, forming angles, ends, outlet, junctions, etc. all as detailed on drawings (all dimensions stated are internal)</p>					
A 450 mm wide x 850 mm deep (average)	15	m			
<u>EXTERNAL WATER SUPPLY</u>					
All water tanks and pump sets measured in Mechanical & Electrical Works Bill 8A			Note		
All pipes shall be deemed to include all excavation, backfilling, disposal, etc., complete with all made bends, elbows, bends, tees, couplings, connectors, unions, diminishing sockets, reducers, etc, whichever fittings/ accessories are applicable and wrapping and insulation			Note		
All MDPE, ductile iron and stainless steel pipe which will be contact with soil shall be wrapped with authority approved polythene sheet			Note		
All flanged or flexible joints shall be protected with 'Denso Mastic' and wrapped around with Denso tape			Note		
B Excavate to locate and expose existing pipe main, for connection to new pipe and all necessary accessories, cutting existing pipe, backfilling, compaction, removal of debris and making good all works disturbed			Item		

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

	Description	Qty	Unit	Rate	\$	c
	BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
	(Cont) EXTERNAL WATER SUPPLY					
A	75 mm diameter approved MDPE pipe water supply mains jointed in push-in spigot and socket joints with rubber ring seals, laid in trench with various compacted sand surround in layers including plyage HRD blue marker mesh greater than 30 mm diameter	28	m			
B	50 mm diameter approved MDPE pipe water supply mains jointed in push-in spigot and socket joints with rubber ring seals, laid in trench with various compacted sand surround in layers including plyage HRD blue marker mesh greater than 30 mm diameter	83	m			
C	20 mm diameter approved MDPE pipe water supply mains jointed in push-in spigot and socket joints with rubber ring seals, laid in trench with various compacted sand surround in layers including plyage HRD blue marker mesh greater than 30 mm diameter	200	m			
D	75 mm diameter approved MDPE pipe water supply mains jointed in push-in spigot and socket joints with rubber ring seals, laid in trench with various compacted sand and reinforced concrete surround in layers including plyage HRD blue marker mesh greater than 30 mm diameter	7	m			
E	20 mm diameter approved MDPE pipe water supply mains jointed in push-in spigot and socket joints with rubber ring seals, laid in trench with various compacted sand and 50 mm diameter pipe sleeve including plyage HRD blue marker mesh greater than 30 mm diameter	4	m			
	<u>Approved stainless steel pipe and fittings to 316L laid underground to fall with various compacted sand in layers including all necessary excavation, disposal, connection and other fixing accessories</u>					
F	20 mm diameter water supply pipe	211	m			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

	Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)						
(Cont) EXTERNAL WATER SUPPLY						
<u>Approved stainless steel 316L pipe in 100 mm diameter heavy duty uPVC pipesleeve laid underground to fall including all necessary excavation, disposal, connection and other fixing accessories</u>						
A	50 mm diameter pipe	211	m			
B	Standard precast concrete (Grade 25) sluice valve chamber, internal size 280 x 430 x 1000 mm deep, comprising free draining compacted granular material and ground beam at base, 100 mm thick precast concrete wall and both faces with cement and sand (1:3) rendering on all exposed surfaces, standard cover and frame with concrete surround, forming opening to receive incoming and outgoing piping with 7 mm thick bituminous felt at opening, 1 no. 50 mm diameter upvc weep pipe cast into wall and externally plugged with 200 x 200 x 200 mm crushed gravel wrapped with and including Terram 500 filter cloth, all necessary excavation, disposal of excavated material, formwork, thrust block all as shown on Engineer's drawings	1	no			
C	100 mm diameter approved sluice valve, complete with piping, fittings, cast iron and concrete surface box encased, all as per Engineer's detail drawings	1	no			
D	Supply and install approved master water meter complete with all pipes and fittings, brass ferrule, elbow, gate valve, coupling, adaptor/reducer and all others fixing accessories including reinforced concrete chamber slab, pipe barrier in black and white paint, all necessary excavation and formwork as per Engineer's drawings	1	no			
E	Approved wash out with concrete chamber and base including all piping, fittings and accessories, all excavation, disposal, formwork, connection, etc.	1	no			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

	Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)						
(Cont) EXTERNAL WATER SUPPLY						
A	100 mm diameter ductile iron short pipe laid underground, tapping from existing main to water bulk meter including sluice valve with chamber and all necessary accessories, excavation, backfilling, compaction, concrete surround, breaking up existing tarmacadam road and subbase approximately 700 mm wide for laying of pipe, removal of debris and making good all works disturbed, all as detailed on drawings	1	no			
B	65 mm diameter 'Glendfield-type 2' or other equal and approved fire hydrant to B.S. 750 complete with standard fire hose tread, connection to pipes, pipes in short length and fittings, and all others fixing accessories including reinforced concrete base and surface box encase with cover, 100 mm diameter sluice valve, all necessary excavation and formwork as per Engineer's drawings	1	no			
C	Precast concrete (Grade 25) marker post overall size 115 mm width x 955 mm high x 75 mm thick with inscribed lettering on aluminium plate to read "H", painted black with white back ground, the whole reinforced with 2 no. BRC 10 bars and 8 no. 8 mm links and planted in 400 x 400 x 450 mm deep concrete base underground, exposed post surfaces painted golden yellow, including all necessary excavation, mould, and removal of debris	1	no			
D	Precast concrete (Grade 25) marker post overall size 115 mm width x 955 mm high x 75 mm thick with painted lettering to read "WATER" vertically, the whole reinforced with 2 no. BRC 10 bars and 8 no. 8 mm links and planted in 300 x 300 x 300 mm deep concrete base underground, exposed post surfaces painted golden yellow, including all necessary excavation, mould, and removal of debris	1	no			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
(Cont) EXTERNAL WATER SUPPLY					
<p>A Garden tap PVC box chamber / valve pit with cover, overall size 530 x 400 x 300 mm high complete with quick coupling valve and gate valve connected to 20 mm diameter stainless steel water supply pipe including all excavation, 75 mm thick gravel base, 75 mm thick loose hard core base and disposal of excavated materials off site</p>	2	no			
<p>B Approved stop cock/gate valve in various diameter, all as detailed on drawings</p>		Item			
<p>C Concrete thrust block for bend, tee, end cap and sluice valve including all excavation, disposal and backfilling, lean concrete, concrete, formwork and reinforcement, all as detailed on drawings</p>		Item			
<p>D Allow for sterilising of cold water main pipes prior to connection to existing mains</p>		Item			
<p>E Allow for pipe flushing and disinfection the whole of the external water supply services to the approval of the relevant authorities and satisfaction of the Superintending Officer</p>		Item			
<p>F Allow for testing the whole of the external water supply services to the approval of the relevant authorities and satisfaction of the Superintending Officer</p>		Item			
<u>FOUL DRAINAGE AND MANHOLES</u>					
<p>Pipe laid under existing road shall be by pipe jacking method</p>		Note			
<p>G Allow for determine the foul drainage and manhole levels, prepare and submit longitudinal sections, all to the approval of the Superintending Officer</p>		Item			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
(Cont) FOUL DRAINAGE AND MANHOLES					
PIPE WORKS					
<p>A 200 mm diameter vitrified clay sewer pipe to B.S. EN 295 laid to falls in trench in spigot and socket polyester flexible joints, including all excavation, disposal, backfilling, sand filling, lean concrete, concrete bed and surround, concrete saddle, reinforcement and formwork, all as detailed on drawings</p>	8	m			
<p>B 150 mm diameter vitrified clay sewer pipe to B.S. EN 295 laid to falls in trench in spigot and socket polyester flexible joints, including all excavation, disposal, backfilling, sand filling, lean concrete, concrete bed and surround, concrete saddle, reinforcement and formwork, all as detailed on drawings</p>	132	m			
<p>C Allow 200 mm diameter vitrified clay backdrop pipe in short lengths to suit in spigot and socket joint and lain vertically in trench including all fittings, tee junction, bend, excavation, backfilling, disposal, concrete encasing, formwork, connection, etc.</p>	1	no			
<p>D Allow 150 mm diameter vitrified clay backdrop pipe in short lengths to suit in spigot and socket joint and lain vertically in trench including all fittings, tee junction, bend, excavation, backfilling, disposal, concrete encasing, formwork, connection, etc.</p>	1	no			
REINFORCED CONCRETE (GRADE 25) MANHOLES, ALL AS DETAILED DRAWINGS					
<p>All dimensions stated are internal with depth taken from top of cover slab to invert</p>					
<p>All concrete shall be sulphate resisting cement</p>					
<p>E The rate for manhole shall include the following:</p>					

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>(Cont) FOUL DRAINAGE AND MANHOLES</u>					
<u>(Cont) REINFORCED CONCRETE (GRADE 25)</u>					
<u>MANHOLES, ALL AS DETAILED DRAWINGS</u>					
<p>150 mm thick top slab, 225 mm thick wall, 200 mm thick base, forming opening in top slab to receive cover, 50 mm lean concrete (grade 15) under, reinforcement, formwork, excavation, remove surplus excavated material off-site and backfilling</p>		Note			
<p>High tensile and mild steel reinforcement 12 mm diameter bar to insitu concrete top slab, wall and base</p>		Note			
<p>Galvanised malleable step iron to BS.1247 for manhole at 300 mm centre in staggered horizontally and vertically</p>		Note			
<p>Grade 304 stainless steel ladder comprised of 65 mm diameter x 5 mm thick handrail and 50 mm diameter x 5 mm thick steps with non-slip rungs complete with all fixing accessories, all as detailed on Engineer's drawings</p>		Note			
<p>12 mm thick cement and sand (1:3) trowelled smooth internally and externally.</p>		Note			
<p>JKR approved 1220 mm diameter precast concrete ring to BS. 5911 with mortar joints</p>		Note			
<p><u>Square salt-glazed stoneware main or branch channel or in three-quarter section all bedded and jointed in cement and sand (1:2), sulphate resisting cement concrete (grade 30) benching in varying thickness to suit at manhole bottom, top of benching trowelled to a hard smooth surface with sulphate resisting (1:2) cement mortar laid monolithic to falls and cross-falls at 1:12 gradient, forming circular opening through manhole wall ready to receive incoming and outgoing sewer pipe</u></p>					
<p>A Overall size 2250 x 1500 x 613 mm deep (MH-1)</p>	1	no			
<p>B Overall size 2250 x 1500 x 706 mm deep (MH-2)</p>	1	no			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

	Description	Qty	Unit	Rate	\$	c
	BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
	(Cont) FOUL DRAINAGE AND MANHOLES					
	(Cont) REINFORCED CONCRETE (GRADE 25) MANHOLES, ALL AS DETAILED DRAWINGS					
	(Cont) Square salt-glazed stoneware main or branch channel or in three-quarter section all bedded and jointed in cement and sand (1:2), sulphate resisting cement concrete (grade 30) benching in varying thickness to suit at manhole bottom, top of benching trowelled to a hard smooth surface with sulphate resisting (1:2) cement mortar laid monolithic to falls and cross-falls at 1:12 gradient, forming circular opening through manhole wall ready to receive incoming and outgoing sewer pipe					
A	Overall size 2250 x 1500 x 865 mm deep (MH-3)	1	no			
B	Overall size 2250 x 1500 x 998 mm deep (MH-4)	1	no			
C	Overall size 2250 x 1500 x 880 mm deep (MH-4A)	1	no			
D	Overall size 2250 x 1500 x 571 mm deep (MH-4B)	1	no			
E	Overall size 2250 x 1500 x 450 mm deep (MH-4C)	1	no			
F	Overall size 2250 x 1500 x 1182 mm deep (MH-5)	1	no			
G	Overall size 2250 x 1500 x 1341 mm deep (MH-6)	1	no			
	MANHOLE COVER					
H	BS EN 124 Class B125 ductile iron manhole cover and frame including bedding frame in cement and sand mortar and setting cover in grease	9	no			
	TESTING					
J	Allow for testing as specified the whole of the foul drainage including grease trap according to BS CP 301:1971 and to the approval of the relevant authorities and satisfaction of the Superintending Officer		Item			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>PLANTER BOX</u>					
<p>Construction and completion of planter box including all excavation, compacted hardcore, lean concrete, reinforced concrete slab, decorative wall, waterproofing, coarse aggregate, 300 mm thick planting soil, 100 mm thick fine aggregate, all necessary plumbing works connected to nearest drain, finished with all exposed concrete / brick surfaces with approved heavy duty tiles of approved colour on cement and sand screed with approved tile colour grouting, skimmer, all as detailed on Architectural and Engineer's drawings and in specification</p>					
A Overall size, 8420 mm x 1200 mm x 325 mm high	1	no			
B Overall size, 6400 mm x 1200 mm x 325 mm high	1	no			
C Overall size, 9650 mm x 2400 mm x 750 mm high	1	no			
D Overall size, 4250 mm x 8850 mm x 750 mm high	1	no			
<u>REFLECTIVE POOL</u>					
<p>Construction and completion of reflective pool including all excavation, compacted hardcore, lean concrete, reinforced concrete slab, decorative wall, waterproofing, coarse aggregate, 300 mm thick planting soil, 100 mm thick fine aggregate, all necessary plumbing works connected to nearest drain including flap valve, finished with all exposed concrete / brick surfaces with approved glass mosaic tiles of approved colour on cement and sand screed with approved tile colour grouting, all lighting (lighting and associated M&E works measure in Mechanical & Electrical Bill 8A), all as detailed on Architectural and Engineer's drawings and in specification</p>					
E Overall size, 14000 mm x 13000 mm x 1010 mm deep	1	no			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<u>WATER FEATURE POND</u>					
<p>Construction and completion of water feature pool complete with planter and seating including all excavation, compacted hardcore, lean concrete, reinforced concrete slab, decorative wall, waterproofing, coarse aggregate, 300 mm thick planting soil, 100 mm thick fine aggregate, all necessary plumbing works connected to nearest drain including flap valve, finished with all exposed concrete / brick surfaces with approved granite tiles of approved colour on cement and sand screed with approved tile colour grouting, all water fountain and lighting (water fountain, lighting and associated M&E works measure in Mechanical & Electrical Bill 8B), all as detailed on Architectural and Engineer's drawings and in specification</p>					
<p>A Overall size, 4250 mm x 1500mm x 700 mm high with overflow scupper drain in selective stone pebble</p>	2	no			
<u>FLAG POLE</u>					
<p>B 2 Nos. of 60 mm diameter to varies stainless steel pipe flag pole, overall high 6000 mm in weld connection comprising of 7500 mm long x 1000 mm wide upstand reinforced concrete base, finish all exposed concrete surfaces with cement and sand (1:3) plaster, approved tiles finishes complete with stainless steel plates, bolts, nut, washers, 25 mm diameter steel eye, 125 mm diameter stainless steel dome, ring, necking, stainless steel pulley, tapered end, end plate, stainless steel rod, rod cleat, nylon rod and etc. including all necessary excavation, disposal, formwork, reinforcement and fixing accessories all as shown on Architectural and Engineer's drawing (Piling measure separately)</p>	1	no			
<u>ANCILLARY BUILDING</u>					
<p>All ancillary building to include anti-termite chemical treatment (Provide 10 years warranty)</p>		Note			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
	<u>(Cont) ANCILLARY BUILDING</u>					
	GUARD HOUSE					
A	Construction and completion of Guard House overall size 3350 x 3000 x 4200 mm high including all excavation, foundation, reinforcement, reinforced concrete ground slab, apron slab, brickwall, metal works up to roof top, perimeter drain complete with all finishing works, approved signage and joinery fittings, plumbing and services, etc. (excluding electrical and lighting which are under Machanical and Electrical works) all as shown on Architectural drawing and Engineer's drawings (Piling measure separately)	1	no			
	<u>DECORATIVE AND BICKWALL FENCE</u>					
	CONCRETE WORKS					
	<u>50 mm thick lean concrete (Grade 15) to underside of</u>					
B	Footing	21	m2			
C	Ground beam	51	m2			
	<u>Reinforced concrete (Grade 30) in</u>					
D	Footing	13	m3			
E	Column	13	m3			
F	Ground beam	31	m3			
	<u>10 mm to 16 mm diameter mild steel / high tensile reinforcement bar in</u>					
G	Footing	1378	kg			
H	Column	2197	kg			
J	Ground beam	3162	kg			
	<u>Formwork to</u>					
K	Sides of footing	78	m2			
L	Sides of column	282	m2			
M	Sides of ground beam	318	m2			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

	Description	Qty	Unit	Rate	\$	c
<u>BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>						
<u>(Cont) DECORATIVE AND BICKWALL FENCE</u>						
DECORATIVE FENCING						
A	'Archifoam' CPC Pattern or other equal and approved 25 mm thick grill / screen, fixed on reinforced concrete foundation, column and beam (concrete foundation, column and beam measured seperately), complete with all approved fixing accessories all in strict accordance with the manufacturer's specification and instruction	96	m2			
BRICKWALL						
<u>Brickwall in cement and sand (1:3) mortar with and including 'Exmet' reinforcement at every fourth course to wall</u>						
B	115 mm thick	645	m2			
C	Approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
D	6 mm diameter x 450 mm long mild steel bonding ties, one end cast into concrete column and hooked around column reinforcement and other end built into joints of brickwork including forming perforation in formwork		Item			
EXTERNAL WALL FINISHES						
E	20 mm thick cement and sand (1:3) plainface plaster including trowelled smooth to wall, column and expose ground beam	1431	m2			
F	Red Sandstone wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column including primed A5631 or other equalvalent, bracket and all other fixing accessories	99	m2			
G	'KCC' textcoat 404 or other equal and approved spraytile texture with 'Wattyl Solagard' or other equal and approved paint to plainface plastered (plaster measured separately) wall, column and expose groung beam	1332	m2			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
(Cont) DECORATIVE AND BICKWALL FENCE					
STAINLESS STEEL GATE					
<p>A Sliding gate incorporate with small swing gate comprised of pattern screen in 100 x 100 mm RHS stainless steel frame structure, design to pattern as per Architectural's details drawing in welded connection including all cutting and complete with all approved lock and fixing accessories, Stainless steel roller and wheel guide, Sliding motor (to Engineer's specification), all as per details on drawing and specification, overall size 7465 x 3000 mm high</p>	1	no			
SIGNAGES					
<p><u>Supply, deliver to site, placing or install in position the bi-lingual wall mounted signage in approved colour 3D cut out powder coated aluminium text including all necessary fixing accessories (size to refer drawing)</u></p>					
<p>B INDIA HIGH COMMISSIONER'S RESIDENCE</p> <p><u>Supply, deliver to site, placing or install in position wall / fence mounted logo in approved colour powder coated aluminium including all necessary fixing accessories (size to refer drawing)</u></p>	1	set			
<p>C Wall logo</p>	1	no			
<u>OTHER WORKS NECESSARY</u>					
<p>D Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
COLLECTION					
Page No. BQ/1					
Page No. BQ/2					
Page No. BQ/3					
Page No. BQ/4					
Page No. BQ/5					
Page No. BQ/6					
Page No. BQ/7					
Page No. BQ/8					
Page No. BQ/9					
Page No. BQ/10					
Page No. BQ/11					
Page No. BQ/12					
Page No. BQ/13					
Page No. BQ/14					
Page No. BQ/15					
Page No. BQ/16					
Page No. BQ/17					
Page No. BQ/18					
Page No. BQ/19					
Page No. BQ/20					
Page No. BQ/21					
Page No. BQ/22					
Page No. BQ/23					

BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<p>COLLECTION</p> <p>Page No. BQ/24</p> <p>Page No. BQ/25</p> <p>BILL 6A - EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE) Carried to Summary</p>					

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)					
<p><u>NOTES</u></p> <p>The bills are to be read and priced in conjunction with the drawings, specification and include all works described / shown in bills and drawings</p> <p>The Contractor is to comply with the conditions of contract, specification, all preliminaries, etc. necessary for the complete execution of the works</p> <p>The Contractor shall be responsible for applying and obtaining all required permits from the relevant authorities for temporary accesses, etc. and for payment of fees thereof</p> <p>The Contractor must visit the site so as to take into consideration existing conditions and to have satisfied himself as to the nature of the site, soil condition, facilities for access, mobilisation of plants, etc. required under this contract. No claims will be allowed on the grounds of ignorance of the conditions under which the works will be executed</p> <p>Prior to the commencement of any work, the levels of the original surface of the site including all slopes shall be agreed by the Superintending Officer in accordance with Preliminaries under 'Setting Out and Site Levels' and on completion of this works, the Contractor must submit as built drawings as required in Preliminaries under 'Completion Joint-Survey and As Built Drawing' which shall form the basis of measurement</p> <p>The Contractor shall take all measures to protect the existing cables and services that is not affected by his scope of work. Any such damage caused by the Contractor shall be made good at the expense of the Contractor and to the satisfaction of the Superintending Officer</p>		<p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p> <p>Note</p>			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) NOTES</u>					
<p>All making good shall be executed with materials and workmanship to match in every respect of the surrounding work and shall be properly done thereto to the complete satisfaction of the S.O.</p>		Note			
<p>Unless otherwise specified, all materials and debris resulting from the clearing shall be stacked and removed completely from the site. On no account shall cleared timber or other materials be deposited in areas to be filled. Burning on site shall be prohibited</p>		Note			
<p>No tipping on the adjoining land shall be allowed in this contract. The Contractor is therefore to make his own arrangements for disposal of all surplus excavated materials where directed and is to pay all charges in connection therewith</p>		Note			
<p>Tenderer shall make his own assessment from all drawings and specification issued at the time of tendering. Any discrepancies between drawing and Bill of Quantities, the drawings shall take precedence. No additional claim will be entertained</p>		Note			
<u>DEMOLITION</u>					
<p>A Allow for remove, transfer, redirect and reinstate existing utilities or services that affecting or obstructing the proper execution of works</p>		Item			
<p>B Allow for and maintain any temporary shorings and bracings that may be required during the process of demolition to ensure the stability of the existing structures / buildings and remove the same off site on completion</p>		Item			
<p>C Remove existing trees in accordance with Municipal Board procedure / requirements including deliver to government nursery, etc. all to the satisfactory of the Superintendance Officer</p>		Item			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>PRECAST REINFORCED PILES (ALL PROVISIONAL)</u>					
<p>The system installation shall consist of 6.3 and 12.9 metre long precast concrete piles element forced into the ground using drop hammer method including cast in pile shoe</p>		Note			
<p>The piles should conform to B.S. 8110 : 1985 and be approved by CPRU Min. of Development for use in Brunei Darussalam</p>		Note			
<p>Steel reinforcement shall conform to B.S. 4449</p>		Note			
<p>End plate should be manufactured to conform to B.S. 4360</p>		Note			
<p>Concrete strength during transfer should correspond to a cube strength of minimum 25 Mpa</p>		Note			
<p>The 28-day strength of concrete shall not be less than 50 Mpa</p>		Note			
<p>Joint between the consecutive pile element shall be in full weld on each side of the end plates brought in contact</p>		Note			
<p>The setting pressure of twice the working load shall be held for a minimum of ten seconds before release</p>		Note			
<p>Each pile shall not deviate by more than 75 mm from the vertical or more than 74 mm from its designed position at the level of the piling chamber</p>		Note			
<p>The paylengths for the supply and inject complete of each pile shall be measured from pile toe to cut-off level</p>		Note			
<p>Provide and erect on site all necessary plant and equipment for installation of precast concrete piles, and dismantle and clear away on completion</p>		Item			
<p>Allow for moving and handling piling frame and equipment inclusive of assembling and dismantling about at site from position to position including use of Selangan timber matt and hiring of Kobelco for the full duration</p>		Item			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

	Description	Qty	Unit	Rate	\$	c
	<u>BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)</u>					
	<u>(Cont) PRECAST REINFORCED PILES (ALL PROVISIONAL)</u>					
A	Supply, transport, handle, pitch, hammer, weld, extend, cut-off head, etc. 125 mm square precast reinforced (Grade 45) concrete piles, all in strict accordance with the pile specification.	16584	m			
B	Supply, transport, handle, pitch, hammer, weld, extend, cut-off head, etc. 150 mm square precast reinforced (Grade 50) concrete piles, all in strict accordance with the pile specification.	7242	m			
	<u>Provide the necessary kentledge, jack and dial gauges for the application and release of the load test. The rates include all supervision and labour, watching and lighting and removal of kentledge and equipment</u>					
C	Load test of 900 kN for 125 mm RC square piles with design working load of 600 kN	4	no			
D	Load test of 900 kN for 150 mm RC square piles with design working load of 600 kN	4	no			
	<u>SITE PREPARATION</u>					
E	Clear site (on flat or sloping ground) ready for earthwork including cutting down all shrubs, lallang, bushes, trees (any size, height and age), undergrowth, strip top soil, etc. grubbing up roots, buried logs, breaking up any existing obstructions if encountered and backfilling void where required with approved materials together with all subsequent disposal of debris all to the approval of the S.O. (Approximate area 13,267 m ²)		Item			
	<u>EARTHWORKS (ALL PROVISIONAL)</u>					
F	Open cut excavation from original ground level (level of cut as per drawing or to determine by Engineer), load and transport off site to a tip to be provided by the Contractor at his own expense	3500	m ³			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

	Description	Qty	Unit	Rate	\$	c
	BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
	(Cont) <u>EARTHWORKS (ALL PROVISIONAL)</u>					
A	Imported earth fill with approved sand soil all as specified to be transported to site, deposit, spread, level, grade and well compacted in layers in making up formation level including forming slopes, ramps and embankments all as detailed on drawings and in the specification (Rate to include for payment of royalty to the Brunei Government Land Department)	9500	m3			
	<u>SOILING AND TURFING</u>					
B	Supply and plant axonopus compressus (cow grass) in close turfing to flat and sloping surfaces as directed, including excavation, disposal, trimming, filling soft sports, top soil, lime, grading, rolling, raking, etc. to the approval of the Superintending Officer.	5768	m2			
C	Allow for maintenance of all turfing till the end of defect liability period including mowing, cutting, watering, weeding, spreading lime and fertilizer, replacement of dead or damaged plants, etc. as directed by the Superintending Officer. The Contractor to submit maintenance programme for approval		Item			
	<u>RETAINING WALL</u>					
	The Contractor is to provide all necessary temporary protection including method statement for Engineer approval before any excavation		Note			
	<u>REINFORCED CONCRETE RETAINING WALL (TYPE A)</u>					
	<u>50 mm thick lean concrete (grade 15) to underside of</u>					
D	Concrete slab	253	m2			
	<u>Reinforced concrete (grade 30) in</u>					
E	Concrete slab	101	m3			
F	Retaining wall	86	m3			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

	Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)						
<u>(Cont) RETAINING WALL</u>						
<u>(Cont) REINFORCED CONCRETE RETAINING WALL (TYPE A)</u>						
<u>10 mm to 25 mm diameter mild steel / high tensile reinforcement bar in</u>						
A	Concrete slab	12120	kg			
B	Retaining wall	10320	kg			
<u>Formwork to</u>						
C	Sides of retaining wall	691	m2			
D	Edge of concrete slab	86	m2			
E	20mm thick cement and sand (1:3) plainface plaster trowelled smooth to retaining wall including all approved paint and colour finish	945	m2			
F	Perforated 200 mm diameter upvc class 'D' sub-soil pipe surrounded with aggregates, all as per Engineer's details drawings	204	m			
G	Movement/Expansion joint, filled with 25 mm wide x 50 mm deep 'Expandite 99' or other equal and approved expansion / movement joint complete with 25 mm thick softboard filler including slip membrane and additional use of formwork, all as detailed on drawings and in specification		Item			
H	75 mm diameter pvc weep hole end with single size aggregates wrapped with filter cloth at 3000 mm centre, all as per Engineer's detail drawings		Item			
<u>REINFORCED CONCRETE RETAINING WALL (TYPE B)</u>						
<u>50 mm thick lean concrete (grade 15) to underside of</u>						
J	Concrete slab	92	m2			
<u>Reinforced concrete (grade 30) in</u>						
K	Concrete slab	37	m3			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

	Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)						
<u>(Cont) RETAINING WALL</u>						
<u>(Cont) REINFORCED CONCRETE RETAINING WALL (TYPE B)</u>						
<u>(Cont) Reinforced concrete (grade 30) in</u>						
A	Retaining wall	35	m3			
<u>10 mm to 25 mm diameter mild steel / high tensile reinforcement bar in</u>						
B	Concrete slab	4440	kg			
C	Retaining wall	4200	kg			
<u>Formwork to</u>						
D	Sides of retaining wall	280	m2			
E	Edge of concrete slab	32	m2			
F	20mm thick cement and sand (1:3) plainface plaster trowelled smooth to retaining wall including all approved paint and colour finish	372	m2			
G	Perforated 200 mm diameter upvc class 'D' sub-soil pipe surrounded with aggregates, all as per Engineer's details drawings	74	m			
H	Movement/Expansion joint, filled with 25 mm wide x 50 mm deep 'Expandite 99' or other equal and approved expansion / movement joint complete with 25 mm thick softboard filler including slip membrane and additional use of formwork, all as detailed on drawings and in specification		Item			
J	75 mm diameter pvc weep hole end with single size aggregates wrapped with filter cloth at 3000 mm centre, all as per Engineer's detail drawings		Item			
<u>REINFORCED CONCRETE RETAINING WALL (TYPE 1)</u>						
<u>50 mm thick lean concrete (grade 15) to underside of</u>						
K	Concrete slab	252	m2			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

	Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)						
	<u>(Cont) RETAINING WALL</u>					
	(Cont) REINFORCED CONCRETE RETAINING WALL (TYPE 1)					
	<u>Reinforced concrete (grade 30) in</u>					
A	Concrete slab	126	m3			
B	Retaining wall	155	m3			
	<u>10 mm to 25 mm diameter mild steel / high tensile reinforcement bar in</u>					
C	Concrete slab	15120	kg			
D	Retaining wall	18600	kg			
	<u>Formwork to</u>					
E	Sides of retaining wall	626	m2			
F	Edge of concrete slab	50	m2			
G	20mm thick cement and sand (1:3) plainface plaster trowelled smooth to retaining wall including all approved paint and colour finish	330	m2			
H	Perforated 150 mm diameter upvc class 'D' sub-soil pipe surrounded with aggregates, all as per Engineer's details drawings	89	m			
J	Movement/Expansion joint, filled with 25 mm wide x 50 mm deep 'Expandite 99' or other equal and approved expansion / movement joint complete with 25 mm thick softboard filler including slip membrane and additional use of formwork, all as detailed on drawings and in specification		Item			
K	75 mm diameter pvc weep hole end with single size aggregates wrapped with filter cloth at 2500 mm centre, all as per Engineer's detail drawings		Item			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

	Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)				(Cont)		
<u>DRIVEWAY AND PAVEMENT</u>						
A	Excavate for driveway and carpark commencing from formation level not exceeding 2.00 m deep, get out, cart away excavated material off-site to a tip to be provided by the Contractor at his expense	1769	m3			
B	Prepare subgrade surface, grade and makeup to line level and camber to required maximum dry density, CBR value, fall and gradients, all as detailed on drawings and in specification	3215	m2			
C	Compact surfaces of subgrade to 90% optimum dry density with minimum soaked CBR value of 4% all as specified, including necessary trimming and levelling surfaces to falls and gradients	3215	m2			
D	Proof roll compacted surfaces to detect soft spots, excavate, remove, lay and compact approved sand filling in layer		Item			
E	Allow for carrying out Laboratory Compaction Test (4.5 kg hammer) including providing necessary instrument	1	no			
F	Allow for carrying Laboratory CBR Test including providing necessary instrument	1	no			
G	Allow for carrying out Field Density Test on prepared subgrade including providing necessary instrument	1	no			
H	Allow for carrying out CBR Test (BS1377 Pt9; 1990) on prepared subgrade including providing necessary instrument	1	no			
J	250 mm thick mechanically compacted granular sub-base of crushed rock, hard durable particles or fragments of rock crushed to size as specified, spread, level and finished to falls and gradients	3215	m2			
K	200 mm thick mechanically compacted crusher run road base of crushed rock, hard durable particles or fragments of rock crushed to size as specified, spread, level and finished to falls and gradients	3215	m2			
L	One (1) layer of reinforced base Type '1' laying of reinforced base on earthworks	3215	m2			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

	Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)						
<u>(Cont) DRIVEWAY AND PAVEMENT</u>						
A	Apply prime coat including sweeping and cleaning surfaces of subbase before application	3215	m2			
B	60 mm thick asphaltic concrete binded course, spread, level and consolidate to the required gradients and cambers with power roller as specified	3215	m2			
C	Apply bituminous tack coat at the approved rate including sweeping and cleaning surfaces of subbase before application	3215	m2			
D	40 mm thick asphaltic concrete wearing course, spread, level and consolidate to the required gradients and cambers with power roller as specified	3215	m2			
E	Cut edge of existing tarmacadam driveway 250 mm wide x 300 mm deep including prepare surfaces to receive new works, make good surfaces disturbed and remove all debris off site		Item			
KERB						
F	125 mm wide x 300 mm high precast concrete kerb (grade 30) (straight and curved-on-plan) on 'L' shape foundation and haunch, laid in straight/curve alignment, reinforced with mild steel bar, all exposed surfaces finished fair and prepare and apply two coats of gloss reflective paint in alternating black and white colour, bedded and jointed in cement and sand mortar including all excavation and formwork, all as detailed on drawing	968	m			
G	100 mm diameter upvc pipe through kerb at 3000 mm centre		Item			
<u>Prepare and apply two coats of approved chlorinated rubber paint on asphaltic for demarcation and directional arrow sign</u>						
H	100 mm wide in straight / curved-on-plan line	105	m			
J	Straight arrow	19	no			
K	Turn right arrow	5	no			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
<u>BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)</u>					
<u>(Cont) DRIVEWAY AND PAVEMENT</u>					
<u>(Cont) KERB</u>					
<u>(Cont) Prepare and apply two coats of approved chlorinated rubber paint on asphaltic for demarcation and directional arrow sign</u>					
A Turn left arrow	2	no			
B Turn left & right arrow	2	no			
C Transverse 'Stop Line'	3	no			
<u>Supply and install approved diamond grade aluminium alloy reflective warning directional sign complete with all post, reinforced concrete footing, excavation, disposal, reinforcement, formwork and painting to approved colour complying to JKR Road Department regulation (Contractor to refer Engineer's drawing for signage details)</u>					
D 'KELUAR'	2	no			
E 'MASUK'	2	no			
F 'BERHENTI'	5	no			
<u>SURFACE WATER DRAINAGE</u>					
The contractor is to check and adjust drain levels on site					
The contractor is to maintain existing drains including make good all works disturbed					
G Allow for connection to existing drain and sump including all hacking and make good to works disturbed including matching existing invert level		Item			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) SURFACE WATER DRAINAGE</u>					
DRAIN					
<u>Reinforced concrete (grade 30) water channel laid to falls in straight / curved alignment with 125 mm thick sides and 150 mm thick base, lean concrete (grade 15), 50 mm weep holes with filter stone, etc., finished on all exposed surfaces with cement and sand (1:3) plaster trowelled smooth, including all necessary excavation, backfilling, crusher run, formwork, reinforcement, forming angles, ends, outlet, junctions, etc. all as detailed on drawings (all dimensions stated are internal and depth to invert level)</u>					
A	300 mm wide x 400 mm deep (average)	29	m		
B	300 mm wide x 500 mm deep (average)	48	m		
C	300 mm wide x 600 mm deep (average)	167	m		
D	300 mm wide x 700 mm deep (average)	70	m		
E	450 mm wide x 325 mm deep (average)	11	m		
F	450 mm wide x 400 mm deep (average)	56	m		
G	450 mm wide x 500 mm deep (average)	155	m		
H	450 mm wide x 1400 mm deep (average)	63	m		
J	650 mm wide x 600 mm deep (average)	264	m		
K	650 mm wide x 900 mm deep (average)	18	m		
L	650 mm wide x 1300 mm deep (average)	52	m		
M	650 mm wide x 1600 mm deep (average)	49	m		
N	650 mm wide x 700 mm deep (average)	14	m		
P	650 mm wide x 800 mm deep (average)	11	m		

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
(Cont) SURFACE WATER DRAINAGE (Cont) DRAIN					
<p>Reinforced concrete (grade 30) J drain laid to falls in straight / curved alignment with 200 mm thick sides and 1175 mm thick base, lean concrete (grade 15), 50 mm weep holes with filter stone, etc., finished on all exposed surfaces with cement and sand (1:3) plaster trowelled smooth, including all necessary excavation, backfilling, crusher run, formwork, reinforcement, forming angles, ends, outlet, junctions, etc. all as detailed on drawings (all dimensions stated are internal and depth to invert level)</p>					
A 650 mm wide x 800 mm deep (average)	70	m			
<p>Reinforced concrete (grade 30) J drain (Type 1) laid to falls in straight / curved alignment with 200 mm thick sides and 175 mm thick base, lean concrete (grade 15), 50 mm weep holes with filter stone, etc., finished on all exposed surfaces with cement and sand (1:3) plaster trowelled smooth, including all necessary excavation, backfilling, crusher run, formwork, reinforcement, forming angles, ends, outlet, junctions, etc. all as detailed on drawings (all dimensions stated are internal and depth to invert level)</p>					
B 650 mm wide x 600 mm deep (average)	40	m			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
(Cont) SURFACE WATER DRAINAGE (Cont) DRAIN					
<u>Reinforced concrete (grade 30) J drain (Type 2) laid to falls in straight / curved alignment with 200 mm thick sides and 175 mm thick base, lean concrete (grade 15), 50 mm weep holes with filter stone, etc., finished on all exposed surfaces with cement and sand (1:3) plaster trowelled smooth, including all necessary excavation, backfilling, crusher run, formwork, reinforcement, forming angles, ends, outlet, junctions, etc. all as detailed on drawings (all dimensions stated are internal and depth to invert level)</u>					
A	650 mm wide x 1000 mm deep (average)	32	m		
B	650 mm wide x 1500 mm deep (average)	9	m		
<u>Reinforced concrete (grade 30) cover drain laid to falls in straight / curved alignment with 125 mm thick sides and 150 mm thick base, lean concrete (grade 15), 50 mm weep holes with filter stone, etc., finished on all exposed surfaces with cement and sand (1:3) plaster trowelled smooth, including all necessary excavation, backfilling, crusher run, formwork, reinforcement, forming angles, ends, outlet, junctions, etc. all as detailed on drawings (all dimensions stated are internal and depth to invert level)</u>					
C	650 mm wide x 625 mm deep (average)	25	m		
GRATING					
<u>Hot dipped galvanised drain grating complete with angle with lugs embedded in concrete including all welding and painting, all as Engineer's details drawing for</u>					
D	450 mm wide drain	56	m		
E	650 mm wide drain	67	m		

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
(Cont) SURFACE WATER DRAINAGE (Cont) GRATING					
<u>Precast reinforced concrete (grade 25) grating including all necessary reinforcement and formwork, laid in position all as per Architectural and Engineer's drawing</u>					
A 650 mm wide drain	25	m			
B Allow for making 'L' shape angle to existing drain to receive new drain grating including all hacking, cutting of reinforcement, replastering, and make good to all surface disturbed to match existing	123	m			
SUMP					
<u>Reinforced concrete (grade 30) sump, comprising 150 mm thick walls and base on and including lean concrete, reinforcement bar, splayed fillet at base corners, top of sump with rebate and angle framing to receive and including hot dipped galvanised steel sump grating, finished on all exposed surfaces with cement and sand (1:3) plaster trowelled smooth, including all excavation, backfilling, disposal, formwork, forming opening and connections of incoming and outgoing drain, all as detailed on drawings (all dimensions stated are internal and depth to invert level)</u>					
C 450 x 450 x 300 mm deep	1	no			
D 450 x 450 x 420 mm deep	1	no			
E 450 x 450 x 450 mm deep	1	no			
F 450 x 450 x 500 mm deep	2	no			
G 450 x 450 x 820 mm deep	1	no			
H 450 x 450 x 2200 mm deep	1	no			
J 750 x 750 x 350 mm deep	1	no			
K 750 x 750 x 450 mm deep	2	no			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

	Description	Qty	Unit	Rate	\$	c
	BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
	(Cont) SURFACE WATER DRAINAGE					
	(Cont) SUMP					
	(Cont) Reinforced concrete (grade 30) sump, comprising 150 mm thick walls and base on and including lean concrete, reinforcement bar, splayed fillet at base corners, top of sump with rebate and angle framing to receive and including hot dipped galvanised steel sump grating, finished on all exposed surfaces with cement and sand (1:3) plaster trowelled smooth, including all excavation, backfilling, disposal, formwork, forming opening and connections of incoming and outgoing drain, all as detailed on drawings (all dimensions stated are internal and depth to invert level)					
A	750 x 750 x 500 mm deep	2	no			
B	750 x 750 x 570 mm deep	1	no			
C	750 x 750 x 600 mm deep	1	no			
D	750 x 750 x 650 mm deep	1	no			
E	750 x 750 x 660 mm deep	2	no			
F	750 x 750 x 700 mm deep	1	no			
G	750 x 750 x 740 mm deep	1	no			
H	750 x 750 x 800 mm deep	1	no			
J	750 x 750 x 860 mm deep	2	no			
K	750 x 750 x 930 mm deep	1	no			
L	750 x 750 x 1130 mm deep	1	no			
M	750 x 750 x 1300 mm deep	1	no			
N	750 x 750 x 1650 mm deep	2	no			
P	750 x 750 x 2450 mm deep	1	no			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

	Description	Qty	Unit	Rate	\$	c
	BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
	(Cont) SURFACE WATER DRAINAGE (Cont) SUMP					
	<u>Hot dipped galvanised sump grating complete with angle with lugs embedded in concrete including all welding and painting, all as Engineer's details drawing for (all dimensions stated are internal)</u>					
A	450 mm square sump	7	no			
B	750 mm square sump	21	no			
	<u>SLOTTED DRAIN</u>					
	<u>Reinforced concrete (grade 30) slotted surface water channel laid to falls in straight/ curved alignment with reinforcement bar and including 100 mm thick hardcore and 50 mm thick lean concrete (grade 15), 300 mm diameter half round slotted drain bolted to bothside of concrete drain, upvc weephole with hydrocell prefabricated wall drainage panel wrapped all sides with one layer Bonal Nwa non-woven geotextile at 3000 centre, finished on all exposed surfaces with 12 mm thick cement and sand (1:3) plaster trowelled smooth including all necessary excavation, backfilling, compacted subgrade, formwork, forming angles, ends, outlet, junctions, etc. all as detailed on drawings (all dimensions stated are internal)</u>					
C	650 mm wide x 600 mm deep (average)	17	m			
	<u>CULVERT & DIVERSION</u>					
D	600 mm diameter precast concrete (grade 30) culvert laid to falls including all excavation, backfilling, disposal, connection, concrete surround etc all as detailed on drawings.	20	m			
E	750 mm diameter precast concrete (grade 30) culvert laid to falls including all excavation, backfilling, disposal, connection, concrete surround etc all as detailed on drawings.	14	m			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>EXTERNAL WATER SUPPLY</u>					
All water tanks and pump sets measured in Mechanical & Electrical Works Bill 8B					
All pipes shall be deemed to include all excavation, backfilling, disposal, etc., complete with all made bends, elbows, bends, tees, couplings, connectors, unions, diminishing sockets, reducers, etc, whichever fittings/ accessories are applicable and wrapping and insulation					
All MDPE, ductile iron and stainless steel pipe which will be contact with soil shall be wrapped with authority approved polythene sheet					
All flanged or flexible joints shall be protected with 'Denso Mastic' and wrapped around with Denso tape					
A Excavate to locate and expose existing pipe main, for connection to new pipe and all necessary accessories, cutting existing pipe, backfilling, compaction, removal of debris and making good all works disturbed					
B 125 mm diameter approved MDPE pipe water supply mains jointed in push-in spigot and socket joints with rubber ring seals, laid in trench with various compacted sand surround in layers including plyage HRD blue marker mesh greater than 30 mm diameter	397	m			
C 125 mm diameter approved MDPE pipe water supply mains jointed in push-in spigot and socket joints with rubber ring seals, laid in trench with various compacted sand and reinforced concrete surround in layers including plyage HRD blue marker mesh greater than 30 mm diameter	56	m			
D 63 mm diameter approved MDPE pipe water supply mains jointed in push-in spigot and socket joints with rubber ring seals, laid in trench with various compacted sand surround in layers including plyage HRD blue marker mesh greater than 30 mm diameter	133	m			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
(Cont) EXTERNAL WATER SUPPLY					
A 50 mm diameter approved MDPE pipe water supply mains jointed in push-in spigot and socket joints with rubber ring seals, laid in trench with various compacted sand surround in layers including plyage HRD blue marker mesh greater than 30 mm diameter	117	m			
B 50 mm diameter approved MDPE pipe water supply mains jointed in push-in spigot and socket joints with rubber ring seals, laid in trench with various compacted sand and 100 mm diameter HDUPVC pipe sleeve including plyage HRD blue marker mesh greater than 30 mm diameter	16	m			
C 40 mm diameter approved MDPE pipe water supply mains jointed in push-in spigot and socket joints with rubber ring seals, laid in trench with various compacted sand surround in layers including plyage HRD blue marker mesh greater than 30 mm diameter	8	m			
D 20 mm diameter approved MDPE pipe water supply mains jointed in push-in spigot and socket joints with rubber ring seals, laid in trench with various compacted sand surround in layers including plyage HRD blue marker mesh greater than 30 mm diameter	302	m			
E 20 mm diameter approved MDPE pipe water supply mains jointed in push-in spigot and socket joints with rubber ring seals, laid in trench with various compacted sand and 100 mm diameter HDUPVC pipe sleeve including plyage HRD blue marker mesh greater than 30 mm diameter	12	m			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

	Description	Qty	Unit	Rate	\$	c
	BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
	(Cont) EXTERNAL WATER SUPPLY					
A	Standard precast concrete (Grade 25) sluice valve chamber, internal size 280 x 430 x 1000 mm deep, comprising free draining compacted granular material and ground beam at base, 100 mm thick precast concrete wall and both faces with cement and sand (1:3) rendering on all exposed surfaces, standard cover and frame with concrete surround, forming opening to receive incoming and outgoing piping with 7 mm thick bituminous felt at opening, 1 no. 50 mm diameter upvc weep pipe cast into wall and externally plugged with 200 x 200 x 200 mm crushed gravel wrapped with and including Terram 500 filter cloth, all necessary excavation, disposal of excavated material, formwork, thrust block all as shown on Engineer's drawings	5	no			
B	100 mm diameter approved sluice valve, complete with piping, fittings, cast iron and concrete surface box encased, all as per Engineer's detail drawings	5	no			
C	Supply and install approved master water meter complete with all pipes and fittings, brass ferrule, elbow, gate valve, coupling, adaptor/reducer and all others fixing accessories including reinforced concrete chamber slab, pipe barrier in black and white paint, all necessary excavation and formwork as per Engineer's drawings	1	no			
D	Approved wash out with concrete chamber and base including all piping, fittings and accessories, all excavation, disposal, formwork, connection, etc.	1	no			
E	100 mm diameter ductile iron short pipe laid underground, tapping from existing main to water bulk meter including sluice valve with chamber and all necessary accessories, excavation, backfilling, compaction, concrete surround, breaking up existing tarmacadam road and subbase approximately 700 mm wide for laying of pipe, removal of debris and making good all works disturbed, all as detailed on drawings	1	no			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
(Cont) EXTERNAL WATER SUPPLY					
A 65 mm diameter 'Glendfield-type 2' or other equal and approved fire hydrant to B.S. 750 complete with standard fire hose tread, connection to pipes, pipes in short length and fittings, and all others fixing accessories including reinforced concrete base and surface box encase with cover, 100 mm diameter sluice valve, all necessary excavation and formwork as per Engineer's drawings	2	no			
B Precast concrete (Grade 25) marker post overall size 115 mm width x 955 mm high x 75 mm thick with inscribed lettering on aluminium plate to read "H", painted black with white back ground, the whole reinforced with 2 no. BRC 10 bars and 8 no. 8 mm links and planted in 400 x 400 x 450 mm deep concrete base underground, exposed post surfaces painted golden yellow, including all necessary excavation, mould, and removal of debris	2	no			
C Precast concrete (Grade 25) marker post overall size 115 mm width x 955 mm high x 75 mm thick with painted lettering to read "WATER" vertically, the whole reinforced with 2 no. BRC 10 bars and 8 no. 8 mm links and planted in 300 x 300 x 300 mm deep concrete base underground, exposed post surfaces painted golden yellow, including all necessary excavation, mould, and removal of debris	5	no			
D Garden tap PVC box chamber / valve pit with cover, overall size 530 x 400 x 300 mm high complete with quick coupling valve and gate valve connected to 20 mm diameter stainless steel water supply pipe including all excavation, 75 mm thick gravel base, 75 mm thick loose hard core base and disposal of excavated materials off site	2	no			
E Approved stop cock/gate valve in various diameter, all as detailed on drawings		Item			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

	Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)						
<u>(Cont) EXTERNAL WATER SUPPLY</u>						
A	Concrete thrust block for bend, tee, end cap and sluice valve including all excavation, disposal and backfilling, lean concrete, concrete, formwork and reinforcement, all as detailed on drawings		Item			
B	Allow for sterilising of cold water main pipes prior to connection to existing mains		Item			
C	Allow for testing the whole of the external water supply services to the approval of the relevant authorities and satisfaction of the Superintending Officer		Item			
D	Allow for pipe flushing and disinfection the whole of the external water supply services to the approval of the relevant authorities and satisfaction of the Superintending Officer		Item			
<u>FOUL DRAINAGE AND MANHOLES</u>						
Pipe laid under existing road shall be by pipe jacking method						
E	Allow for determine the foul drainage and manhole levels, prepare and submit longitudinal sections, all to the approval of the Superintending Officer		Item			
PIPE WORKS						
F	200 mm diameter vitrified clay sewer pipe to B.S. EN 295 laid to falls in trench in spigot and socket polyester flexible joints, including all excavation, disposal, backfilling, sand filling, lean concrete, concrete bed and surround, concrete saddle, reinforcement and formwork, all as detailed on Engineer's drawings	296	m			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) FOUL DRAINAGE AND MANHOLES</u>					
(Cont) PIPE WORKS					
<p>A 150 mm diameter vitrified clay sewer pipe to B.S. EN 295 laid to falls in trench in spigot and socket polyester flexible joints, including all excavation, disposal, backfilling, sand filling, lean concrete, concrete bed and surround, concrete saddle, reinforcement and formwork, all as detailed on Engineer's drawings</p>	346	m			
<p>B Allow 200 mm diameter vitrified clay backdrop pipe in short lengths to suit in spigot and socket joint and lain vertically in trench including all fittings, tee junction, bend, excavation, backfilling, disposal, concrete encasing, formwork, connection, etc.</p>	2	no			
<p>C Allow 150 mm diameter vitrified clay backdrop pipe in short lengths to suit in spigot and socket joint and lain vertically in trench including all fittings, tee junction, bend, excavation, backfilling, disposal, concrete encasing, formwork, connection, etc.</p>	2	no			
<p>REINFORCED CONCRETE (GRADE 25) MANHOLES, ALL AS DETAILED DRAWINGS</p>					
<p>All dimensions stated are internal with depth taken from top of cover slab to invert</p>					
<p>All concrete shall be sulphate resisting cement</p>					
<p>D The rate for manhole shall include the following:</p> <p>150 mm thick top slab, 225 mm thick wall, 200 mm thick base, forming opening in top slab to receive cover, 50 mm lean concrete (grade 15) under, reinforcement, formwork, excavation, remove surplus excavated material off-site and backfilling</p> <p>High tensile and mild steel reinforcement 12 mm diameter bar to insitu concrete top slab, wall and base</p>		<p>Note</p> <p>Note</p> <p>Note</p>			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) FOUL DRAINAGE AND MANHOLES</u>					
<u>(Cont) REINFORCED CONCRETE (GRADE 25)</u>					
MANHOLES, ALL AS DETAILED DRAWINGS					
Galvanised malleable step iron to BS.1247 for manhole at 300 mm centre in staggered horizontally and vertically		Note			
Grade 304 stainless steel ladder comprised of 65 mm diameter x 5 mm thick handrail and 50 mm diameter x 5 mm thick steps with non-slip rungs complete with all fixing accessories, all as detailed on Engineer's drawings		Note			
12 mm thick cement and sand (1:3) trowelled smooth internally and externally.		Note			
JKR approved 1220 mm diameter precast concrete ring to BS. EN 124 with mortar joints		Note			
<u>Half round salt-glazed stoneware main or branch channel or in three-quarter section all bedded and jointed in cement and sand (1:2), sulphate resisting cement concrete (grade 30) benching in varying thickness to suit at manhole bottom, top of benching trowelled to a hard smooth surface with sulphate resisting (1:2) cement mortar laid monolithic to falls and cross-falls at 1:12 gradient, forming circular opening through manhole wall ready to receive incoming and outgoing sewer pipe</u>					
A Overall size 1200 diameter x 1630 mm deep (MH 1)	1	no			
B Overall size 1200 diameter x 2360 mm deep (MH 2)	1	no			
C Overall size 1200 diameter x 3210 mm deep (MH 3)	1	no			
D Overall size 1200 diameter x 3360 mm deep (MH 4)	1	no			
E Overall size 1200 diameter x 4510 mm deep (MH 5)	1	no			
F Overall size 1200 diameter x 4650 mm deep (MH 6)	1	no			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) FOUL DRAINAGE AND MANHOLES</u>					
<u>(Cont) REINFORCED CONCRETE (GRADE 25)</u>					
<u>MANHOLES, ALL AS DETAILED DRAWINGS</u>					
<u>(Cont) Half round salt-glazed stoneware main or branch channel or in three-quarter section all bedded and jointed in cement and sand (1:2), sulphate resisting cement concrete (grade 30) benching in varying thickness to suit at manhole bottom, top of benching trowelled to a hard smooth surface with sulphate resisting (1:2) cement mortar laid monolithic to falls and cross-falls at 1:12 gradient, forming circular opening through manhole wall ready to receive incoming and outgoing sewer pipe</u>					
A Overall size 1200 diameter x 3810 mm deep (MH 7)	1	no			
B Overall size 1200 diameter x 3920 mm deep (MH 8)	1	no			
C Overall size 1200 diameter x 3070 mm deep (MH 9)	1	no			
D Overall size 1200 diameter x 2220 mm deep (MH 10)	1	no			
<u>Square salt-glazed stoneware main or branch channel or in three-quarter section all bedded and jointed in cement and sand (1:2), sulphate resisting cement concrete (grade 30) benching in varying thickness to suit at manhole bottom, top of benching trowelled to a hard smooth surface with sulphate resisting (1:2) cement mortar laid monolithic to falls and cross-falls at 1:12 gradient, forming circular opening through manhole wall ready to receive incoming and outgoing sewer pipe</u>					
E Overall size 2250 x 1500 x 750 mm deep (MH-1)	1	no			
F Overall size 2250 x 1500 x 883 mm deep (MH-2)	1	no			
G Overall size 2250 x 1500 x 1003 mm deep (MH-3)	1	no			
H Overall size 2250 x 1500 x 1077 mm deep (MH-4)	1	no			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) FOUL DRAINAGE AND MANHOLES</u>					
<u>(Cont) REINFORCED CONCRETE (GRADE 25)</u>					
<u>MANHOLES, ALL AS DETAILED DRAWINGS</u>					
<u>(Cont) Square salt-glazed stoneware main or branch channel or in three-quarter section all bedded and jointed in cement and sand (1:2), sulphate resisting cement concrete (grade 30) benching in varying thickness to suit at manhole bottom, top of benching trowelled to a hard smooth surface with sulphate resisting (1:2) cement mortar laid monolithic to falls and cross-falls at 1:12 gradient, forming circular opening through manhole wall ready to receive incoming and outgoing sewer pipe</u>					
A Overall size 2250 x 1500 x 1221 mm deep (MH-5)	1	no			
B Overall size 2250 x 1500 x 1388 mm deep (MH-6)	1	no			
C Overall size 2250 x 1500 x 1411 mm deep (MH-7)	1	no			
D Overall size 2250 x 1500 x 1466 mm deep (MH-8)	1	no			
E Overall size 2250 x 1500 x 1407 mm deep (MH-8a)	1	no			
F Overall size 2250 x 1500 x 1286 mm deep (MH-8b)	1	no			
G Overall size 2250 x 1500 x 2805 mm deep (MH-9)	1	no			
H Overall size 2250 x 1500 x 954 mm deep (MH-10)	1	no			
J Overall size 2250 x 1500 x 855 mm deep (MH-10a)	1	no			
K Overall size 2250 x 1500 x 750 mm deep (MH-10b)	1	no			
L Overall size 2250 x 1500 x 1072 mm deep (MH-11)	1	no			
M Overall size 2250 x 1500 x 1181 mm deep (MH-12)	1	no			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
(Cont) FOUL DRAINAGE AND MANHOLES					
(Cont) REINFORCED CONCRETE (GRADE 25)					
MANHOLES, ALL AS DETAILED DRAWINGS					
(Cont) Square salt-glazed stoneware main or branch channel or in three-quarter section all bedded and jointed in cement and sand (1:2), sulphate resisting cement concrete (grade 30) benching in varying thickness to suit at manhole bottom, top of benching trowelled to a hard smooth surface with sulphate resisting (1:2) cement mortar laid monolithic to falls and cross-falls at 1:12 gradient, forming circular opening through manhole wall ready to receive incoming and outgoing sewer pipe					
A Overall size 2250 x 1500 x 1368 mm deep (MH-13)	1	no			
B Overall size 2250 x 1500 x 1459 mm deep (MH-14)	1	no			
C Overall size 2250 x 1500 x 1334 mm deep (MH-15)	1	no			
D Overall size 2250 x 1500 x 1411 mm deep (MH-15a)	1	no			
E Overall size 2250 x 1500 x 1097 mm deep (MH-16)	1	no			
F Overall size 2250 x 1500 x 1031 mm deep (MH-17)	1	no			
G Overall size 2250 x 1500 x 866 mm deep (MH-18)	1	no			
H Overall size 2250 x 1500 x 790 mm deep (MH-18a)	1	no			
J Overall size 2250 x 1500 x 670 mm deep (MH-18b)	1	no			
K Overall size 2250 x 1500 x 2697 mm deep (MH-19)	1	no			
L Overall size 2250 x 1500 x 972 mm deep (MH-20)	1	no			
M Overall size 2250 x 1500 x 797 mm deep (MH-21)	1	no			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
(Cont) FOUL DRAINAGE AND MANHOLES					
(Cont) REINFORCED CONCRETE (GRADE 25)					
MANHOLES, ALL AS DETAILED DRAWINGS					
(Cont) Square salt-glazed stoneware main or branch channel or in three-quarter section all bedded and jointed in cement and sand (1:2), sulphate resisting cement concrete (grade 30) benching in varying thickness to suit at manhole bottom, top of benching trowelled to a hard smooth surface with sulphate resisting (1:2) cement mortar laid monolithic to falls and cross-falls at 1:12 gradient, forming circular opening through manhole wall ready to receive incoming and outgoing sewer pipe					
A Overall size 2250 x 1500 x 750 mm deep (MH-22)	1	no			
MANHOLE COVER					
B BS EN 124 Class D400 ductile iron manhole cover and frame including bedding frame in cement and sand mortar and setting cover in grease	10	no			
C BS EN 124 Class B125 ductile iron manhole cover and frame including bedding frame in cement and sand mortar and setting cover in grease	29	no			
TESTING					
D Allow for testing as specified the whole of the foul drainage including grease trap according to BS CP 301:1971 and to the approval of the relevant authorities and satisfaction of the Superintending Officer		Item			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>PLANTER BOX</u>					
<p>Construction and completion of planter box including all excavation, compacted hardcore, lean concrete, reinforced concrete slab, decorative wall, waterproofing, coarse aggregate, 300 mm thick planting soil, 100 mm thick fine aggregate, all necessary plumbing works connected to nearest drain, finished with all exposed concrete / brick surfaces with approved heavy duty tiles of approved colour on cement and sand screed with approved tile colour grouting, all as detailed on Architectural and Engineer's drawings and in specification</p>					
A Overall size, 3000 mm x 1500 mm x 750 mm high	1	no			
B Overall size, 4845 mm x 1500 mm x 600 mm high	1	no			
C Overall size, 5830 mm x 3800 mm x 300 mm high	1	no			
<u>REFLECTIVE POOL</u>					
<p>Construction and completion of reflective pool including all excavation, compacted hardcore, lean concrete, reinforced concrete slab, decorative wall, waterproofing, coarse aggregate, 300 mm thick planting soil, 100 mm thick fine aggregate, all necessary plumbing works connected to nearest drain including flap valve, finished with all exposed concrete / brick surfaces with KCC textcoat 404 spraytile texture with Watty1 Solagard paint and approved glass mosaic tiles of approved colour on cement and sand screed with approved tile colour grouting, all lighting (lighting and associated M&E works measure in Mechanical & Electrical Bill 8B), all as detailed on Architectural and Engineer's drawings and in specification</p>					
D Overall size, 10000 mm x 8570 mm x 900 mm deep	1	no			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>WATER FEATURE POOL</u>					
<p>Construction and completion of water feature pool complete with planter and seating including all excavation, compacted hardcore, lean concrete, reinforced concrete slab, decorative wall, waterproofing, coarse aggregate, 300 mm thick planting soil, 100 mm thick fine aggregate, all necessary plumbing works connected to nearest drain including flap valve, finished with all exposed concrete / brick surfaces with approved glass mosaic tiles of approved colour on cement and sand screed with approved tile colour grouting, all water fountain and lighting (water fountain, lighting and associated M&E works measure in Mechanical & Electrical Bill 8B), all as detailed on Architectural and Engineer's drawings and in specification</p>					
<p>A Overall size, 23100 mm x 7600mm x 900 mm deep with overflow scupper drain in selective stone pebble</p>	1	no			
<u>FLAG POLE</u>					
<p>B 2 Nos. of 60 mm diameter to varies stainless steel pipe flag pole, overall high 6000 mm in weld connection comprising of 7500 mm long x 1000 mm wide upstand reinforced concrete base, finish all exposed concrete surfaces with cement and sand (1:3) plaster, approved tiles finishes complete with stainless steel plates, bolts, nut, washers, 25 mm diameter steel eye, 125 mm diameter stainless steel dome, ring, necking, stainless steel pulley, tapered end, end plate, stainless steel rod, rod cleat, nylon rod and etc. including all necessary excavation, disposal, formwork, reinforcement and fixing accessories all as shown on Architectural and Engineer's drawing (Piling measure separately)</p>	1	no			
<u>ANCILLARY BUILDING</u>					
<p>All ancillary building to include anti-termite chemical treatment (Provide 10 years warranty)</p>		Note			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) ANCILLARY BUILDING</u>					
SUBSTATION					
<p>A Construction and completion of the Substation overall size 10900 x 7000 x 5150 mm high including all excavation, foundation, reinforcement, reinforced concrete trench, plinth, ground slab, apron slab, roof slab, ramp, vent blocks, metal works up to roof top complete with all finishing works, approved signage, joinery and sanitary fittings, etc all as shown in Architectural and Engineer's drawing (excluding electrical and lighting which are under M & E works) (Piling measured separately)</p>	1	no			
GUARD HOUSE					
<p>B Construction and completion of Guard House overall size 3350 x 3000 x 4200 mm high including all excavation, foundation, reinforcement, reinforced concrete ground slab, apron slab, brickwall, metal works up to roof top, perimeter drain complete with all finishing works, approved signage and joinery fittings, plumbing and services, etc. (excluding electrical and lighting which are under Mechanical and Electrical works) all as shown on Architectural drawing and Engineer's drawings (Piling measure separately)</p>	2	no			
<u>COVERED WALKWAY / LINK WAY</u>					
<p>C Construction and completion of covered walkway including all excavation, foundation, ground slab, reinforcement, metal works up to roof top, gutter, ramp, handrailing and curved metal roofing complete with all finishing works, etc. (excluding electrical and lighting which are under Mechanical and Electrical works Bill 8B), all as detailed on Architectural and Engineer's drawings</p>	35	m2			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) COVERED WALKWAY / LINK WAY</u>					
A Construction and completion of covered walkway including all excavation, foundation, ground slab, reinforcement, metal works up to roof top, gutter and curved metal roofing complete with all finishing works, etc. (excluding electrical and lighting which are under Machanical and Electrical works Bill 8B), all as detailed on Architectural and Engineer's drawings	131	m2			
B Construction and completion of pathway including all excavation, foundation, ground slab, reinforcement, complete with all finishing works, etc. (excluding electrical and lighting which are under Machanical and Electrical works Bill 8B), all as detailed on Architectural and Engineer's drawings	67	m2			
<u>DECORATIVE AND BICKWALL FENCE</u>					
CONCRETE WORKS					
<u>50 mm thick lean concrete (Grade 15) to underside of</u>					
C Footing	29	m2			
D Ground beam	71	m2			
<u>Reinforced concrete (Grade 30) in</u>					
E Footing	17	m3			
F Column	30	m3			
G Ground beam	43	m3			
<u>10 mm to 16 mm diameter mild steel / high tensile reinforcement bar in</u>					
H Footing	1802	kg			
J Column	5070	kg			
K Ground beam	4386	kg			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

	Description	Qty	Unit	Rate	\$	c
	BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
	(Cont) DECORATIVE AND BICKWALL FENCE					
	(Cont) CONCRETE WORKS					
	<u>Formwork to</u>					
A	Sides of footing	107	m2			
B	Sides of column	571	m2			
C	Sides of ground beam	423	m2			
	DECORATIVE FENCING					
D	'Archifoam' CPC Pattern or other equal and approved 25 mm thick grill / screen, fixed on reinforced concrete foundation, column and beam (concrete foundation, column and beam measured seperately), complete with all approved fixing accessories all in strict accordance with the manufacturer's specification and instruction	244	m2			
	BRICKWALL					
	<u>Brickwall in cement and sand (1:3) mortar with and including 'Exmet' reinforcement at every fourth course to wall</u>					
E	230 mm thick	38	m2			
F	120 mm thick	696	m2			
G	Approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		Item			
H	6 mm diameter x 450 mm long mild steel bonding ties, one end cast into concrete column and hooked around column reinforcement and other end built into joints of brickwork including forming perforation in formwork		Item			
	EXTERNAL WALL FINISHES					
J	20 mm thick cement and sand (1:3) plainface plaster including trowelled smooth to wall, column and expose ground beam	1735	m2			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

	Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)						
	<u>(Cont) DECORATIVE AND BICKWALL FENCE</u> <u>(Cont) EXTERNAL WALL FINISHES</u>					
A	Red Sandstone wall tiles, laid on cement and sand screed (screed measured seperately) to wall and column including primed A5631 or other equalvalent, bracket and all other fixing accessories	388	m2			
B	'KCC' textcoat 404 or other equal and approved spraytile texture with 'Wattyl Solagard' or other equal and approved paint to plainface plastered (plaster measured separately) wall, column and expose grourng beam	1348	m2			
	STAINLESS STEEL GATE					
C	Sliding gate comprised of pattern screen in 100 x 100 mm RHS stainless steel frame structure, design to pattern as per Architectural's details drawing in welded connection including all cutting and complete with all approved lock and fixing accessories, Stainless steel roller and wheel guide, Sliding motor (to Engineer's specification), all as per details on drawing and specification, overall size 6900 x 3000 mm high	2	no			
	SIGNAGES					
	<u>Supply, deliver to site, placing or install in position the bi-lingual wall mounted signage in approved colour 3D cut out powder coated aluminium text including all necessary fixing accessories (size to refer drawing)</u>					
D	HIGH COMMISSION OF INDIA	1	set			
	<u>Supply, deliver to site, placing or install in position wall / fence mounted logo in approved colour powder coated aluminium including all necessary fixing accessories (size to refer drawing)</u>					
E	Wall logo	2	no			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>FEATURE WALL</u>					
<p>A Feature wall, overall size 12500 mm x 3000 mm x 380 mm thick comprised of brick cavity wall, RC capping, finished all exposed surface with red sandstone wall tiles on cement and sand plainface plaster, all as detailed on Architectural drawings</p>	1	no			
<p>B Construction and completion of pump and sand filter enclosure including all excavation, ground slab, reinforcement, pipe works, complete with all finishing works, etc. (excluding electrical, pump and sand filter which are under Mechanical and Electrical works Bill 8B), all as detailed on Architectural and Engineer's drawings</p>	1	no			
<u>OTHER WORKS NECESSARY</u>					
<p>C Other works not covered in the above items but mentioned in specifications and/ or drawings necessary for the completion of the works (Tenderers must specify actual work involved therein)</p> <p>1) _____</p> <p>2) _____</p> <p>3) _____</p>		Item			

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
COLLECTION					
Page No. BQ/1					
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Page No. BQ/17					
Page No. BQ/18					
Page No. BQ/19					
Page No. BQ/20					
Page No. BQ/21					
Page No. BQ/22					
Page No. BQ/23					

BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<p>COLLECTION</p> <p>Page No. BQ/24</p> <p>Page No. BQ/25</p> <p>Page No. BQ/26</p> <p>Page No. BQ/27</p> <p>Page No. BQ/28</p> <p>Page No. BQ/29</p> <p>Page No. BQ/30</p> <p>Page No. BQ/31</p> <p>Page No. BQ/32</p> <p>Page No. BQ/33</p> <p>Page No. BQ/34</p> <p>Page No. BQ/35</p>					
BILL 6B - EXTERNAL WORKS (CHANCERY BUILDING & STAFF RESIDENCES)					
Carried to Summary					

BILL 7A - PRIME COST AND PROVISIONAL SUMS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 7A - PRIME COST AND PROVISIONAL SUMS (HIGH COMMISSIONER'S RESIDENCE)					
<u>PRIME COST & PROVISIONAL SUMS</u>					
Amount of Prime Cost & Provisional Sums including profit and attendance shall be deducted in whole or in part if not used.					
		Note			
Profit & Attendance shall be adjusted proportionately with the actual expenditure of Prime Cost Sums.					
		Note			
<u>NOMINATED SUBCONTRACTORS AND SUPPLIERS</u>					
The Contractor will be responsible for supervision and administration of all works carried out by Nominated Subcontractors or material supplied by Nominated Suppliers in accordance with the Conditions of Contract whether subject to Prime Cost allowance or otherwise.					
		Note			
Without prejudice to his responsibility under this Contract, the Contractor shall enter into written Contracts with all Nominated Subcontractors and Suppliers, lodging a copy of each Subcontract with the Superintending Officer. Approval of the form of Contract shall be given by the Superintending Officer.					
		Note			
The Contract price shall be deemed to include the cost of the provision by the Contractor of attendance upon every Nominated Subcontractor and the term 'Attendance' shall mean the following:					
		Note			
(1) Confer with the Nominated Subcontractor and coordinate his work as necessary with general building works.					
		Note			
(2) Allow him full access to the site during normal working hours or otherwise by arrangement.					
		Note			
(3) Allow him the use of ladders, staging, scaffolding, etc.					
		Note			
(4) Allow him the use of water.					
		Note			
(5) Allow him the use of toilet, washing and other facilities.					
		Note			

BILL 7A - PRIME COST AND PROVISIONAL SUMS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
<u>BILL 7A - PRIME COST AND PROVISIONAL SUMS (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
<u>(Cont) NOMINATED SUBCONTRACTORS AND SUPPLIERS</u>					
<p>(6) Allow him the use of adequate electrical power of the purpose of the work and for all tests.</p>		Note			
<p>(7) Be responsible for the arrangement of all site deliveries and provide for the hoisting of materials and equipment to the floors on which they will be required. For this purpose, the Contractor shall allow the Subcontractor the use of the hoist and hoist driver, crane and crane driver in ordinary working hours, provided that the Subcontractor cooperates with other trades requirements in hoisting facilities.</p>		Note			
<p>(8) Provide adequate lighting on the floor required.</p>		Note			
<p>(9) Provide suitable storage areas in partially completed building.</p>		Note			
<p>(10) Form openings and recesses, building, fixing, etc., which have been marked out before hand by the Nominated Subcontractor or details of which have been supplied by him.</p>		Note			
<p>(11) Do all normal making good to walls, floors, ceilings and other surfaces.</p>		Note			
<p>Where Nominated Subcontractors require chases to be cut or other similar work involving the cutting away of executed work, they shall unless by other arrangements with the Contractor, perform such work and the making good at their own cost. The Owner will not entertain any claims resulting from work of this nature whether it be carried out by the Contractor or by a Nominated Subcontractor. The Contractor and Nominated Subcontractors shall coordinate their work to avoid as far as possible the necessary to damage completed work.</p>		Note			

BILL 7A - PRIME COST AND PROVISIONAL SUMS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
<u>BILL 7A - PRIME COST AND PROVISIONAL SUMS (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
<u>(Cont) NOMINATED SUBCONTRACTORS AND SUPPLIERS</u>					
<p>The Contractor's attention is drawn to the fact that should he elect and be approved by the Superintending Officer to tender for any of the items listed hereafter his quotation will be deemed to include all profit and attendance. Should his tender be accepted and the Contract awarded, the particular sum together with the profit and attendance as indicated hereafter shall be wholly omitted and the accepted tender amount shall be taken as the new sum.</p>					
<p>The Contractor shall not be entitled to any profit and attendance for works executed by Local Authorities for which Provisional Sums are provided for, and for works executed by Direct Contractors</p>					
<u>PRIME COST SUMS</u>					
<u>LANDSCAPING</u>					
<p>A Provide the Prime Cost Sum of Brunei Dollar One Hundred and Fifty Thousand Only (B\$150,000.00) for the supply and installation of Landscaping by a firm to be nominated by the S.O./ Architect</p>		Item			
<p>B Add for Profit</p>		%			
<p>C Add for Attendance</p>		%			
<u>PROVISIONAL SUMS</u>					
<u>SIGNAGES</u>					
<p>D Provide the Provisional Sum of Brunei Dollars Thirty Thousand Only (B\$30,000.00) for Signages to be expended at the direction of the Superintending Officer</p>		Item			
<u>CONNECTION CHARGES</u>					
<p>E Provide the Provisional Sum of Brunei Dollars Twenty Thousand Only (B\$20,000.00) for Connection Charges to be expended at the direction of the S.O./ Architect</p>		Item			

BILL 7A - PRIME COST AND PROVISIONAL SUMS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
<u>BILL 7A - PRIME COST AND PROVISIONAL SUMS (HIGH COMMISSIONER'S RESIDENCE) (Cont)</u>					
<u>(Cont) PROVISIONAL SUMS</u>					
<u>BUILDER'S WORK IN CONNECTION WITH</u>					
<u>SPECIALIST'S AND MECHANICAL & ELECTRICAL</u>					
<u>WORKS</u>					
A Provide the Provisional Sum of Brunei Dollars Thirty Thousand Only (B\$30,000.00) for Builder's Work In Connection With Specialist's and Mechanical & Electrical Works to be expended at the direction of the S.O./ Architect		Item			
<u>DAYWORKS AND MATERIALS</u>					
B Provide the Provisional Sum of Brunei Dollars Fifty Thousand Only (B\$50,000.00) for Dayworks and Materials to be expended at the direction of the Superintending Officer		Item			
<u>CONTINGENCY</u>					
C Provide a Provisional Sum of Brunei Dollars Seventy Thousand Only (B\$70,000.00) for Contingency to be expended at the direction of the S.O./ Architect		Item			

BILL 7A - PRIME COST AND PROVISIONAL SUMS (HIGH COMMISSIONER'S RESIDENCE)

Description	Qty	Unit	Rate	\$	c
BILL 7A - PRIME COST AND PROVISIONAL SUMS (HIGH COMMISSIONER'S RESIDENCE) (Cont)					
<p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>BILL 7A - PRIME COST AND PROVISIONAL SUMS (HIGH COMMISSIONER'S RESIDENCE) Carried to Summary</p>					

BILL 7B - PRIME COST AND PROVISIONAL SUMS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
<u>BILL 7B - PRIME COST AND PROVISIONAL SUMS (CHANCERY BUILDING & STAFF RESIDENCES)</u>					
<u>PRIME COST & PROVISIONAL SUMS</u>					
Amount of Prime Cost & Provisional Sums including profit and attendance shall be deducted in whole or in part if not used.		Note			
Profit & Attendance shall be adjusted proportionately with the actual expenditure of Prime Cost Sums.		Note			
<u>NOMINATED SUBCONTRACTORS AND SUPPLIERS</u>					
The Contractor will be responsible for supervision and administration of all works carried out by Nominated Subcontractors or material supplied by Nominated Suppliers in accordance with the Conditions of Contract whether subject to Prime Cost allowance or otherwise.		Note			
Without prejudice to his responsibility under this Contract, the Contractor shall enter into written Contracts with all Nominated Subcontractors and Suppliers, lodging a copy of each Subcontract with the Superintending Officer. Approval of the form of Contract shall be given by the Superintending Officer.		Note			
The Contract price shall be deemed to include the cost of the provision by the Contractor of attendance upon every Nominated Subcontractor and the term 'Attendance' shall mean the following:		Note			
(1) Confer with the Nominated Subcontractor and coordinate his work as necessary with general building works.		Note			
(2) Allow him full access to the site during normal working hours or otherwise by arrangement.		Note			
(3) Allow him the use of ladders, staging, scaffolding, etc.		Note			
(4) Allow him the use of water.		Note			
(5) Allow him the use of toilet, washing and other facilities.		Note			

BILL 7B - PRIME COST AND PROVISIONAL SUMS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 7B - PRIME COST AND PROVISIONAL SUMS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) NOMINATED SUBCONTRACTORS AND SUPPLIERS</u>					
<p>(6) Allow him the use of adequate electrical power of the purpose of the work and for all tests.</p>		Note			
<p>(7) Be responsible for the arrangement of all site deliveries and provide for the hoisting of materials and equipment to the floors on which they will be required. For this purpose, the Contractor shall allow the Subcontractor the use of the hoist and hoist driver, crane and crane driver in ordinary working hours, provided that the Subcontractor cooperates with other trades requirements in hoisting facilities.</p>		Note			
<p>(8) Provide adequate lighting on the floor required.</p>		Note			
<p>(9) Provide suitable storage areas in partially completed building.</p>		Note			
<p>(10) Form openings and recesses, building, fixing, etc., which have been marked out before hand by the Nominated Subcontractor or details of which have been supplied by him.</p>		Note			
<p>(11) Do all normal making good to walls, floors, ceilings and other surfaces.</p>		Note			
<p>Where Nominated Subcontractors require chases to be cut or other similar work involving the cutting away of executed work, they shall unless by other arrangements with the Contractor, perform such work and the making good at their own cost. The Owner will not entertain any claims resulting from work of this nature whether it be carried out by the Contractor or by a Nominated Subcontractor. The Contractor and Nominated Subcontractors shall coordinate their work to avoid as far as possible the necessary to damage completed work.</p>		Note			

BILL 7B - PRIME COST AND PROVISIONAL SUMS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 7B - PRIME COST AND PROVISIONAL SUMS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<u>(Cont) NOMINATED SUBCONTRACTORS AND SUPPLIERS</u>					
<p>The Contractor's attention is drawn to the fact that should he elect and be approved by the Superintending Officer to tender for any of the items listed hereafter his quotation will be deemed to include all profit and attendance. Should his tender be accepted and the Contract awarded, the particular sum together with the profit and attendance as indicated hereafter shall be wholly omitted and the accepted tender amount shall be taken as the new sum.</p>					
<p>The Contractor shall not be entitled to any profit and attendance for works executed by Local Authorities for which Provisional Sums are provided for, and for works executed by Direct Contractors</p>					
<u>PRIME COST SUMS</u>					
<u>PREPARATION AREA COUNTER TOP AND EQUIPMENTS</u>					
<p>A Provide the Prime Cost Sum of Brunei Dollar Eighty Thousand Only (B\$80,000.00) for the supply and installation of Preparation Area Counter Top & Equipments by a firm to be nominated by the S.O./ Architect</p>					
<p>B Add for Profit</p>					
<p>C Add for Attendance</p>					
<u>LANDSCAPING</u>					
<p>D Provide the Prime Cost Sum of Brunei Dollar One Hundred and Fifty Thousand Only (B\$150,000.00) for the supply and installation of Landscaping by a firm to be nominated by the S.O./ Architect</p>					
<p>E Add for Profit</p>					
<p>F Add for Attendance</p>					

BILL 7B - PRIME COST AND PROVISIONAL SUMS (CHANCERY BUILDING & STAFF RESIDENCES)

	Description	Qty	Unit	Rate	\$	c
BILL 7B - PRIME COST AND PROVISIONAL SUMS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)						
<u>PROVISIONAL SUMS</u>						
<u>SIGNAGES</u>						
A	Provide the Provisional Sum of Brunei Dollars Seventy Five Thousand Only (B\$75,000.00) for Signages to be expended at the direction of the Superintending Officer		Item			
<u>CONNECTION CHARGES</u>						
B	Provide the Provisional Sum of Brunei Dollars Twenty Thousand Only (B\$20,000.00) for Connection Charges to be expended at the direction of the S.O./ Architect		Item			
<u>BUILDER'S WORK IN CONNECTION WITH SPECIALIST'S AND MECHANICAL & ELECTRICAL WORKS</u>						
C	Provide the Provisional Sum of Brunei Dollars Thirty Thousand Only (B\$30,000.00) for Builder's Work In Connection With Specialist's and Mechanical & Electrical Works to be expended at the direction of the S.O./ Architect		Item			
<u>DAYWORKS AND MATERIALS</u>						
D	Provide the Provisional Sum of Brunei Dollars Fifty Thousand Only (B\$50,000.00) for Dayworks and Materials to be expended at the direction of the Superintending Officer		Item			
<u>CONTINGENCY</u>						
E	Provide a Provisional Sum of Brunei Dollars One Hundred and Twenty Thousand Only (B\$120,000.00) for Contingency to be expended at the direction of the S.O./ Architect		Item			

BILL 7B - PRIME COST AND PROVISIONAL SUMS (CHANCERY BUILDING & STAFF RESIDENCES)

Description	Qty	Unit	Rate	\$	c
BILL 7B - PRIME COST AND PROVISIONAL SUMS (CHANCERY BUILDING & STAFF RESIDENCES) (Cont)					
<p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>BILL 7B - PRIME COST AND PROVISIONAL SUMS (CHANCERY BUILDING & STAFF RESIDENCES) Carried to Summary</p>					

MAIN SUMMARY

		HIGH COMMISSIONER'S RESIDENCE, CHANCERY & STAFF RESIDENCE
		B\$
BILL 1A	- GENERALLY AND PRELIMINARIES (HIGH COMMISSIONER'S RESIDENCE)	FROM PAGE BQ/30
BILL 1B	- GENERALLY AND PRELIMINARIES (CHANCERY & STAFF RESIDENCES)	FROM PAGE BQ/30
BILL 2	- HIGH COMMISSIONER'S RESIDENCE	FROM PAGE SUM/1
BILL 3	- CHANCERY BUILDING	FROM PAGE SUM/2
BILL 4	- STAFF RESIDENCES (RG)	FROM PAGE SUM/3
BILL 5	- STAFF RESIDENCES (NRG)	FROM PAGE SUM/4
BILL 6A	- EXTERNAL WORKS (HIGH COMMISSIONER'S RESIDENCE)	FROM PAGE BQ/27
BILL 6B	- EXTERNAL WORKS (CHANCERY & STAFF RESIDENCES)	FROM PAGE BQ/37
BILL 7A	- PRIME COST AND PROVISIONAL SUMS (HIGH COMMISSIONER'S RESIDENCE)	FROM PAGE BQ/5
BILL 7B	- PRIME COST AND PROVISIONAL SUMS (CHANCERY & STAFF RESIDENCES)	FROM PAGE BQ/5
BILL 8A	- MECHANICAL & ELECTRICAL WORKS (HIGH COMMISSIONER'S RESIDENCE)	FROM PAGE B8A/SUM/1
BILL 8B	- MECHANICAL & ELECTRICAL WORKS (CHANCERY & STAFF RESIDENCES)	FROM PAGE B8B/SUM/2
TOTAL CARRIED TO FORM OF TENDER ... B\$		\$

CONTRACTOR : _____

SIGNATURE : _____

AUTHORITY : _____

DATE : _____

Note:

It is the tenderer's responsibility to ensure that there is no page missing or in duplicate

	Description	Qty	Unit	Rate	\$	c
	<u>SCHEDULE OF RATES</u>					
	The rates entered shall form part of the Contract and be used to adjust the Bills of Quantities where applicable for the evaluation and award of the Tender, and shall be valid throughout the Contract Period for variation works if any					
	<u>SUBSTRUCTURE</u>					
A	Movement/Expansion joint, filled with 25 mm wide x 50 mm deep approved expansion / movement joint complete with 25 mm thick softboard filler including slip membrane and additional use of formwork, all as detailed on drawings and in specification		m			
	<u>ROOF</u>					
B	M20 x 350 mm long holding down bolts including nuts and washers		no			
C	M32 x 400 mm long holding down bolts including nuts and washers		no			
D	M10 bolts including nuts and washers		no			
E	M12 bolts including nuts and washers		no			
F	M12 HILTI HSA anchor bolts including nuts and washers		no			
G	M24 HSFG bolts including nuts and washers		no			
H	M32 HSFG bolts including nuts and washers		no			
	<u>The following in 'Lysaght'</u>					
J	Longitudinal fascia capping		m			
K	Transverse fascia capping		m			
L	Corrugation end closure		m			
M	Longitudinal end flashing, fixed with and including turning down at ends (measured nett - no allowance made for laps)		m			
N	<u>Extra over</u> for forming 500 mm wide x 50 mm depth scupper drain finished with screeding and approved high quality waterproofing to specification and Architect's approval, all as detailed on drawings		m			

	Description	Qty	Unit	Rate	\$	c
	<u>SCHEDULE OF RATES (Cont)</u>					
	<u>(Cont) ROOF</u>					
	<u>(Cont) The following in 'Lysaght'</u>					
A	Decorative reinforced concrete capping to gutter wall including all necessary formwork, reinforcement and finished all expose surface with 'KCC' textcoat with 'Wattyl Solagard' or other equal and approved paint in approved colour		m			
B	Two-piece flashing where 100 mm diameter vent pipe passes through roof, complete with under flashing and 150 mm high collar, dressed to suit profile of roofing sheets and bedded in mastic compound, the overflashing consisting of 225 mm high sleeve bedded to pipe in mastic compound and fixed with stout galvanised wire		no			
C	Two-piece flashing where 150 mm diameter vent pipe passes through roof, complete with under flashing and 150 mm high collar, dressed to suit profile of roofing sheets and bedded in mastic compound, the overflashing consisting of 225 mm high sleeve bedded to pipe in mastic compound and fixed with stout galvanised wire		no			
	<u>EXTERNAL WALL</u>					
D	115 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		m			
E	150 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		m			
F	300 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		m			
G	415 mm wide with 150 mm upturn approved damp proof course bedded in joints of brickwall (measured nett-rate to include for laps)		m			

	Description	Qty	Unit	Rate	\$	c
	<u>SCHEDULE OF RATES (Cont)</u>					
	<u>(Cont) EXTERNAL WALL</u>					
A	6 mm diameter x 450 mm long mild steel bonding ties, one end cast into concrete column and hooked around column reinforcement and other end built into joints of brickwork including forming perforation in formwork		no			
B	Approved 225 mm long mild steel cavity wall ties, installed in a slight fall and both ends pressed down in fresh mortar and surrounded by mortar		no			
	<u>WINDOWS</u>					
C	Precast reinforced concrete (grade 20) lintel, overall size 150 x 200 mm reinforced with, bedded and jointed in cement and sand (1:3) mortar, hoisted and fixed in position, finished fair on all exposed surfaces, all as detailed on drawings and in specification		m			
D	Precast reinforced concrete (grade 20) window head, overall size 200 x 400 mm reinforced with, bedded and jointed in cement and sand (1:3) mortar, hoisted and fixed in position, finished fair on all exposed surfaces, all as detailed on drawings and in specification		m			
	<u>DOORS</u>					
	<u>Precast reinforced concrete (grade 20) including all reinforcement, mould, bedding and jointing in cement and sand (1:3) including hoisting and fixing in position and finished fair on all exposed surfaces</u>					
E	150 x 200 mm high lintel cast in various lengths, reinforced with and including 4 nos. 12 mm tensile bar and 10 mm mild steel stirrup at 150 mm centres		m			
F	150 x 50 x 100 mm high heelstone cast to suit the profile of door jamb with one end built into door jamb and other end cast into heelstone and finished fair		m			

	Description	Qty	Unit	Rate	\$	c
	<u>SCHEDULE OF RATES (Cont)</u>					
	(Cont) DOORS					
	<u>(Cont) Precast reinforced concrete (grade 20) including all reinforcement, mould, bedding and jointing in cement and sand (1:3) including hoisting and fixing in position and finished fair on all exposed surfaces</u>					
A	150 x 25 x 3 mm thick mild steel lugs with one end fishtailed built into joints of brickwork and the other end turned up, holed and screwed to back of timber door frame		m			
B	6 mm wide approved silicone sealant pointing to gap between frame and tile		m			
	<u>WALL FINISHES</u>					
C	Approved heavy duty wall tiles in approved colour, laid in pattern with adhesive and colour grout pointing on cement and sand screed (screed measured seperately) to wall		m ²			
	<u>FLOOR FINISHES</u>					
D	<u>Extra for</u> foming groove line to ramp		m			
E	25 mm wide expansion joint at 6.0 m bothways comprising 'Flexel' or other equal and approved filler board, expamet steel 264 and aliminium construction joint profile to Architect approval		m			
F	Isolation joint in pavement slab, filled with 12 mm thick flexcell and forming round edges groove including all necessary use of sawn formwork		m			
G	Construction joint in pavement slab, filled with and including 12 x 20 mm 'Thioflex-600' or other equal and approved sealant, 12 mm thick flexcell, slab held together and formed rounded edges groove with and including 20 mm diameter mild steel dowel bar at 450 mm centres with one half of bar debonded with grease/bitumen and one end of bar fitted with plastic foam filler with metal sliding fit including necessary use of sawn formwork		m			

	Description	Qty	Unit	Rate	\$	c
	<u>SCHEDULE OF RATES (Cont)</u>					
	<u>(Cont) FLOOR FINISHES</u>					
A	Approved aluminium edge strip and dividing strip, fixed strictly in accordance with manufacturer's instruction		m			
B	Approved stainless steel divider strip, fixed strictly in accordance with manufacturer's instruction		m			
	<u>CEILING FINISHES</u>					
C	Access panel complete with aluminium edge finish with approved jointing compound to gypsum board / cement board		no			
D	Shadow gaps / cove to gypsum board / cement board including painting		m			
E	Drop in ceiling to gypsum board / cement board including paint		m			
F	Forming 25 mm wide drip mold including all approved paint finished		m			
	<u>PLUMBING</u>					
	<u>COLD WATER SERVICES</u>					
	<u>Copper pipe and fittings to B.S. 2871 Part 1 to ceiling space, wall duct and slab soffit, etc. including chasing into and complete with hangers, clips and brackets, etc.</u>					
G	15 mm diameter supply / riser / dropper pipe		m			
H	20 mm diameter supply / riser / dropper pipe		m			
J	25 mm diameter supply / riser / dropper pipe		m			
K	32 mm diameter supply / riser / dropper pipe		m			
L	40 mm diameter supply / riser / dropper pipe		m			
M	50 mm diameter supply / riser / dropper pipe		m			

	Description	Qty	Unit	Rate	\$	c
	<u>SCHEDULE OF RATES (Cont)</u>					
	(Cont) PLUMBING					
	(Cont) COLD WATER SERVICES					
	<u>(Cont) Copper pipe and fittings to B.S. 2871 Part 1 to ceiling space, wall duct and slab soffit, etc. including chasing into and complete with hangers, clips and brackets, etc.</u>					
A	65 mm diameter supply / riser / dropper pipe		m			
B	100 mm diameter supply / riser / dropper pipe		m			
C	150 mm diameter supply / riser / dropper pipe		m			
D	100 mm diameter drain pipe		m			
	HOT WATER SERVICES					
	<u>Copper pipe and fittings to B.S. 2871 Part 1 to ceiling space, wall duct and slab soffit, etc. including chasing into and complete with hangers, clips and brackets, etc.</u>					
E	12 mm diameter supply / riser / dropper pipe		m			
F	19 mm diameter supply / riser / dropper pipe		m			
G	25 mm diameter supply / riser / dropper pipe		m			
H	100 mm diameter supply / riser / dropper pipe		m			
J	15 mm diameter approved brass gate valve		no			
K	20 mm diameter approved brass gate valve		no			
L	25 mm diameter approved brass gate valve		no			
M	32 mm diameter approved brass gate valve		no			
N	40 mm diameter approved brass gate valve		no			
P	50 mm diameter approved brass gate valve		no			

Description	Qty	Unit	Rate	\$	c
<u>SCHEDULE OF RATES (Cont)</u>					
<u>(Cont) PLUMBING</u>					
SOIL, WASTE AND VENT PIPE					
<u>Upvc soil, waste and vent pipes and fittings to B.S. 4660, laid in trench including all excavation, disposal and backfilling etc.</u>					
A		m			
B		m			
C		m			
D		m			
E		m			
F		m			
G		m			
H		m			
J		m			
<u>Upvc soil, waste and vent pipes and fittings to B.S. 4514 to ceiling space, wall, duct and slab soffit, etc. including chasing into and complete with hangers, clips and brackets</u>					
K		m			
L		m			
M		m			
N		m			
P		m			
Q		m			
R		m			
S		m			
T		m			
U		m			

	Description	Qty	Unit	Rate	\$	c
	<u>SCHEDULE OF RATES (Cont)</u>					
	(Cont) <u>PLUMBING</u>					
	(Cont) <u>SOIL, WASTE AND VENT PIPE</u>					
	<u>(Cont) Upvc soil, waste and vent pipes and fittings to B.S. 4514 to ceiling space, wall, duct and slab soffit, etc. including chasing into and complete with hangers, clips and brackets</u>					
A	100 mm diameter acid waste pipe		m			
B	<u>Extra over</u> for 50 mm bend		no			
C	<u>Extra over</u> for 50 mm bend with inspection eye		no			
D	<u>Extra over</u> for 100 mm bend		no			
E	<u>Extra over</u> for 150 mm bend		no			
F	<u>Extra over</u> for 50 x 50 x 50 mm junction with inspection cover		no			
G	<u>Extra over</u> for 100 x 100 x 50 mm junction with inspection cover		no			
H	<u>Extra over</u> for 150 x 150 x 50 mm junction with inspection cover		no			
	<u>Wire Cowl</u>					
J	100 mm diameter approved upvc vent wire cowl fixed on top of 100 mm diameter vent pipe		no			
	<u>GAS PIPING SERVICES</u>					
	<u>Copper Gas pipe to Table Y and fittings run exposed below ceiling and complete with quick acting shut off valve, hangers, clips and brackets.</u>					
K	15 mm diameter		m			
L	20 mm diameter		m			
M	25 mm diameter		m			
N	32 mm diameter		m			
P	40 mm diameter		m			

	Description	Qty	Unit	Rate	\$	c
	<u>SCHEDULE OF RATES (Cont)</u>					
	<u>(Cont) PLUMBING</u>					
	<u>(Cont) GAS PIPING SERVICES</u>					
A	Sump Gully and chamber size 900 x 900 mm in various depth internally with multiple inlets comprising 150 mm thick concrete (grade 30) wall and base, upvc gully trap to B.S. 4660 with 344 x 344 removable stainless steel grating with hinges, etc. finished with cement and sand render internally, epoxy painting, inlet and outlet, jointing to waste pipes, including excavation, disposal, backfilling, formwork, etc, the whole as per detail shown on Engineer's drawing		no			
B	Gully trap and chamber size 300 x 300 mm in various depth internally with multiple inlets comprising 125 mm thick concrete (grade 20) wall and base, upvc gully trap to B.S.4660 with perforated grating, 415 x 415 mm stainless steel grating with hinge, etc. finished with cement and sand render internally, epoxy painting, inlet and outlet, jointing to waste pipes, including excavation, disposal, backfilling, formwork, etc, the whole as per detail shown on Engineer's drawing		no			
	<u>ROAD AND DRIVEWAY</u>					
C	Excavate for driveway and carpark commencing from formation level not exceeding 2.00 m deep, get out, cart away excavated material off-site to a tip to be provided by the Contractor at his expense		m3			
D	Prepare subgrade surface, grade and makeup to line level and camber to required maximum dry density, CBR value, fall and gradients, all as detailed on drawings and in specification		m2			
E	Compact surfaces of subgrade to 90% optimum dry density (CBR > 5%) all as specified, including necessary trimming and levelling surfaces to falls and gradients		m2			
F	One (1) layers of approved Geogrid reinforced base type 1, all laying and earthwork preparation to manufacturer's specifications and as detailed on drawings		m2			

	Description	Qty	Unit	Rate	\$	c
	<u>SCHEDULE OF RATES (Cont)</u>					
	<u>(Cont) ROAD AND DRIVEWAY</u>					
A	350 mm thick mechanically compacted crusher run stone base of crushed rock, hard durable particles or fragments of rock crushed to size as specified, spread, level and finished to falls and gradients		m2			
B	150 mm thick reinforced concrete (Grade 30) in pavement/ramp laid in bays to falls including all necessary formwork		m2			
C	BRC A10 fabric mesh reinforcement in pavement slab (measured nett - rate to include for laps, cutting and waste)		m2			
D	Proof roll compacted surfaces to detect soft spots, excavate, remove, lay and compact approved sand filling in layer		m2			
E	Allow for carrying out Laboratory Compaction Test (4.5 kg hammer) including providing necessary instrument		no			
F	Allow for carrying Laboratory CBR Test including providing necessary instrument		no			
G	Allow for carrying out Field Density Test on prepared subgrade including providing necessary instrument		no			
H	Allow for carrying out CBR Test (BS1377 Pt9; 1990) on prepared subgrade including providing necessary instrument		no			
J	Expansion joint in pavement slab, all as per Engineer's details drawings		m			
K	Cut edge of existing tarmacadam driveway 250 mm wide x 300 mm deep including prepare surfaces to receive new works, make good surfaces disturbed and remove all debris off site		m			
L	Approved stop cock/gate valve in various diameter, all as detailed on drawings		no			

	Description	Qty	Unit	Rate	\$	c
<p style="text-align: center;"><u>SCHEDULE OF RATES (Cont)</u></p> <p>A Concrete thrust block for bend, tee, end cap and sluice valve including all excavation, disposal and backfilling, lean concrete, concrete, formwork and reinforcement, all as detailed on drawings</p> <p>B</p> <p>C</p> <p>D</p> <p>E</p> <p>CONTRACTOR :</p> <p>F</p> <p>G</p> <p>H</p> <p>J</p> <p>WITNESS :</p> <p>K</p> <p>L</p> <p>M</p> <p>N</p> <p>DATE :</p>			no			

Description	Qty	Unit	Rate	\$	c
<p align="center"><u>SCHEDULE OF RATES (Cont)</u></p> <p>COLLECTION</p> <p>Page No. BQ/1</p> <p>Page No. BQ/2</p> <p>Page No. BQ/3</p> <p>Page No. BQ/4</p> <p>Page No. BQ/5</p> <p>Page No. BQ/6</p> <p>Page No. BQ/7</p> <p>Page No. BQ/8</p> <p>Page No. BQ/9</p> <p>Page No. BQ/10</p> <p>Page No. BQ/11</p> <p>SCHEDULE OF RATES Carried to Summary</p>					

DAYWORK SCHEDULE

Any work ordered by the Architect to be carried out by daywork shall be paid for at the rates entered hereunder subject to the following conditions:

1. The rates entered for labour shall be deemed to include all on-costs associated with the employment of such labour including (inter alia), Head Office charges, overhead charges, profit, site supervision and staff, insurances, wages, travelling time and expenses, subsistence allowances, time lost due to inclement weather, bonus, holiday and sick pay, and any other employee's fringe benefit(s), small tools and consumable stores, temporary equipment such as wagons, temporary tracks, ladders, staging, scaffolding and all items of a similar nature unless these are provided or set up exclusively for daywork.
2. The wages for gangers and loading hands working with their gang shall be paid for at the appropriate rates, but the time of walking gangers, sub-foremen and foremen will not be including and shall be deemed to be included in the rates entered for labour under site supervision and staff.
3. The cost of special watching and lighting necessitated by daywork shall be included in the rates.
4. The rates entered for Plant shall apply only to Plant which the Contractor has available on the Site. Such rates shall be deemed to include all overhead charges, profit, site supervision and staff, hire charges, fuel, maintenance, consumable stores, spare parts, insurances, etc. but shall exclude the cost of wages for drivers and operators which shall be payable separately as dealt with under paragraph 1 above.
5. Payment for mechanically operated Plant shall be made only at such time as the plant is engaged on daywork and shall exclude all standing, idle or down time.
6. If any workmen or items of Plant or Daywork do not readily belong to any classification included in the Schedule or inserted by the Contractor at the time of tendering the Architect shall determine the equivalent classification to be adopted for such workmen or item of plant and payment for such will be made accordingly.

Daywork Schedule

7. The rates inserted by the Contractor shall be realistic rates in conformity with those on which his tender has been based and shall be based on conditions prevailing at the time of tender but bearing in mind that claims for escalation will not be entertained.
8. Notwithstanding the provisions of the Labour Enactments of Brunei Darussalam, overtime working if approved by the S.O. will be deemed to be works carried outside the hours of 7.30 a.m. and 5.30 p.m. on Monday to Sunday inclusive with payment for overtime working calculated on the following basis:-

Monday to Sunday inclusive - between the hours of 5.30 p.m. and midnight - at time and a half (i.e. 1 1/2 times the amount entered under Labour)

Monday to Sunday inclusive - between the hours of midnight and 7.30 a.m. - at double time (i.e. 2 times the amount entered under Labour)

Daywork Schedule

LABOUR

	<u>Description</u>	<u>Unit</u>	<u>Rate</u> <u>B\$</u>
A	Labourer - Male	hour	
B	Labourer - Female	hour	
C	Concretor	hour	
D	Steel bender	hour	
E	Mason	hour	
F	Drainlayer	hour	
G	Carpenter/Joiner	hour	
H	Steelworker	hour	
I	Welder	hour	
J	Electrician	hour	
K	Plumber	hour	
L	Painter	hour	
M	Driver	hour	
N	Mechanic	hour	
O	Plant Operator - Mechanical Plant under 100 B.H.P.	hour	
P	Plant Operator - Mechanical Plant 100 B.H.P. and over	hour	

(Any classification not included above)

Daywork Schedule

PLANT

	<u>Description</u>		<u>Capacity</u>	<u>Unit</u>	<u>Rate</u> <u>B\$</u>
A	Compressors - Portable (incl. pneumatic breaker, tools & hose)		250c.f.m.	hour	
B	Compressors - Ditto		450c.f.m.	hour	
C	Compressors - Mobile (incl. tools & hose)		450c.f.m.	hour	
D	Crane - Mobile		10 t	hour	
E	Crane - Ditto		20 t	hour	
F	Dumpers (or Dump Trucks)		5 m3	hour	
G	Excavators - (incl. Face shovels, skimmers, dragliners, or backactors)		0.5 m3	hour	
H	Excavators - Ditto		1.0 m3	hour	
I	Excavators - Ditto		1.5 m3	hour	
J	Excavators - Ditto		2.0 m3	hour	
K	Tractors shovel		1.0 m3	hour	
L	Generating sets		5 k.v.a.	hour	
M	Lorries - Van or similar utility		1000 kg	hour	
N	Lorries - ordinary flat top		6 t	hour	
O	Lorries - ordinary - heavy haulage		10 t	hour	
P	Mixers - Concrete, open drum		0.80 m3	hour	
Q	Mixers - Ditto		1.00 m3	hour	
R	Mixers - with weigh batchers		2.00 m3	hour	

DS/4

Daywork Schedule

PLANT - CON'T

	<u>Description</u>		<u>Capacity</u>	<u>Unit</u>	<u>Rate</u> <u>B\$</u>
A	Pumps	- Portable (incl. foot valves, suction hose, up to 60 ft of delivery hose and all fittings)			
B	Pumps	- diesel or petrol driven	75 mm	hour	
C	Pumps	- Ditto	100 mm	hour	
D	Pumps	- air driven	75 mm	hour	
E	Pumps	- electrically driven	100 mm	hour	
F	Tractors	- Crawler type with bull or angle dozer balde and/or ripper	18 k.w.	hour	
G	Tractors	- Ditto	25 k.w.	hour	
H	Tractors	- Ditto	75 k.w.	hour	
I	Tractors	- Wheel	18 k.w.	hour	
J	Tractors	- Tractor shover	18 k.w.	hour	
K	Tractors	- Pneumatic tyred with cu yd scraper	25 k.w.	hour	
L	Trench Digger	-	25 k.w.	hour	
M	Water truck (Type) (Incl. spraying equipment)		1500 ltr.	hour	
N	Welding and cutting set (oxy acetylene inclusive of oxygen and acetylene)		each	hour	
O	Ditto - (Electric Arc)		each	hour	

Daywork Schedule

MATERIALS

	<u>Description</u>	<u>Unit</u>	<u>Rate</u> <u>BS</u>
A	Cement (50 kg bag)	bag	
B.	Sand	m3	
C	20 mm aggregate	m3	
D	25 mm aggregate	m3	
E	38 mm aggregate	m3	
F	Mild steel bar 13 mm and below	t	
G	Ditto 16 mm to 32 mm	t	
H	High tensile bar 13 mm and below	t	
I	Ditto 16 mm to 32 mm	t	
J	Bricks - ordinary first quality	pc	
K	Timber - sawn Meranti	m3	
L	Timber - wrot Meranti	m3	
M	Timber - sawn Kapur Bukit	m3	
N	Timber - wrot Kapur Bukit	m3	
O	6 mm plywood	m2	
P	12 mm plywood	m2	

Appendix A

PERFORMA OF BANK GUARANTEE (PERFORMANCE)

(Judicial Stamp paper of appropriate value as per stamp Act-of respective state)

Head of Chancery
High Commission of India
Baitussayifaa, Simpang 40-22
Jalan Sungai Akar
Bandar Seri Begawan BC3916
Brunei Darussalam

Whereas the Head of Chancery,,High Commission of India, Baitussayifaa, Simpang 40-22,,Jalan Sungai Akar,,Bandar Seri Begawan BC3916, Brunei Darussalam (hereinafter called “HIGH COMMISSION OF INDIA” which expression shall unless repugnant to the subject or context include its successors and assigns) having awarded a work order / contract / supply order No. dated (hereinafter called the contract) to M/s (hereinafter called the contractor / supplier) at a total price of B\$ subject to the terms and conditions contained in the contract.

WHEREAS, the terms and conditions of the contract require the contractor to furnish a bank guarantee for B\$(Brunei Dollars) being 5% of the total value of the contract for proper execution and due fulfillment of the terms and conditions contained in the contract.

We, the Bank, (hereinafter called the “Bank”) do hereby unconditionally and irrevocably undertake to pay to HIGH COMMISSION OF INDIA immediately on demand in writing and without protest / or demur all moneys payable by the contractor / supplier to HIGH COMMISSION OF INDIA in connection with the execution / supply of and performance of the works / equipment, inclusive of any loss, damages, charges, expenses and costs caused to or suffered by or which would be caused to or suffered by HIGH COMMISSION OF INDIA by reason of any breach by the contractor / supplier of any of the terms and conditions contained in the contract as specified in the notice of demand made by HIGH COMMISSION OF INDIA to the bank. Any such demand made by NBCC on the bank shall be conclusive evidence of the amount due and payable by the bank under this guarantee. However, the Bank’s liability under this guarantee, shall be limited to B\$..... in the aggregate and the bank hereby agrees to the following terms and conditions:-

- (i) This guarantee shall be a continuing guarantee and irrevocable for all claims of HIGH COMMISSION OF INDIA as specified above and shall be valid during the period specified for the performance of the contract.
- (ii) We, the said bank further agree with HIGH COMMISSION OF INDIA that HIGH COMMISSION OF INDIA shall have the fullest liberty without our consent and without affecting in any manner our obligations and liabilities hereunder to vary any of the terms and conditions of the said contract or to extend time for performance of contract by the Contractor from time to time or to postpone for any time or from time to time any of the powers exercisable by HIGH COMMISSION OF INDIA against the contractor / supplier under the contract and forbear or enforce any of the terms and conditions relating to the said contract and we shall not be relieved from our liability by reason of any such variations or extension being granted to the contractor or for any forbearance, act or omission on the part of HIGH COMMISSION OF INDIA or any indulgence by HIGH COMMISSION OF INDIA to the contractor or by any such matter or thing whatsoever, which under the law relating to the sureties would, but for this provision, have effect of so relieving us.

Appendix A

- (iii) This guarantee / undertaking shall be in addition to any other guarantee or security whatsoever HIGH COMMISSION OF INDIA may now or at any time have in relation to the performance of the works / equipment and the company shall have full re-course to or enforce this security in performance to any other security or guarantee which the HIGH COMMISSION OF INDIA may have or obtained and there shall be no forbearance on the part of the company in enforcing or requiring enforcement of any other security which shall have the effect of releasing the Bank from its full liability. It shall not be necessary for HIGH COMMISSION OF INDIA to proceed against the said contractor / supplier before proceeding against the Bank.
- (iv) This guarantee / undertaking shall not be determined or affected by the liquidation or winding up, dissolution or change of constitution or insolvency of the supplier / contractor, but shall in all respects and for all purposes be binding and operative until payment of all moneys payable to HIGH COMMISSION OF INDIA in terms thereof are paid by the Bank.
- (v) The Bank hereby waives all rights at any time inconsistent with the terms of this Guarantee and the obligations of the bank in terms hereof, shall not be otherwise effected or suspended by reasons of any dispute or disputes having been raised by the supplier / contractor (whether or not pending before any Arbitrator, Tribunal or Court) or any denial of liability by the supplier / contractor stopping or preventing or purporting to stop or prevent any payments by the Bank to HIGH COMMISSION OF INDIA in terms hereof.

We, the said Bank, lastly undertake not to revoke this guarantee during its currency except with the previous consent of NBCC in writing upon expiry of which, we shall be relieved from all liabilities under this guarantee thereafter.

Signed this day of at

For and on behalf of Bank

WITNESS

1. _____
2. _____

LIST OF DRAWING

ARCHITECTURAL

DRAWING NO.

DESCRIPTION

HIGH COMMISSIONER'S RESIDENCE

AR-1693/Indian HighCom/High Commissioner's
Residence/

TS-1.00	TITLE PAGE
TS-1.01	LOCATION PLAN, TOPOGRAPHICAL SURVEY, RG DRAIN DETAIL
TS-1.02	SITE DEVELOPMENT PLAN
TS-1.03	SITE DEVELOPMENT PLAN (FENCE LAYOUT)
TS-2.01	KEY PLAN
TS-2.02	GROUND FLOOR PLAN – A
TS-2.03	GROUND FLOOR PLAN – B
TS-2.04	FIRST FLOOR PLAN
TS-2.05	GROUND FLOOR CEILING PLAN
TS-2.06	FIRST FLOOR CEILING PLAN
TS-2.07	ROOF PLAN
TS-3.01	SECTION A-A & SECTION B-B
TS-3.02	SECTION C-C
TS-4.01	ELEVATION A & ELEVATION B
TS-4.02	ELEVATION C & ELEVATION D
TS-5.01	DOORS SCHEDULE
TS-5.02	WINDOW SCHEDULES W1 – W11
TS-5.03	WINDOW SCHEDULES W12 – W24
TS-5.04	WINDOW SCHEDULES W25 – W30, DAYLIGHT VENTILATION AND TABULATION
TS-5.05	DECORATIVE SCREEN SCHEDULE
TS-7.01	SANITARY SCHEDULE (1 OF 4)
TS-7.02	SANITARY SCHEDULE (2 OF 4)
TS-7.03	SANITARY SCHEDULE (3 OF 4)
TS-7.04	SANITARY SCHEDULE (4 OF 4)
TS-8.01	SCHEDULE OF FINISHES
TS-9.01	IRONMONGERY SCHEDULE
TS-11.01	PERIMETER FENCE 1E AND GATE DETAILS
TS-11.02	PERIMETER FENCE 1F AND SECTIONS & DETAILS
TS-11.03	PERIMETER FENCE 1G AND SECTIONS
TS-11.04	DETAIL OF WC-01 (GF-21), SECTIONS, COUNTER TOP DETAIL
TS-11.05	DETAIL OF WC-03 (GF-17), SECTIONS, DETAIL OF WC-06 (GF-07), SECTIONS

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LIST OF DRAWING

ARCHITECTURAL

DRAWING NO.

DESCRIPTION

HIGH COMMISSIONER'S RESIDENCE (cont'd)

AR-1693/Indian HighCom/High Commissioner's
Residence/

TS-11.06	DETAIL OF WC-01 (FF-07), SECTIONS, COUNTER TOP DETAIL
TS-11.07	DETAIL OF WC-02 (FF-09), SECTIONS, COUNTER TOP DETAIL
TS-11.08	DETAIL OF WC-03 (FF-10), SECTIONS, COUNTER TOP DETAIL
TS-11.09	DETAIL OF WC-04 (FF-13), SECTIONS, COUNTER TOP DETAIL
TS-11.10	DETAIL OF WC-05 (FF-09), SECTIONS, DETAIL OF WC-06 (FF-14), SECTIONS
TS-11.11	KITCHEN (GF-04) DETAILS
TS-11.12	COUNTER TOP 1, 2 & 3 DETAILS FOR KITCHEN (GF-04)
TS-11.13	PANTRY / FAMILY KITCHEN (FF-08) DETAILS, COUNTER TOP DETAILS
TS-11.14	DETAIL OF STAIRCASE 1, DETAIL OF STAIRCASE 2, SECTION DETAIL
TS-11.15	TIMBER LOUVERS SCREEN PLAN & GUEST BEDROOM & @ MASTER BEDROOM DETAILS, SECTIONS
TS-11.16	TIMBER LOUVERS SCREEN PLAN @ MASTER BEDROOM DETAILS, SECTIONS
TS-11.17	TIMBER LOUVERS SCREEN PLAN @ BEDROOM 1 & 2 DETAILS, SECTIONS
TS-11.18	MISCELLANEOUS DETAILS
TS-11.19	BAY SECTIONS
TS-11.20	MAID'S ROOM (GF-06) & GUEST BEDROOM (GF-08) WARDROBE DETAILS
TS-11.21	FAMILY DINING BAR (GF-02) CABINET 1 & 2 DETAILS
TS-11.22	MASTER'S BEDROOM (FF-01) WALK IN CLOSET 1 DETAILS
TS-11.23	MASTER'S BEDROOM (FF-01) WALK IN CLOSET 2 DETAILS & WARDROBE 1 DETAILS
TS-11.24	BEDROOM 01 & 02 (FF-02) (FF-03) WALK IN CLOSET DETAILS
TS-11.25	BEDROOM 01 & 02 (FF-02) (FF-03) WARDROBE 1 DETAILS & BEDROOM 3 (FF-04) WARDROBE 1 DETAILS
TS-11.26	TYPICAL COUNTER TOP KITCHENETTE (FF-16&FF-17) DETAILS & ENTRANCE WATER FEATURE DETAILS

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LIST OF DRAWING

ARCHITECTURAL

DRAWING NO.

DESCRIPTION

HIGH COMMISSIONER'S RESIDENCE (cont'd)

AR-1693/Indian HighCom/High Commissioner's Residence/	TS-11.27	TV CABINET DETAILS (FF-01)
	TS-11.28	GUARD POST DETAIL
	TS-11.29	REFLECTIVE POOL DETAILS
	TS-11.30	FLAGPOLE DETAILS
	TS-11.31	CARPORCH FEATURE WALL DETAILS
	TS-11.32	GLAZING WORKS SPOT DETAILS (01-10)
	TS-11.33	GLAZING WORKS SPOT DETAILS (11-18)
	TS-11.34	GUARD POST COUNTER DETAIL

CHANCERY COMPLEX

AR-1693/Indian HighCom/India Chancery Complex/	TS-1.00	TITLE PAGE
	TS-1.01	LOCATION PLAN, TOPOGRAPHICAL SURVEY, RC DRAIN & WINGWALL DETAILS
	TS-1.02	SITE DEVELOPMENT PLAN
	TS-1.03	SITE DEVELOPMENT PLAN (FENCE LAYOUT PLAN)
	TS-2.01	LOWER GROUND FLOOR PLAN (KEY PLAN)
	TS-2.02	GROUND FLOOR PLAN (KEY PLAN)
	TS-2.03	GROUND FLOOR PLAN – A
	TS-2.04	GROUND FLOOR PLAN – B
	TS-2.05	GROUND FLOOR PLAN – C
	TS-2.06	GROUND FLOOR PLAN – D
	TS-2.07	1 ST FLOOR PLAN (KEY PLAN)
	TS-2.08	1 ST FLOOR PLAN – A
	TS-2.09	1 ST FLOOR PLAN – B
	TS-2.10	1 ST FLOOR PLAN – C
	TS-2.11	1 ST FLOOR PLAN – D
	TS-2.12	ROOF PLAN (KEY PLAN)
	TS-2.13	ROOF PLAN – A
	TS-2.14	ROOF PLAN – B
	TS-2.15	ROOF PLAN – C
	TS-2.16	ROOF PLAN – D
	TS-2.17	GROUND FLOOR CEILING PLAN (KEY PLAN)
	TS-2.18	GROUND FLOOR REFLECTED CEILING PLAN – A
	TS-2.19	GROUND FLOOR REFLECTED CEILING PLAN – B

LIST OF DRAWING

ARCHITECTURAL

DRAWING NO.

DESCRIPTION

CHANCERY COMPLEX (cont'd)

AR-1693/Indian HighCom/India Chancery Complex/

TS-2.20	GROUND FLOOR REFLECTED CEILING PLAN – C
TS-2.21	GROUND FLOOR REFLECTED CEILING PLAN – D
TS-2.22	1 ST FLOOR CEILING PLAN – (KEY PLAN)
TS-2.23	1 ST FLOOR REFLECTED CEILING PLAN – A
TS-2.24	1 ST FLOOR REFLECTED CEILING PLAN – B
TS-2.25	1 ST FLOOR REFLECTED CEILINGPLAN – C
TS-2.26	1 ST FLOOR REFLECTED CEILING PLAN – D
TS-3.01	SECTION A-A & SECTION B-B
TS-3.02	SECTION C-C
TS-3.03	SECTION D-D & SECTION E-E
TS-4.01	ELEVATION A & ELEVATION B
TS-4.02	ELEVATION C & ELEVATION D
TS-4.03	ELEVATION E
TS-4.04	ELEVATION F
TS-5.01	DOORS SCHEDULE
TS-5.02	WINDOWS SCHEDULE (1 OF 5)
TS-5.03	WINDOWS SCHEDULE (2 OF 5)
TS-5.04	WINDOWS SCHEDULE (3 OF 5)
TS-5.05	WINDOWS SCHEDULE (4 OF 5)
TS-5.06	WINDOWS SCHEDULE (5 OF 5)
TS-5.07	DECORATIVE SCREEN SCHEDULE
TS-5.08	DAYLIGHT, VENTILATION TABULATIONS
TS-7.01	SANITARY SCHEDULES (1 OF 4)
TS-7.02	SANITARY SCHEDULES (2 OF 4)
TS-7.03	SANITARY SCHEDULES (3 OF 4)
TS-7.04	SANITARY SCHEDULES (4 OF 4)
TS-8.01	FINISHES SCHEDULES
TS-9.01	IRONMONGERY SCHEDULES (1 OF 2)
TS-9.02	IRONMONGERY SCHEDULES (2 OF 2)
TS-11.01	PERIMETER FENCE – 1A PLAN & ELEVATIONS, SECTIONS AND DETAIL
TS-11.02	PERIMETER FENCE – 1B PLAN & ELEVATIONS AND DETAILS
TS-11.03	PERIMETER FENCE – 1C PLAN & ELEVATION D AND SECTION T-T

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LIST OF DRAWING

ARCHITECTURAL

DRAWING NO.

DESCRIPTION

CHANCERY COMPLEX (cont'd)

AR-1693/Indian HighCom/India Chancery Complex/

TS-11.04	PERIMETER FENCE – 1C ELEVATION E (INSIDE) AND GATE DETAILS
TS-11.05	PERIMETER FENCE – 1D PLAN, ELEVATION F AND SECTION T-T
TS-11.06	ELECTRICAL SUBSTATION PLANS, SECTIONS & ELEVATIONS
TS-11.07	DOORS & WINDOWS SCHEDULE, DAYLIGHT & VENTILATION TABULATIONS
TS-11.08	DETAILS
TS-11.09	TOILET DETAIL 01 (GF-06, GF-07)
TS-11.10	TOILET DETAIL 01 (GF-06, GF-07)
TS-11.11	TOILET DETAIL 02 (GF-33, GF-34)
TS-11.12	TOILET DETAIL 02 (GF-33, GF-34)
TS-11.13	WC-3 (GF-37) & WC-4 (GF-38) DETAILS
TS-11.14	WC-5 (GF-40) & WC-6 (GF-42) DETAILS, WC-7 (GF-24) DETAILS
TS-11.15	FEMALE WC (1F-05) & MALE WC (1F-06)
TS-11.16	TOILET (1F-17) DETAIL
TS-11.17	PANTRY DETAIL (GF-11), PANTRY 1 & 2 DETAIL (1F-07 & 1F-20)
TS-11.18	COUNTER TOP DETAILS (GF-11, 1F-07 & 1F-20)
TS-11.19	STAIRCASE 01 DETAILS, SECTIONAL ELEVATIONS OF STAIRCASE 01
TS-11.20	STAIRCASE 02 DETAILS, SECTIONAL ELEVATIONS OF STAIRCASE 02
TS-11.21	BAY SECTIONS (1 OF 2)
TS-11.22	BAY SECTIONS (2 OF 2) & SEATING DETAILS
TS-11.23	EXTERNAL STAIRWAY DETAIL
TS-11.24	MISCELLANEOUS DETAILS
TS-11.25	GLAZING WORKS SPOT DETAILS (01-08)
TS-11.26	GLAZING WORKS SPOT DETAILS (09-16)
TS-11.27	GLAZING WORKS SPOT DETAILS 917-22)
TS-11.28	GUARD POST DETAILS (2 NOS.)
TS-11.29	FEATURE WALL DETAILS & HANDICAP RAMP DETAILS
TS-11.30	WATER FEATURE DETAILS
TS-11.31	REFLECTIVE POOL DETAILS
TS-11.32	CARPORCH FEATURE WALL DETAILS
TS-11.33	MULTI-PURPOSE HALL CEILING DETAILS
TS-11.34	GUARD POST COUNTER DETAILS (2 NOS.)
TS-11.35	GUARD OFFICE COUNTER DETAILS

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LIST OF DRAWING

ARCHITECTURAL

DRAWING NO.

DESCRIPTION

RG STAFF RESIDENCE

AR-1693/Indian HighCom/RG Staff Residence/

TS-1.00	TITLE PAGE
TS-1.01	SITE DEVELOPMENT PLAN / KEY PLAN
TS-2.01	GROUND FLOOR PLANS
TS-2.02	1 ST FLOOR PLAN
TS-2.03	2 ND FLOOR PLAN
TS-2.04	ROOF PLAN
TS-2.05	GROUND FLOOR REFLECTED CEILING PLANS
TS-2.06	1 ST FLOOR REFLECTED CEILING PLANS
TS-2.07	2 ND FLOOR REFLCETED CEILING PLAN
TS-3.01	SECTION K-K & SECTION J-J
TS-4.01	ELEVATION K & ELEVATION L
TS-4.02	ELEVATION M & ELEVATION N
TS-5.01	DOORS SCHEDULE
TS-5.02	WINDOWS SCHEDULE
TS-5.03	DECORATIVE SCREEN SCHEDULES
TS-5.04	DAYLIGHT, VENTILATION & TABULATIONS
TS-7.01	SANITARY SCHEDULE (1 OF 3)
TS-7.02	SANITARY SCHEDULE (2 OF 3)
TS-7.03	SANITARY SCHEDULE (3 OF 3)
TS-8.01	SCHEDULE OF FINISHES
TS-9.01	IRONMONGERY SCHEDULE
TS-11.01	TYPICAL TOILET 01 (GF-05, 1F-07 & 2F-09) DETAILS, TOILET (1F-07) DETAILS
TS-11.02	TOILET 02 DETAILS (2F-06), TOILET 03 DETAILS (2F-07) POWDER ROOM DETAILS (1F-08)
TS-11.03	KITCHEN (GF-04) DETAILS, KITCHEN CABINET DETAILS
TS-11.04	KITCHEN (1F-10) DETAILS, KITCHEN COUNTER DETAILS
TS-11.05	PANTRY (1F-11) DETAILS, PANTRY CABINET DETAILS

LIST OF DRAWING

ARCHITECTURAL

DRAWING NO.

DESCRIPTION

RG STAFF RESIDENCE

AR-1693/Indian HighCom/RG Staff Residence/

TS-11.06	TYPICAL DETAIL OF STAIRCASE, SECTION DETAIL
TS-11.07	MISCELLANEOUS DETAILS
TS-11.08	BEDROOM (GF-03), (1F-04), (2F-05) & MASTER'S BEDROOM (2F-02) WARDROBE 1 DETAILS & MASTER'S BEDROOM (2F- 02) WARDROBE 2 DETAILS
TS-11.09	TYPICAL DETAIL OF WALKWAY
TS-11.10	GLAZING WORKS SPOT DETAILS (01-10)
TS-11.11	GLAZING WORKS SPOT DETAILS (01-10)

NRG STAFF RESIDENCE

AR-1693/Indian HighCom/NRG Staff Residence/

TS-1.00	TITLE PAGE
TS-1.01	SITE DEVELOPMENT PLAN / KEY PLAN
TS-2.01	GROUND FLOOR PLAN
TS-2.02	TYPICAL 1 ST & 2 ND FLOOR PLANS
TS-2.03	3 RD FLOOR PLAN
TS-2.04	ROOF PLAN
TS-2.05	GROUND FLOOR CEILING PLAN
TS-2.06	TYPICAL 1 ST & 2 ND FLOOR CEILING PLANS
TS-2.07	3 RD FLOOR CEILING PLAN
TS-3.01	SECTION G-G & SECTION H-H
TS-4.01	ELEVATION G & ELEVATION H
TS-4.02	ELEVATION I & ELEVATION J
TS-5.01	DOOR SCHEDULE
TS-5.02	WINDOW SCHEDULE
TS-5.03	DECORATIVE SCREEN SCHEDULE
TS-5.04	DAYLIGHT & VENTILATION TABULATIONS
TS-7.01	SANITARY SCHEDULE (1 OF 2)
TS-7.02	SANITARY SCHEDULE (2 OF 2)
TS-8.01	FINISHES SCHEDULE

LIST OF DRAWING

ARCHITECTURAL

DRAWING NO.

DESCRIPTION

NRG STAFF RESIDENCE (cont'd)

AR-1693/Indian HighCom/NRG Staff Residence/

TS-9.01	IRONMONGERIES SCHEDULE (1 OF 2)
TS-9.02	IRONMONGERIES SCHEDULE (2 OF 2)
TS-11.01	DETAIL OF WC (GF-02) DETAIL, TYPICAL WC-02 (1F-07 & 2F-07) DETAILS
TS-11.02	TYPICAL POWDER RM .(1F-06 & 2F-06) DETAIL, TYPICAL WC-01 (1F-04 & 2F-04)
TS-11.03	WC-01 (3F-03) & POWDER RM (3F-04) DETAIL
TS-11.04	WC-03 (3F-10) & WC-04 (3F-23) DETAIL, WC-02 (3F-10) DETAIL
TS-11.05	WC-05 (3F-15) DETAIL
TS-11.06	DETAIL OF STAIRCASE (1 OF 2)
TS-11.07	DETAIL OF STAIRCASE (2 OF 2)
TS-11.08	KITCHEN (GF-01) DETAIL, COUNTER DETAILS
TS-11.09	TYPICAL KITCHEN (1F-05 & 2F-05) DETAILS, KITCHEN (3F-05) DETAILS
TS-11.10	COUNTER 1 & 2 DETAILS FOR KITCHEN (1F-05, 2F-05 & 3F-05)
TS-11.11	MISCELLANEOUS DETAILS
TS-11.12	BEDROOM (GF-03), (1F-08), (1F-09), (3F-11), (3F-14), (3F-16) MASTER'S BEDROOM (1F-03), WARDROBE 1 DETAILS & MASTER'S BEDROOM (3F-09) WARDROBE 2 DETAILS
TS-11.13	CARPARK FEATURE WALL DETAILS
TS-11.14	GLAZING WORKS SPOT DETAILS (01-10)
TS-11.15	GLAZING WORKS SPOT DETAILS (11-15)

LIST OF DRAWING

CIVIL & STRUCTURAL

<u>DRAWING NO.</u>	<u>DESCRIPTION</u>
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HIGH COMMISSIONER'S RESIDENCE

OA344-COVER PAGE	COVER PAGE
OA344-DRAWING LIST-01	DRAWING LIST
OA344-DRAWING LIST-02	DRAWING LIST
OA344-DRAWING LIST-03	DRAWING LIST
OA344-DRAWING LIST-04	DRAWING LIST
OA344-GENERAL NOTES	GENERAL NOTES

KEY PLAN

OA344-HCR-KYP-01	FOUNDATION PLAN
OA344-HCR-KYP-02	GROUND FLOOR PLAN
OA344-HCR-KYP-03	FIRST FLOOR PLAN & MEZZANINE FLOOR PLAN
OA344-HCR-KYP-04	ROOF PLAN

DETAILS

OA344-HCR-PILECAP-01	PILECAP DETAILS
OA344-HCR-COL-01	COLUMN DETAILS
OA344-HCR-STAR-01	STAR 1 DETAILS
OA344-HCR-STAR-02	STAR 2 DETAILS
OA344-HCR-MSC-01	MISCELLANEOUS DETAILS
OA344-HCR-MSC-01	MISCELLANEOUS DETAILS

GROUND FLOOR BEAM DETAILS

OA344-HCR-GB-01	GROUND FLOOR BEAMS DETAILS
OA344-HCR-GB-02	GROUND FLOOR BEAMS DETAILS
OA344-HCR-GB-03	GROUND FLOOR BEAMS DETAILS
OA344-HCR-GB-04	GROUND FLOOR BEAMS DETAILS
OA344-HCR-GB-05	GROUND FLOOR BEAMS DETAILS
OA344-HCR-GB-06	GROUND FLOOR BEAMS DETAILS
OA344-HCR-GB-07	GROUND FLOOR BEAMS DETAILS

GROUND FLOOR SLAB DETAILS

OA344-HCR-GS-01	GROUND FLOOR SLABS DETAILS
OA344-HCR-GS-02	GROUND FLOOR SLABS DETAILS
OA344-HCR-GS-03	GROUND FLOOR SLABS DETAILS
OA344-HCR-GS-04	GROUND FLOOR SLABS DETAILS
OA344-HCR-GS-05	GROUND FLOOR SLABS DETAILS

LIST OF DRAWING

CIVIL & STRUCTURAL

DRAWING NO.

DESCRIPTION

HIGH COMMISSIONER'S RESIDENCE (cont'd)

FIRST FLOOR BEAM DETAILS

OA344-HCR-FB-01	FIRST FLOOR BEAMS DETAILS
OA344-HCR-FB-02	FIRST FLOOR BEAMS DETAILS
OA344-HCR-FB-03	FIRST FLOOR BEAMS DETAILS
OA344-HCR-FB-04	FIRST FLOOR BEAMS DETAILS

FIRST FLOOR SLAB DETAILS

OA344-HCR-FS-01	FIRST FLOOR SLABS DETAILS
OA344-HCR-FS-02	FIRST FLOOR SLABS DETAILS

MEZZANINE FLOOR BEAM DETAILS

OA344-HCR-MEZ-01	MEZZANINE FLOOR BEAMS DETAILS
OA344-HCR-MEZ-02	MEZZANINE FLOOR BEAMS DETAILS

MEZZANINE FLOOR SLAB DETAILS

OA344-HCR-MS-01	MEZZANINE FLOOR SLAB DETAILS
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ROOF BEAM DETAILS

OA344-HCR-RB-01	ROOF BEAMS DETAILS
OA344-HCR-RB-02	ROOF BEAMS DETAILS
OA344-HCR-RB-03	ROOF BEAMS DETAILS

ROOF SLAB DETAILS

OA344-HCR-RS-01	ROOF SLABS DETAILS
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ROOF TRUSS DETAILS

OA344-HCR-RT-01	ROOF TRUSS DETAILS
OA344-HCR-RT-02	ROOF TRUSS DETAILS

FENCE DETAILS

OA344-HCR-FENC-DET-01	FENCE LAYOUT PLAN
OA344-HCR-FENC-DET-02	FENCE DETAILS
OA344-HCR-FENC-DET-03	FENCE DETAILS
OA344-HCR-FENC-DET-04	FENCE DETAILS
OA344-HCR-FENC-DET-05	FENCE DETAILS

LIST OF DRAWING

CIVIL & STRUCTURAL

DRAWING NO.

DESCRIPTION

CHANCERY COMPLEX

KEY PLAN

OA344-CC-KYP-01	FOUNDATION PLAN
OA344-CC-KYP-02	GROUND FLOOR PLAN
OA344-CC-KYP-03	FIRST FLOOR PLAN
OA344-CC-KYP-04	ROOF PLAN
OA344-CC-KYP-05	BASEMENT PLAN

KEYPLAN REBARS

OA344-CC-GRD-TOP-01	GROUND FLOOR SLAB PLAN FOR TOP REBARS
OA344-CC-GRD-BOT-01	GROUND FLOOR SLAB PLAN FOR BOTTOM REBARS
OA344-CC-F01-TOP-01	FIRST FLOOR SLAB PLAN FOR TOP REBARS
OA344-CC-F01-BOT-01	FIRST FLOOR SLAB PLAN FOR BOTTOM REBARS
OA344-CC-RRF-TOP-01	ROOF SLAB PLAN FOR TOP REBARS
OA344-CC-RRF-BOT-01	ROOF SLAB PLAN FOR BOTTOM REBARS

DETAILS

OA344-CC-PILECAP-DET-01	PILECAP DETAILS
QA344-CC-COL-01	COLUMN DETAILS
QA344-CC-COL-02	COLUMN DETAILS
QA344-CC-COL-03	COLUMN DETAILS
QA344-CC-LIFT-01	LIFT 1 DETAILS
QA344-CC-STAIR-01	STAIR 1 DETAILS
QA344-CC-STAIR-02	STAIR 2 DETAILS
QA344-CC-LR-01	LOWER ROOF TRUSS DETAILS
QA344-CC-TR-01	UPPER ROOF TRUSS DETAILS

BASEMENT BEAM DETAILS

OA344-CC-BA-01	BASEMENT BEAMS DETAILS
OA344-CC-BA-02	BASEMENT BEAMS DETAILS

GROUND FLOOR BEAM DETAILS

OA344-CC-GGR-01	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-02	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-03	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-04	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-05	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-06	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-07	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-08	GROUND FLOOR BEAMS DETAILS

LIST OF DRAWING

CIVIL & STRUCTURAL

DRAWING NO.

DESCRIPTION

CHANCERY COMPLEX (cont'd)

GROUND FLOOR BEAM DETAILS

OA344-CC-GGR-09	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-10	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-11	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-12	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-13	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-14	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-15	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-16	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-17	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-18	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-19	GROUND FLOOR BEAMS DETAILS
OA344-CC-GGR-20	GROUND FLOOR BEAMS DETAILS

FIRST FLOOR BEAM DETAILS

OA344-CC-F01-01	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-02	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-03	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-04	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-05	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-06	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-07	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-08	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-09	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-10	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-11	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-12	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-13	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-14	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-15	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-16	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-17	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-18	FIRST FLOOR BEAMS DETAILS
OA344-CC-F01-19	FIRST FLOOR BEAMS DETAILS

ROOF BEAM DETAILS

OA344-CC-RRF-01	ROOF BEAMS DETAILS
OA344-CC-RRF-02	ROOF BEAMS DETAILS
OA344-CC-RRF-03	ROOF BEAMS DETAILS
OA344-CC-RRF-04	ROOF BEAMS DETAILS
OA344-CC-RRF-05	ROOF BEAMS DETAILS

LIST OF DRAWING

CIVIL & STRUCTURAL

DRAWING NO.

DESCRIPTION

RG RESIDENCE

KEYPLAN

OA344-RG-KYP-01	FOUNDATION PLAN & GROUND FLOOR PLAN
OA344-RG-KYP-02	FIRST & SECOND FLOOR PLAN
OA344-RG-KYP-03	ROOF PLAN

DETAILS

OA344-RG-PILECAP-01	PILECAP DETAILS
OA344-RG-COL-01	COLUMN DETAILS
OA344-RG-STAR-01	STAR 1 & 2 DETAILS
OA344-RG-RT-01	ROOF TRUSS DETAILS

GROUND FLOOR BEAM DETAILS

OA344-RG-GB-01	GROUND FLOOR BEAMS DETAILS
OA344-RG-GB-02	GROUND FLOOR BEAMS DETAILS

GROUND FLOOR SLAB DETAILS

OA344-RG-GS-01	GROUND FLOOR SLABS DETAILS
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FIRST FLOOR BEAM DETAILS

OA344-RG-F01-01	FIRST FLOOR BEAMS DETAILS
OA344-RG-F01-02	FIRST FLOOR BEAMS DETAILS

FIRST FLOOR SLAB DETAILS

OA344-RG-FS-01	FIRST FLOOR SLABS DETAILS
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SECOND FLOOR BEAM DETAILS

OA344-RG-F02-01	SECOND FLOOR BEAMS DETAILS
OA344-RG-F02-02	SECOND FLOOR BEAMS DETAILS

SECOND FLOOR SLAB DETAILS

OA344-RG-SS-01	SECOND FLOOR SLAB DETAILS
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ROOF BEAM DETAILS

OA344-RG-RRF-01	ROOF BEAMS DETAILS
OA344-RG-RRF-02	ROOF BEAMS DETAILS
OA344-RG-RRF-03	ROOF BEAMS DETAILS

LIST OF DRAWING

CIVIL & STRUCTURAL

DRAWING NO.

DESCRIPTION

RG RESIDENCE (cont'd)

ROOF SLAB DETAILS

OA344-RG-RS-01

ROOF FLOOR SLABS DETAILS

NON-RG RESIDENCE

KEYPLAN

OA344-NRG-KYP-01

FOUNDATION PLAN & GROUND FLOOR PLAN

OA344-NRG-KYP-02

FIRST & SECOND FLOOR PLAN

OA344-NRG-KYP-03

THIRD FLOOR & ROOF PLAN

DETAILS

OA344-NRG-PILECAP-01

PILECAP DETAILS

OA344-NRG-COLUMN-01

COLUMN DETAILS

OA344-NRG-STAR-01

STAR 1 & 2 DETAILS

OA344-NRG-RT-01

ROOF TRUSS DETAILS

GROUND FLOOR BEAM DETAILS

OA344-NRG-GB-01

GROUND FLOOR BEAMS DETAILS

OA344-NRG-GB-02

GROUND FLOOR BEAMS DETAILS

GROUND FLOOR SLAB DETAILS

OA344-NRG-GS-01

GROUND FLOOR SLABS DETAILS

FIRST FLOOR BEAM DETAILS

OA344-NRG-F01-01

FIRST FLOOR BEAMS DETAILS

OA344-NRG-F01-02

FIRST FLOOR BEAMS DETAILS

FIRST FLOOR SLAB DETAILS

OA344-NRG-FS-01

FIRST FLOOR SLAB DETAILS

SECOND FLOOR BEAM DETAILS

OA344-NRG-F02-01

SECOND FLOOR BEAMS DETAILS

OA344-NRG-F02-02

SECOND FLOOR BEAMS DETAILS

LIST OF DRAWING

CIVIL & STRUCTURAL

DRAWING NO.

DESCRIPTION

NON-RG RESIDENCE (cont'd)

SECOND FLOOR SLAB DETAILS

OA344-NRG-SS-01 SECOND FLOOR SLAB DETAILS

THIRD FLOOR BEAM DETAILS

OA344-NRG-F03-01 THIRD FLOOR BEAMS DETAILS
OA344-NRG-F03-02 THIRD FLOOR BEAMS DETAILS

THIRD FLOOR SLAB DETAILS

OA344-NRG-TS-01 THIRD FLOOR SLAB DETAILS

ROOF BEAM DETAILS

OA344-NRG-RRF-01 ROOF BEAMS DETAILS
OA344-NRG-RRF-02 ROOF BEAMS DETAILS
OA344-NRG-RRF-03 ROOF BEAMS DETAILS

INFRA & CIVIL WORKS

SITE PLAN

OA344-CIV-HC-SW-SP-01B SITE PLAN – SEWERAGE LAYOUT
OA344-CIV-HC-WS-SP-01B SITE PLAN – WATER SUPPLY LAYOUT
OA344-CIV-HC-RD-SP-01C SITE PLAN – ROAD AND DRAINAGE LAYOUT

DETAIL OF DRAINAGE WORKS

OA344-CIV-DN-DET-01 DETAIL OF DRAINAGE WORKS – SHEET 1

DETAIL OF EARTH WORKS

OA344-CIV-EW-SEC-01 EARTHWORKS – LONGITUDINAL SECTION 01
OA344-CIV-EW-DET-01 TYPICAL DETAIL OF WASH DAY & MISCELLANEOUS
DETAILS
OA344-CIV-EW-DET-02 DETAIL OF SLOPE PROTECTION
OA344-CIV-EW-DET-03 DETAIL OF SLOPE PROTECTION

LIST OF DRAWING

CIVIL & STRUCTURAL

DRAWING NO.

DESCRIPTION

INFRA & CIVIL WORKS (cont'd)

DETAIL OF ROAD WORKS

OA344-CIV-RW-DET-01	TYPICAL SECTION DETAIL OF ROAD – SHEET 01
OA344-CIV-RW-DET-02	TYPICAL SECTION DETAIL OF ROAD – SHEET 02

DETAIL OF SEWERAGE WORKS

OA344-CIV-SW-DET-01	DETAIL OF SEWERAGE WORKS - SHEET 01
OA344-CIV-SW-DET-02	DETAIL OF SEWERAGE WORKS - SHEET 02
OA344-CIV-SW-DET-03	DETAIL OF SEWERAGE WORKS - SHEET 03
OA344-CIV-SW-DET-04	DETAIL OF SEWERAGE WORKS - SHEET 04
OA344-CIV-SW-LS-01A	MANHOLES SECTION DIAGRAM 01

DETAIL OF WATER WORKS

OA344-CIV-WS-DET-01	DETAIL OF WATER WORKS - SHEET 01
OA344-CIV-WS-DET-02	DETAIL OF WATER WORKS - SHEET 02
OA344-CIV-WS-DET-03	DETAIL OF WATER WORKS - SHEET 03

GUARD HOUSE

OA344-CC-GH-KYP-01	FOUNDATION, GROUND & ROOF PLAN
OA344-CC-GH-DET-01	PILECAP DETAILS & COLUMN SCHEDULE
OA344-CC-GH-DET-02	GROUND FLOOR BEAM, ROOF BEAM & SLAB DETAILS

SUBSTATION

OA344-SS-KYP-01	FOUNDATION, GROUND & ROOF PLAN
OA344-SS-DET-01	PILECAP DETAILS & COLUMN SCHEDULE
OA344-SS-GB-01	GROUND FLOOR BEAM DETAILS
OA344-SS-GB-02	GROUND FLOOR BEAM & SLAB DETAILS
OA344-SS-RB-01	ROOF BEAM DETAILS
OA344-SS-RB-02	ROOF BEAM & SLAB DETAILS

LIST OF DRAWING

MECHANICAL & ELECTRICAL

<u>DRAWING NO.</u>	<u>DESCRIPTION</u>
<u>HIGH COMMISSIONER'S RESIDENCE</u>	
LKA/RES/001/EL-101	EXTERNAL LIGHTING LAYOUT – SITE DEVELOPMENT PLAN AND LIGHTING & POWER LAYOUT FOR GUARD HOUSE
LKA/RES/001/EL-201	LIGHTING LAYOUT – GROUND FLOOR PLAN
LKA/RES/001/EL-202	LIGHTING LAYOUT – FIRST FLOOR PLAN
LKA/RES/001/EP-201	POWER LAYOUT – GROUND FLOOR PLAN
LKA/RES/001/EP-202	POWER LAYOUT – FIRST FLOOR PLAN
LKA/RES/001/SL-301	SINGLE LINE DIAGRAMS – 1
LKA/RES/001/SL-302	SINGLE LINE DIAGRAMS – 2
LKA/RES/001/TEL-101	EXTERNAL TELEPHONE LAYOUT – SITE DEVELOPMENT PLAN
LKA/RES/001/TEL-201	TELEPHONE LAYOUT – GROUND FLOOR PLAN
LKA/RES/001/TEL-202	TELEPHONE LAYOUT – FIRST FLOOR PLAN
LKA/RES/001/TEL-301	TELEPHONE LAYOUT – GUARD HOUSE, SCHEMATIC DIAGRAM AND CJB-1 DETAILS
LKA/RES/001/TEL-302	STANDARD DETAILS TELEPHONE FOOTWAY JUNCTION BOX NO. 3 (FJB-3)
LKA/RES/001/SC-201	SECURITY SYSTEM LAYOUT – GROUND FLOOR PLAN AND SCHEMATIC DIAGRAM
LKA/RES/001/TV-201	MATV LAYOUT – GROUND FLOOR PLAN
LKA/RES/001/TV-202	MATV LAYOUT – FIRST FLOOR PLAN AND SCHEMATIC DIAGRAM
LKA/RES/001/AC-201	A/C & VENTILATION LAYOUT – GROUND FLOOR PLAN
LKA/RES/001/AC-202	A/C & VENTILATION LAYOUT – FIRST FLOOR PLAN AND GUARD HOUSE

LIST OF DRAWING

MECHANICAL & ELECTRICAL

<u>DRAWING NO.</u>	<u>DESCRIPTION</u>
<u>HIGH COMMISSIONER'S RESIDENCE (cont'd)</u>	
LKA/RES/001/PL-101	WATER LAYOUT – SITE DEVELOPMENT PLAN
LKA/RES/001/PL-201	WATER LAYOUT – GROUND FLOOR PLAN
LKA/RES/001/PL-202	WATER LAYOUT – FIRST FLOOR PLAN AND GUARD HOUSE
LKA/RES/001/PL-301	WATER SCHEMATIC & STANDARD DETAILS – 1
LKA/RES/001/PL-302	STANDARD DETAILS – 2
LKA/RES/001/PL-303	STANDARD DETAILS – 3
LKA/RES/001/SN-201	SANITARY LAYOUT – SITE DEVELOPMENT PLAN / GROUND FLOOR PLAN
LKA/RES/001/SN-202	SANITARY LAYOUT – FIRST FLOOR PLAN
LKA/RES/001/SN-301	SANITARY SCHEMATIC DIAGRAMS
LKA/RES/001/SN-302	MISCELLANEOUS DETAILS – 1
LKA/RES/001/SN-303	MISCELLANEOUS DETAILS - 2

CHANCERY COMPLEX

LKA/IND/001/LV-101	LV CABLE ROUTE LAYOUT – SITE DEVELOPMENT PLAN
LKA/IND/001/EL-101	EXTERNAL LIGHTING LAYOUT – SITE DEVELOPMENT PLAN
LKA/IND/001/EL-201	LIGHTING LAYOUT – GROUND FLOOR PLAN
LKA/IND/001/EL-202	LIGHTING LAYOUT – FIRST FLOOR PLAN
LKA/IND/001/EL-203	RESIDENCE HOUSE BLOCK A LIGHTING LAYOUT – FLOOR PLANS
LKA/IND/001/EL-204	RESIDENCE HOUSE BLOCK B LIGHTING LAYOUT – FLOOR PLANS
LKA/IND/001/EP-201	POWER LAYOUT – GROUND FLOOR PLAN
LKA/IND/001/EP-202	POWER LAYOUT – FIRST FLOOR PLAN

LIST OF DRAWING

MECHANICAL & ELECTRICAL

<u>DRAWING NO.</u>	<u>DESCRIPTION</u>
<u>CHANCERY COMPLEX (cont'd)</u>	
LKA/IND/001/EP-203	RESIDENCE HOUSE BLOCK A POWER LAYOUT – FLOOR PLANS
LKA/IND/001/EP-204	RESIDENCE HOUSE BLOCK B POWER LAYOUT – FLOOR PLANS
LKA/IND/001/SL-201	SINGLE LINE DIAGRAMS – 1
LKA/IND/001/SL-202	SINGLE LINE DIAGRAMS – 2
LKA/IND/001/SL-203	SINGLE LINE DIAGRAMS – 3
LKA/IND/001/SL-204	SINGLE LINE DIAGRAMS – 4
LKA/IND/001/SL-205	SINGLE LINE DIAGRAMS – 5
LKA/IND/001/SL-206	SINGLE LINE DIAGRAMS – 6
LKA/IND/001/TEL-101	EXTERNAL TELEPHONE LAYOUT – SITE DEVELOPMENT PLAN
LKA/IND/001/TEL-201	TELEPHONE & COMPUTER LAYOUT – GROUND FLOOR PLAN
LKA/IND/001/TEL-202	TELEPHONE & COMPUTER LAYOUT – FIRST FLOOR PLAN AND SCHEMATIC DIAGRAM
LKA/IND/001/TEL-203	RESIDENCE HOUSE BLOCK A TELEPHONE LAYOUT – FLOOR PLANS
LKA/IND/001/TEL-204	RESIDENCE HOUSE BLOCK B TELEPHONE LAYOUT – FLOOR PLANS AND SCHEMATIC DIAGRAM
LKA/IND/001/TEL-301	STANDARD DETAIL TELEPHONE FOOTWAY JUNCTION BOX NO. 3 (FJB-3)
LKA/IND/001/AV-201	AUDIO VISUAL LAYOUT – GROUND FLOOR PLAN
LKA/IND/001/SC-201	SECURITY SYSTEM LAYOUT – GROUND FLOOR PLAN AND SCHEMATIC DIAGRAM
LKA/IND/001/LF-201	LIFT INSTALLATION AND DETAILS
LKA/IND/001/FA-201	FIRE ALARM LAYOUT – GROUND FLOOR PLAN
LKA/IND/001/FA-202	FIRE ALARM LAYOUT – FIRST FLOOR PLAN AND SCHEMATIC DIAGRAM

LIST OF DRAWING

MECHANICAL & ELECTRICAL

<u>DRAWING NO.</u>	<u>DESCRIPTION</u>
<u>CHANCERY COMPLEX (cont'd)</u>	
LKA/IND/001/FA-203	RESIDENCE HOUSE BLOCK A FIRE ALARM LAYOUT – FLOOR PLANS
LKA/IND/001/FA-204	RESIDENCE HOUSE BLOCK B FIRE ALARM LAYOUT – FLOOR PLANS
LKA/IND/001/AC-201	A/C & VENTILATION LAYOUT – GROUND FLOOR PLAN
LKA/IND/001/AC-202	A/C & VENTILATION LAYOUT – FIRST FLOOR PLAN
LKA/IND/001/AC-203	A/C & VENTILATION LAYOUT – ROOF DECK PLAN
LKA/IND/001/AC-204	RESIDENCE HOUSE BLOCK A A/C & VENTILATION LAYOUT FLOOR PLANS
LKA/IND/001/AC-205	RESIDENCE HOUSE BLOCK B A/C & VENTILATION LAYOUT FLOOR PLANS
LKA/IND/001/AC-301	SCHEMATIC & MISCELLANEOUS DETAILS
LKA/IND/001/AC-302	SECTION FOR SUPPLY AIR DUCT
LKA/IND/001/FHR-201	FIRE HOSEREEL LAYOUT – GROUND & FIRST FLOOR PLANS
LKA/IND/001/FHR-301	FIRE HOSEREEL SYSTEM EQUIPMENT & PIPING – ENLARGED PLAN AND EQUIPMENT SCHEDULES
LKA/IND/001/FHR-302	FIRE HOSEREEL SYSTEM SCHEMATIC DIAGRAM AND MISCELLANEOUS DETAIL
LKA/IND/001/PL-101	PLUMBING LAYOUT – SITE DEVELOPMENT PLAN & PUMP ROOM LAYOUT
LKA/IND/001/PL-201	PLUMBING LAYOUT – GROUND FLOOR PLAN PART 1 OF 2
LKA/IND/001/PL-202	PLUMBING LAYOUT – GROUND FLOOR PLAN PART 2 OF 2
LKA/IND/001/PL-203	RESIDENCE HOUSE BLOCK A PLUMBING LAYOUT FLOOR PLANS
LKA/IND/001/PL-204	RESIDENCE HOUSE BLOCK B PLUMBING LAYOUT FLOOR PLANS

LIST OF DRAWING

MECHANICAL & ELECTRICAL

<u>DRAWING NO.</u>	<u>DESCRIPTION</u>
<u>CHANCERY COMPLEX (cont'd)</u>	
LKA/IND/001/PL-205	PLUMBING LAYOUT FIRST FLOOR PLAN OF CHANCERY BUILDING
LKA/IND/001/PL-301	PLUMBING SCHEMATIC DIAGRAM PART 1 OF 2
LKA/IND/001/PL-302	PLUMBING LAYOUT SCHEMATIC DIAGRAM PART 3 AND WATER DEMAND
LKA/IND/001/PL-303	DOMESTIC WATER SYSTEM EQUIPMENT & PIPING ENLARGED PLAN & EQUIPMENT SCHEDULES
LKA/IND/001/PL-304	MISCELLANEOUS DETAIL
LKA/IND/001/PL-305	MISCELLANEOUS DETAIL
LKA/IND/001/PL-306	MISCELLANEOUS DETAIL
LKA/IND/001/SN-101	SANITARY LAYOUT – SITE DEVELOPMENT PLAN
LKA/IND/001/SN-201	SANITARY LAYOUT – GROUND FLOOR PLAN
LKA/IND/001/SN-202	SANITARY LAYOUT – FIRST FLOOR PLAN, CONSULAR BLDG. AND GUARD HOUSE FLOOR PLANS
LKA/IND/001/SN-203	SANITARY LAYOUT – GROUND FLOOR PLAN & TYP. FIRST AND SECOND FLOOR PLAN (RESIDENCE HOUSE BLOCK A)
LKA/IND/001/SN-204	SANITARY LAYOUT – THIRD FLOOR PLAN (RESIDENCE HOUSE BLOCK A) & GROUND FLOOR PLAN (STAFF ACCOMMODATION BLOCK B)
LKA/IND/001/SN-205	SANITARY LAYOUT – FIRST FLOOR PLAN & SECOND FLOOR PLAN (RESIDENCE HOUSE BLOCK B)
LKA/IND/001/SN-301	SEWER PROFILES – 1
LKA/IND/001/SN-302	SEWER PROFILES – 2
LKA/IND/001/SN-303	SANITARY SCHEMATIC DIAGRAMS – 1
LKA/IND/001/SN-304	SANITARY SCHEMATIC DIAGRAMS – 2
LKA/IND/001/SN-305	SANITARY SCHEMATIC DIAGRAMS – 3
LKA/IND/001/SN-306	SEWER PROFILE – 3 AND MISCELLANEOUS DETAIL - 1
LKA/IND/001/SN-307	MISCELLANEOUS DETAIL - 2



*High Commissioner of India
Brunei Darussalam*

**PROPOSED CONSTRUCTION OF CHANCERY, HIGH
COMMISSIONER'S RESIDENCE, STAFF RESIDENCES AND
AUXILIARY FACILITIES BUILDINGS
FOR THE HIGH COMMISSION OF INDIA
BRUNEI DARUSSALAM**

**FINANCIAL BID DOCUMENT
(VOLUME 2 OF 2)**

ARKITEK REKAJAYA
Architects & Interior Designers

OTHMAN & ASSOCIATES
Civil & Structural Engineers

LKA KONSULT SDN BHD
Mechanical & Electrical Engineers

MRBC PARTNERSHIP
Quantity Surveyors

**PROPOSED CONSTRUCTION OF CHANCERY, HIGH
COMMISSIONER'S RESIDENCE, STAFF RESIDENCES AND
AUXILIARY FACILITIES BUILDINGS
FOR THE HIGH COMMISSION OF INDIA
BRUNEI DARUSSALAM**

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1. FINANCIAL BID DOCUMENT

A. BILL OF QUANTITIES

- a. CHANCERY, NON-RG & RG – M&E**
- b. RESIDENCE – M&E**

B. M&E SPECIFICATIONS

- a. MECHANICAL**
- b. ELECTRICAL**
- c. LIFT**

C. M&E TECHNICAL DATA

- a. MECHANICAL**
- b. ELECTRICAL**

2. M&E DRAWINGS

Section	Description	Bill No.	Amount	
			\$	c
BILL 8A BILL 8B	PROPOSED CONSTRUCTION OF CHANCERY, HIGH COMMISSIONER'S RESIDENCE, STAFF RESIDENCES AND AUXILIARY FACILITIES BUILDING FOR THE HIGH COMMISSION OF INDIA, BRUNEI DARUSSALAM.			
	<u>VOL 2/2 M&E SUMMARY</u>			
	<u>SUMMARY OF PRICES OF M&E WORKS FOR HIGH COMMISSIONER'S RESIDENCE</u>			
	<u>SUMMARY OF PRICES OF M&E WORKS FOR CHANCERY, STAFF RESIDENCES AND AUXILIARY FACILITIES BUILDING</u>			
	<u>CONTINGENCY SUM</u>		50,000.00	

TO FINAL SUMMARY PAGE :

We,.....

Hereby tender and undertake the design, supply, install, test, commission and maintain as specified and execute all works for Mechanical & Electrical and Associated Services Installation for **PROPOSED CONSTRUCTION OF CHANCERY, HIGH COMMISSIONER'S RESIDENCE, STAFF RESIDENCES AND AUXILIARY FACILITIES BUILDING FOR THE HIGH COMMISSION OF INDIA BRUNEI DARUSSALAM.** And, further stipulate that our organization has read the entire specification, examined the accompanying tender drawings in detail, visited the site and evaluated the requirements and

Address of Contractor:

.....

.....

.....

.....

Authorized Signature:

Company Stamp:

M&E BILL OF QUANTITIES

BILL 8A
(RESIDENCE)

Section	Description	Bill No.	Amount	
			\$	c
BILL 8A	<u>SUMMARY OF PRICES OF M&E WORKS FOR HIGH COMMISSIONER'S RESIDENCE</u>			
R/M	<u>Mechanical Services</u>			
[1]	EQUIPMENT			
[2]	PIPEWORK			
[3]	ELECTRICAL			
[4]	POOL POND & PLUMBING			
R/E	<u>Electrical Services</u>			
[1]	SWITCHBOARDS and LV RETICULATION MAINS			
[2]	GENERAL LIGHTING and POWER SERVICES			
[3]	LIGHT FITTINGS and ACCESSORIES			
[4]	TELEPHONE and COMPUTER SYSTEM			
[5]	FIRE PROTECTION SYSTEM			
[6]	MATV SYSTEM			
[7]	SECURITY SYSTEM			
[8]	LIGHTNING PROTECTION SYSTEM			
[9]	EXTERNAL WORKS			
[10]	STANDBY GENERATOR SET			
TUC	<u>Tests Upon Completion</u>			
TO M&E SUMMARY PAGE (BILL 8A) :				

MECHANICAL SERVICES
(BILL OF QUANTITIES)

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
R/M	<u>MECHANICAL SERVICES FOR HIGH COMMISSIONER'S RESIDENCE</u>					
[1]	<u>EQUIPMENT</u> <u>INVERTER SPLIT SYSTEM EQUIPMENT (Carrier or approved equivalent)</u> Supply, installation, testing and commissioning of the Air Conditioning System as shown and indicated in the drawing. All material supply & works carry out shall be as per DES requirements and approved vendors products. Rate quoted shall be inclusive of supply and termination of all power and control cables to equipment including necessary cable, glands, lugs, earthing, conduit/ HDGS cable tray and other necessary accessories. Air Cooled Split Conditioning system consisting of AHU and matching air cooled condensing unit compressor shall be fully inverter type c/w sight glass, refrigerant & oil, refrigerant filter, air filter, brackets and supports, power & control wiring and other necessary accessories as specified and as shown in the drawing. <u>1. INVERTER MULTI SYSTEM EQUIPMENT (Carrier or approved equivalent)</u> Air Cooled Condensing Unit (CU) shall be floor mounted type, each unit shall have a minimum of 2 compressors per module and all compressors shall be fully inverter type and completely possible to operate at ranges of partial loads. Compressors shall be reliable twin rotary type with DC motors. condenser fan motor shall be high efficiency DC motor capable of operating at 32 different steps. Condensers shall be copper tube and aluminum-type. The outdoor unit shall be able to handle equivalent pipe lengths up to 235 meters. Fan Coil Unit (FCU) complete with air filter and all necessary accessories for satisfactory operation. Outdoor condition: 34.0 deg C/28.5 deg C DB/WB Indoor condition: 21.0 deg C DB, 55%RH and as per drawings.					
	<u>OUTDOOR CONDENSING UNIT</u>					
	<u>RATING CAPACITY</u>					
A	VRF-G1 (51.8 Kw)	set	1			
B	VEF-G2 (48.1 Kw)	set	1			
C	VRF-F1 (58.5 Kw)	set	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>INVERTER TYPE FAN COIL UNITS</u>					
	Cassette (Ceiling Mounted Type Unit)					
	<u>RATING CAPACITY</u>					
A	FCU-R1 to R4 (11.5 Kw each)	nos.	4			
B	FCU-R5 (6.2 Kw)	no.	1			
C	FCU-G1 & G2 (7.0 Kw each)	nos.	2			
D	FCU-G3 & G4 (7.3 Kw each)	nos.	2			
E	FCU-G5 (11.3 Kw)	no	1			
F	FCU-G6 (5.6 Kw)	no	1			
G	FCU-G7 (2.6 Kw)	no	1			
H	FCU-F1 & F2 (8.0 Kw each)	no	2			
I	FCU-F3 (6.5 Kw)	no	1			
J	FCU-F4 (9.0 Kw)	no	1			
K	FCU-F5 (6.5 Kw)	no	1			
L	FCU-F6 (8.2 Kw)	no	1			
M	FCU-F7 (12.3 Kw)	no	1			
	<u>2. DX SPLIT TYPE UNITS (Carrier or approved equivalent)</u>					
	To supply and install DX Split systems each comprising unit c/w brackets, supports, wireless controller and with all necessary accessories for a complete operable system.					
N	FCU/CU - (2.6 KW)	nos.	9			
To Collection:						
	<u>COLLECTION</u>					
	<u>PAGE</u>					
	R/M1 (page 1/1) - - - - -	-	-	-		
	R/M1 (page 2/2) - - - - -	-	-	-		
TO R/M1 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
R/M	<u>MECHANICAL SERVICES FOR HIGH COMMISSIONER'S RESIDENCE</u>					
[2]	<u>PIPEWORK</u>					
	<u>REFRIGERANT PIPEWORK</u>					
	Solid drawn copper tube c/w 20mm thick THERMAL insulation and white PVC Denso wrap tape encased in heavy duty PVC impact resistant industrial trunking, fittings, liquid line solenoid valves, TX valves, sight glasses and filter driers, supports, brackets and as specified. All systems to be pressure tested, evacuated and dehydrated before charging with refrigerant. (where two refrigerant lines system is offered Tenderer is to price for the 2 lines accordingly). Testing, evacuation and dehydration of both refrigeration systems, before charging with refrigerant, and include initial refrigerant charge. Note : All test pressures and evacuation pressures to be submitted in type written form to the Engineer.					
	<u>REFRIGERANT PIPE (INVERTER SYSTEM)</u>					
A	FCU-R1 to R4 (11.5 Kw each)	lot	4			
B	FCU-R5 (6.2 Kw)	lot	1			
C	FCU-G1 & G2 (7.0 Kw each)	lot	2			
D	FCU-G3 & G4 (7.3 Kw each)	lot	2			
E	FCU-G5 (11.3 Kw)	lot	1			
F	FCU-G6 (5.6 Kw)	lot	1			
G	FCU-G7 (2.6 Kw)	lot	1			
H	FCU-F1 & F2 (8.0 Kw each)	lot	2			
I	FCU-F3 (6.5 Kw)	lot	1			
J	FCU-F4 (9.0 Kw)	lot	1			
K	FCU-F5 (6.5 Kw)	lot	1			
L	FCU-F6 (8.2 Kw)	lot	1			
M	FCU-F7 (12.3 Kw)	lot	1			
	<u>MAIN LINE</u>					
N	VRF-G1 (51.8 Kw)	lot	1			
O	VEF-G2 (48.1 Kw)	lot	1			
P	VRF-F1 (58.5 Kw)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>CARRIER DX SPLIT TYPE UNITS</u>					
A	FCU/CU - (2.6 Kw)	lot	9			
	<u>VRF DISTRIBUTION JOINT KITS</u>					
B	VRF-G1 (51.8 Kw)	m	14			
C	VEF-G2 (48.1 Kw)	m	18			
D	VRF-F1 (58.5 Kw)	m	98			
E	FCU-R1 to R4 (11.5 Kw each)	lot	4			
F	FCU-R5 (6.2 Kw)	lot	1			
G	FCU-G1 & G2 (7.0 Kw each)	lot	2			
H	FCU-G3 & G4 (7.3 Kw each)	lot	2			
I	FCU-G5 (11.3 Kw)	lot	1			
J	FCU-G6 (5.6 Kw)	lot	1			
K	FCU-G7 (2.6 Kw)	lot	1			
L	FCU-F1 & F2 (8.0 Kw each)	lot	2			
M	FCU-F3 (6.5 Kw)	lot	1			
N	FCU-F4 (9.0 Kw)	lot	1			
O	FCU-F5 (6.5 Kw)	lot	1			
P	FCU-F6 (8.2 Kw)	lot	1			
Q	FCU-F7 (12.3 Kw)	lot	1			
	<u>SOLENOID VALVE KITS</u>					
R	VRF-G1 (51.8 Kw)	lot	1			
S	VEF-G2 (48.1 Kw)	lot	1			
T	VRF-F1 (58.5 Kw)	lot	1			
U	FCU-R1 to R4 (11.5 Kw each)	lot	4			
V	FCU-R5 (6.2 Kw)	lot	1			
W	FCU-G1 & G2 (7.0 Kw each)	lot	2			
X	FCU-G3 & G4 (7.3 Kw each)	lot	2			
Y	FCU-G5 (11.3 Kw)	lot	1			
Z	FCU-G6 (5.6 Kw)	lot	1			
AA	FCU-G7 (2.6 Kw)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	FCU-F1 & F2 (8.0 Kw each)	lot	2			
B	FCU-F3 (6.5 Kw)	lot	1			
C	FCU-F4 (9.0 Kw)	lot	1			
D	FCU-F5 (6.5 Kw)	lot	1			
E	FCU-F6 (8.2 Kw)	lot	1			
F	FCU-F7 (12.3 Kw)	lot	1			
	<u>BALL VALVE AND FITTINGS</u>					
G	VRF-G1 (51.8 Kw)	lot	1			
H	VEF-G2 (48.1 Kw)	lot	1			
I	VRF-F1 (58.5 Kw)	lot	1			
J	FCU-R1 to R4 (11.5 Kw each)	lot	4			
K	FCU-R5 (6.2 Kw)	lot	1			
L	FCU-G1 & G2 (7.0 Kw each)	lot	2			
M	FCU-G3 & G4 (7.3 Kw each)	lot	2			
N	FCU-G5 (11.3 Kw)	lot	1			
O	FCU-G6 (5.6 Kw)	lot	1			
P	FCU-G7 (2.6 Kw)	lot	1			
Q	FCU-F1 & F2 (8.0 Kw each)	lot	2			
R	FCU-F3 (6.5 Kw)	lot	1			
S	FCU-F4 (9.0 Kw)	lot	1			
T	FCU-F5 (6.5 Kw)	lot	1			
U	FCU-F6 (8.2 Kw)	lot	1			
V	FCU-F7 (12.3 Kw)	lot	1			
	<u>CONDENSATE DRAIN PIPE</u> 32mm dia. pipes (unless otherwise specified) to BS 3505 Class D c/w 15mm thick insulation concealed within walls and run in HD UPVC trunking c/w traps, fittings, brackets and supports.					
W	FCU-R1 to R4 (11.5 Kw each)	lot	4			
X	FCU-R5 (6.2 Kw)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	FCU-G1 & G2 (7.0 Kw each)	lot	2			
B	FCU-G3 & G4 (7.3 Kw each)	lot	2			
C	FCU-G5 (11.3 Kw)	lot	1			
D	FCU-G6 (5.6 Kw)	lot	1			
E	FCU-G7 (2.6 Kw)	lot	1			
F	FCU-F1 & F2 (8.0 Kw each)	lot	2			
G	FCU-F3 (6.5 Kw)	lot	1			
H	FCU-F4 (9.0 Kw)	lot	1			
I	FCU-F5 (6.5 Kw)	lot	1			
J	FCU-F6 (8.2 Kw)	lot	1			
K	FCU-F7 (12.3 Kw)	lot	1			
L	FCU/CU (2.6 Kw)	lots	9			
To Collection:						
<u>COLLECTION</u>						
<u>PAGE</u>						
	R/M2 (page 1/4) - - - - -	-	-	-		
	R/M2 (page 2/4) - - - - -	-	-	-		
	R/M2 (page 3/4) - - - - -	-	-	-		
	R/M2 (page 4/4) - - - - -	-	-	-		
TO R/M2 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
R/M	<u>MECHANICAL SERVICES FOR HIGH COMMISSIONER'S RESIDENCE</u>					
[3]	<u>ELECTRICAL</u>					
	<u>Electrical and Controls</u> All components, cables and controls shall be of types and qualities as specified in Section 3, "ELECTRICAL", of the DES General Specification for Air Conditioning Installations, the Electrical Installation Part of this Specification and IEE Regulations and installed to standards as similarly specified.					
	<u>Automatic Controls</u> All automatic controls necessary for the operation and control of the Inverter Split System including thermostat and associated electrical power and control wiring.					
	<u>VRF SYSTEM (Carrier or approved equivalent)</u>					
A	Simplified Remote Controllers (Chancery-Grd flr)	lot	1			
B	Simplified Remote Controllers (Chancery-Grd flr)	lot	1			
C	Simplified Remote Controllers (Chancery- 1st flr)	lot	1			
	<u>Power Supply and Control Cables</u> All interconnecting power supply wiring between local isolating switch and condensing unit and all interconnecting power and control wiring between condensing unit and associated indoor unit, run in high impact conduit, trunking and HDGS cable tray.					
D	VRF-G1 (51.8 Kw)	lot	1			
E	VEF-G2 (48.1 Kw)	lot	1			
F	VRF-F1 (58.5 Kw)	lot	1			
G	FCU-R1 to R4 (11.5 Kw each)	lots	4			
H	FCU-R5 (6.2 Kw)	lot	1			
I	FCU-G1 & G2 (7.0 Kw each)	lots	2			
J	FCU-G3 & G4 (7.3 Kw each)	lots	2			
K	FCU-G5 (11.3 Kw)	lot	1			
L	FCU-G6 (5.6 Kw)	lot	1			
M	FCU-G7 (2.6 Kw)	lot	1			
N	FCU-F1 & F2 (8.0 Kw each)	lots	2			
O	FCU-F3 (6.5 Kw)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>Power Supply and Control Cables (Continued)</u>					
A	FCU-F4 (9.0 Kw)	lot	1			
B	FCU-F5 (6.5 Kw)	lot	1			
C	FCU-F6 (8.2 Kw)	lot	1			
D	FCU-F7 (12.3 Kw)	lot	1			
E	FCU/CU (2.6 Kw)	lots	9			
	<u>EXHAUST FANS (KDK or approved equivalent)</u>					
	Ceiling Mount Ducted Type					
	c/w backdraft damper and fresh air louvre.					
F	EF.RG-1 - (Capacity: 105 cmh, S.P.: 20 Pa)	lot	1			
G	EF.RG-2 - (Capacity: 435 cmh, S.P.: 20 Pa) each	lots	2			
	EF.RG-3 - (Capacity: 125 cmh, S.P.: 20 Pa)	lot	1			
	EF.RG-4 - (Capacity: 324 cmh, S.P.: 20 Pa)	lot	1			
	EF.RF-5 - (Capacity: 210 cmh, S.P.: 20 Pa)	lots	2			
	Wall Mounted type c/w automatic backdraft damper					
H	EF.RG-1 - (Capacity: 210 cmh)	lot	1			
I	EF.RG-2 - (Capacity: 150 cmh)	lot	1			
J	EF.RG-3 - (Capacity: 75 cmh) each	lots	2			
K	EF.RG-5 - (Capacity: 678 cmh)	lot	1			
L	EF.RG-6 - (Capacity: 120 cmh)	lots	2			
M	EF.RF-8 - (Capacity: 370 cmh)	lot	1			
N	EF.RF-9 - (Capacity: 270 cmh)	lot	1			
O	EF.RF-10 - (Capacity: 105 cmh)	lots	2			
P	EF.RF-12 - (Capacity: 165 cmh)	lots	2			
Q	EF.RF-13 - (Capacity: 360 cmh)	lots	2			
	<u>ISOLATOR SWITCHES</u>					
R	VRF Units	lots	3			
	(i) VRF-G1 (80A)					
	(ii) VEF-G2 (80A)					
	(iii) VRF-F1 (85A)					
S	Condensing Units (20A each)	lots	9			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>KITCHEN EXHAUST HOOD</u> Supply & installation of Canopy & 3-sided Type Kitchen Exhaust Hood constructed from 1.5mm thk. SS 316 finish with welds ground smooth and polished c/w Firestat, hood light, grease filter, hangers etc and as per specifications, drawings and all accessories for a complete satisfactory and operational system					
	<u>KITCHEN EXHAUST HOOD (CONTINUED)</u>					
A	Size: 1200mm(L) x 700mm(W) 3-Sided Type					
B	<u>GREASE BAFFLE FILTER</u> Aluminium Grease Baffle Filter (3 nos. -500mm x 400mm x 50mm) shall be "AAF" brand, baffle type or other approved equal	lot	1			
	<u>KITCHEN EXHAUST VENTILATION</u>					
C	<u>BIFURCATED EXHAUST FAN</u> Axial type axial fan (split air way and direct motor isolated from air stream) complete with flexible connections, bracket and supports. a) Capacity : 5058 cmh b) Staitc pressure loss : 532 Pa c) Max. Speed : 25rps	lot	1			
D	<u>FRESH AIR FAN (AXIAL TYPE)</u> Axial type fan with direct coupled motor complete with flexible connections, bracket and supports. a) Capacity : 4552 b) Staitc pressure loss : 41 Pa c) Max. Speed : 25rps	lot	1			
E	<u>Firestat</u> (to be set to stop the fan when exhaust air temperature rises to 96°C).	lot	1			
F	<u>Hood Light</u> (The bulb shall be enclosed in a vapor proof fixture with nickel plated socket and heat resistant globe c/w heat and oil resistant wire and cast fitting junction box) c/w ON/OFF Switch and all associated wiring.	lot	1			
G	<u>Ductwork</u> c/w bends, transformation connection etc. (SS 304)	lot	1			
H	All hangers, supports, bolts and nuts (Stainless Steel type 316) including HDGS bracket and angle bar terminated/welded to structure for supporting fans and duct work	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	<p>EF-CP (Control Panel) Manual and automatic control operation, Start and Stop push button switch, indication of fan(s) run and trip, wiring in G.I. concealed conduit, etc as per drawings and as specified.</p> <p>AUTOMATIC SECURITY GATE SYSTEM Supply and installation of Heavy duty high quality automatic gate system c/w motorised control and interconnecting power wiring, and complete all necessary accessories including remote controls. The automatic gate shall be control and manually open and close from a switch located inside the residence (2-location to be confirmed).</p>	lot	1			
B	Automatic Gate Motor (gate approx. wt.=1000kg) c/w all accessories.	lot	1			
C	Manually operated switch c/w power and control wiring and all accessories for a complete operable system.	lot	1			
<u>COLLECTION</u>						
<u>PAGE</u>						
	R/M3 (page 1/4) - - - - -	-	-	-		
	R/M3 (page 2/4) - - - - -	-	-	-		
	R/M3 (page 3/4) - - - - -	-	-	-		
	R/M3 (page 4/4) - - - - -	-	-	-		
TO R/M3 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
R/M	<u>MECHANICAL SERVICES FOR HIGH COMMISSIONER'S RESIDENCE</u>					
[4]	<u>POOL POND EQUIPMENTS</u> To supply and install the following equipment and materials inclusive of all associated mechanical and electrical controls, power cables, interconnection control wiring as specified and shown on the drawings					
A	Pool Pond Self-Priming Pumpset (Made of Hyward or approved equivalent). Single stage end suction centrifugal pump c/w squirrel cage electric motor, TEFC, 415V/3 PH/50HZ 2900 rpm (max.) Capacity: 183 l/min at 42 TDH	sets	2			
B	Sand Filter c/w accessories Capacity: 183 l/min	lot	1			
C	<u>CONTROL PANEL (PP-CP) - PKS or approved equivalent</u> Manual and automatic control operation, Start and Stop push button switch, indication of pump run and trip, wiring in G.I. concealed conduit, and etc as specified.	lot	1			
D	Control and power wiring to pumpset, float and pressure switches, complete with inter-connecting control wiring in PVC conduit/HDGS tray	lot	1			
	<u>PIPEWORK, FITTINGS AND ACCESSORIES</u> Supply and install the following, including all accessories and fixtures necessary and in accordance with the specifications described herein and as shown on the drawings. All piping and fittings shall be HDPE pipe c/w HDGS (hanger, bracket and support), etc.					
	<u>PIPE</u>					
E	50 mm diameter	m	50			
F	25 mm diameter	lot	1			
	<u>Gate Valves</u>					
G	50 mm diameter	nos	7			
H	25 mm diameter	nos	2			
	<u>Check Valves</u>					
I	50 mm diameter	nos	2			
	<u>Strainers</u>					
J	50 mm diameter	nos	2			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
<u>PIPEWORK, FITTINGS AND ACCESSORIES (CONTINUED)</u>						
A	Flexible Connections 50mm diameter	nos	4			
<u>Fitting and Accessories</u>						
B	Pressure gauge c/w petcock (0-100 psi).	nos	4			
C	25 mm dia . Automatic Air Relief Valve.	nos	1			
<u>Painting of Pipework & Pumps</u>						
D	Painting including one rust inhibitive primer, one undercoat and 2 finishing red gloss paint for all pipeworks, pumps, brackets and supports.	lot	1			
E	Pool Basket Strainer c/w all accessories and as per drawings. (Hayward or approved equivalent)	lot	1			
F	Chlorinator Feeder (2gpm) - Hayward or approved equivalent	lot	1			
G	Submersible Pumpset (Made of Flyght or approved equivalent) Capacity: 90 l/min; TDH: 3.0m	nos	1			
<u>PLUMBING</u>						
H	Domestic Water Storage Tank (Made of LSL or approved equivalent). Capacity: 2.5 cubic metre c/w accessories including R.C. plinth and as per drawing and specification.	lot	1			
I	Water Pumpset (Made of CNP or approved equivalent) Capacity: 44 L/min TDH: 40m	sets	2			
J	Control and power wiring to pumpset, float and pressure switches, complete with inter-connecting control wiring in PVC conduit/HDGS tray	lot	1			
K	Outdoor Sand Filter (Stainless Steel 304) - Made of Backfree or approved equivalent. Cap: 44 L/min	lot	1			
L	Valves and fittings as per drawings (inside the pump room)	lot	1			
To Collection:						
<u>COLLECTION</u>						
<u>PAGE</u>						
	R/M4 (page 1/2) - - - - -	-	-	-		
	R/M4 (page 2/2) - - - - -	-	-	-		
TO R/M4 SUMMARY:						

ELECTRICAL SERVICES
(BILL OF QUANTITIES)

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
R/E	<u>ELECTRICAL INSTALLATION FOR HIGH COMMISSIONER'S RESIDENCE</u>					
[1]	<u>SWITCHBOARDS AND LV RETICULATION MAINS</u>					
	<u>Sub-Switchboard / Distribution Boards</u> Supply, install, test and commission factory assembled modular type tested Form 4 construction, front access IP42 (IEC) floor mounted metal clad board and other accessories as detailed in the drawings and specifications. (Cost to be inclusive of termination of all cables, including cable glands, lugs, etc. as per drawings/ specifications). Distribution boards shall be constructed to Form I and IP42, electrical grounding, all necessary accessories as shown in the drawing, . All cable terminals shall be provided with numbered identification ferrules. Cost quoted to be inclusive of termination of all incoming/ outgoing cables which includes cable glands, lugs, cable tags, etc. as per drawings/specifications.					
A	SSB-RS (including RG-LP) as per drawing	lot	1			
B	DB/RG-PP as per drawing	lot	1			
C	DB/RF-LP (including RF-PP) as per drawing	lot	1			
D	DB-RA as per drawing	lot	1			
E	DB-GH as per drawing	lot	1			
F	DWP -CP as per drawing	lot	1			
G	Supply and installation of CT KWH meter complete with linking of telephone outlet and allow for the necessary liaison with Authorities (including QP testing and certification).	lot	1			
H	Earthing of the sub-switchboards and distribution boards as per specifications and drawings.	lot	1			
	<u>LV Reticulation Mains</u> Supply and install submain cables as per drawings & specification. Cost of hot dipped galvanised cable ladder, tray, trunking, required shall be included in the pricing of cable. The size of cable ladder/cable tray and containment provided shall be adequate for cable spacings factor as per latest EIR and IEE Regulations. Rates of cable laid underground shall include cost of trench excavation, sand bedding, pipesleeves, protective tile and reinstatement. Rates for cables shall be inclusive of cable identification tags at 10m intervals and at every bend. Cost quoted to be inclusive of termination of all incoming and outgoing cables including cable glands, lugs, etc as per drawing and specifications. Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.					
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	4x1c/25mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories from SSB-RS to DB-RA.	m	10			
B	4x1c/25mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories from SSB-RS to DB/RG-PP.	m	15			
C	4x1c/25mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories from SSB-RS to DB/RF-LP.	m	60			
D	1x4c/16mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories from SSB-RS to PP-CP.	m	60			
E	1x2c/10mm ² PVC/SWA/PVC cable laid underground, pipesleeves and cable tray c/w necessary accessories from SSB-RS to DB-GH.	m	60			
	<u>Miscellaneous and Related Works</u>					
F	Allow miscellaneous cost for concrete encased pipesleeves of 150mm dia for all road crossing, pipe jacking, hard standing areas, returfing, refurbishment and making good of existing ground.	lot	1			
G	Allow miscellaneous cost for providing floor openings, pipe sleeves through RC beams & slabs, fire stop barrier, fire seal pillows, etc for passage of sub-main cables, lighting and power wiring, telephone & computer system, fire alarm & fire protection system, water services, aircon services and other disciplines.	lot	1			
H	Allow cost for liaison with Authorities regarding power supply application and energization of the system.	lot	1			
	<u>Upgrading Works (if required)</u>					
I	Allow cost for the upgrading of the existing substation inclusive of necessary and required materials. Cost to include liason to authorities and nearby residences.	lot	1			
J	Supply, install and commissioning of 500 kVA 11kV/433V outdoor type Distribution Transformer c/w all necessary accessories to DES specification ref: DES/11KV/TRF/REV '0' dated 26-7-1997.	lot	1			
K	800A Outdoor type 433V 3 Phase 50Hz Low Voltage Distribution Feeder Pillar as per DES Specification.	lot	1			
L	4x1c/500mm ² XLPE/AWA/PVC cable from transformer to MFP laid underground.	m	15			
M	Equipment body earthing system c/w necessary accessories to achieve below 1 ohm (for MFP, RMU & Transformer)	lot	1			
N	Transformer neutral earthing using 2x120mm ² PVC earth cable c/w heavy duty earth chamber and necessary accessories to achieve 1 ohm or less link to main earthing system.	lot	1			
				To Collection:		

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>COLLECTION</u>					
	<u>PAGE</u>					
	R/E1 (Page 1/3) - - - - -					
	R/E1 (Page 2/3) - - - - -					
	R/E1 (Page 3/3) - - - - -					
TO R/E1 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
R/E	<u>ELECTRICAL INSTALLATION FOR HIGH COMMISSIONER'S RESIDENCE</u>					
[2]	<p><u>GENERAL LIGHTING AND POWER SERVICES</u> Supply, installation and termination of light and power point in conduit/trunking as per drawing and specification.</p> <p>Rates for lighting and power point shall be inclusive of providing cable marker sleeved with the circuit number identified. Unless otherwise specified all switch plates and power point switch plate shall be of moulded white plastic range accessories approved by DES. CPC earth cable shall be provided inside back box and terminated with cable connector whether the switch plate is of plastic or of metallic range.</p> <p>Cost quoted to be inclusive of termination of all incoming/ outgoing cables including cable glands, lugs, etc as per drawing and specifications.</p> <p>NOTES:</p> <p>i) all utility boxes for switches, outlets, etc shall be of flush mounted, factory fitted with moulded brass nut and not of self tapping screw type.</p> <p>ii) conduit adapter fitted to boxes for use of switches, outlets, etc shall be with lock nuts and securely tightened.</p> <p>iii) all exposed conduit and flexible conduit inside ceiling voids shall be of color coded.</p> <p>iv) flexible conduit shall be of corrugated polyamide (nylon) flexible conduit and fittings shall be of manufacturer recommended.</p> <p>v) light fittings shall be of factory provided supports and brackets with independent hangers from other installations.</p> <p>vi) for bedroom areas, SSO switches are to T&J Electric "Radiance" Champagne with decorate frame matte black.</p> <p>vii) all other areas, SSO switches to T&J Electric "Radiance" Champagne.</p> <p><u>Unless otherwise specified Color Code for Service Raceway & Conduits are as follows:</u></p> <p>- lighting and power - - - - - orange - fire detection - - - - - red - telephone & computer - - - - green - PA system - - - - - yellow - security system - - - - - white - AC & BMS - - - - - blue</p>					
A	Lighting point c/w wiring in PVC conduit using 3x1c/1.5mm ² PVC cable c/w 10A switch plate and gang as per switching arrangement shown in the lighting drawings.	nos	390			
B	Emergency lighting point in PVC conduit using 3x1c/1.5mm ² PVC cable c/w key switch as shown in the drawing.	nos	4			
C	Exhaust fan wiring point in concealed PVC conduit using 3x1c/2.5mm ² PVC cable c/w fused spur outlet similar to MK, Clipsal, Legrand or equivalent next to fan and switch at the door.	nos	22			
				To Collection:		

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	Power point in concealed PVC conduit using 6 nos 2.5mm ² PVC cable as per single line diagram and terminated with the following outlets priced separately as below.	nos	127			
B	Power point in concealed PVC conduit using 3x1c/4mm ² PVC cable as per single line diagram and terminated with the following outlets priced separately as below.	nos.	5			
C	13A single SSO mounted as shown in the drawing similar to MK, Clipsal, T&J white plastic finish or equivalent.	nos	56			
D	13A single weatherproof SSO mounted as shown in the drawing similar to MK, Clipsal, T&J white plastic finish or equivalent.	nos	7			
E	13A twin SSO mounted as shown in the drawing similar to MK, Clipsal, legrand or equivalent.	nos	64			
F	15A single SSO using 3x1c/4mm ² PVC cable mounted as shown in the drawing similar to MK, Clipsal, T&J white plastic finish or equivalent.	no	5			
G	Cooker SSO w/ neon indicator using 3x1c/6mm ² PVC cable in concealed PVC conduit mounted as shown in the drawing.	no	3			
H	Water heater point in concealed PVC conduit using 3x1c/4mm ² PVC cable c/w connection outlet and flush 20A DP switch and pilot lamp and marked "water heater" similar to MK Logic 5423 WH WHI, Clipsal, T&J or equivalent.	nos	8			
I	Dimmer rack/controller and switch for Formal Dining lighting to DES approved equivalent.	lots	1			
J	Power point using 3x1c/4mm ² PVC cable in concealed PVC conduit c/w 20A SPN weatherproof isolator for A/C units.	nos	2			
<u>Miscellaneous and Related Works</u>						
K	Allow cost for circuit tagging and labelling of all cables and wiring circuits (incoming/outgoing cables and corresponding DB name) using numeric sleeves or self laminating wrapped around oil resistant nylon cable identification labels to brother, winco, brady, thorpe or approved equivalent. Labels shall apply to but not limited to the following: i) all DB, MSB, SSB, FAP, Tel & Computer, Secuty System, etc ii) socket outlets iii) switches iv) light fittings	lot	1			
To Collection:						
<u>COLLECTION</u>						
<u>PAGE</u>						
R/E2 (Page 1/2) - - - - -						
R/E2 (Page 2/2) - - - - -						
TO R/E2 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount			
					\$	c		
R/E	<u>ELECTRICAL INSTALLATION FOR HIGH COMMISSIONER'S RESIDENCE</u>							
[3]	<u>LIGHT FITTINGS AND ACCESSORIES</u>							
	Supply and install DES approved light fittings as specified in the drawings and as indicated below or as per Engineer/SO requirement. All light fittings shall be provided with independent support to the structure and shall not depend to other system.							
	Rates for light fittings shall be inclusive of providing a tape label with the circuit number identified and a strong adhesive used to bond the tape to the fittings. A system guarantee of 3 years by means of factory warranty certificate for all the light fittings.							
	All LED light fittings offered must be of non degradable diffusers. All LEDs in the light fitting offered shall have a minimum lifetime to 70% luminous flux at 50,000 hours and shall be CREE, Nichia, Lumiled LEDs or approved equivalent. A system guarantee of 3 years by means of factory warranty certificate shall be submitted for all LED light fittings. Contractor to ensure LED light fitting offered shall met the design illumination requirement.							
	Emergency packs are to be rated for a minimum of 2 hours duration or as specified and shall be non-maintained type.							
A	F1 - 12W LED Bollard 750mm high 3000k sanded black to NVC NGLLED 5612-1 or approved equivalent, mounted as shown in the drawing.	nos.	16					
B	F2 - 18.5W LED Wall-mounted luminaire 3000k 25° to NVC NWLED3544 fencing light, mounted as shown in the drawing.	nos	25					
C	F4 - 9W LED Uplighter 3000K to NVC NFLED5012 or approved equivalent, as shown in the drawing. (Garden Light Spike)	nos	20					
D	F5 - 6W LED Inground uplight 3000K 20° to NVC NLED4203 or approved equivalent, as shown in the drawing.	nos	31					
E	F5B - 6W LED Inground uplight 3000K 45° to NVC NLED4203 or approved equivalent, as shown in the drawing.	nos	8					
F	F6 - 36W LED Inground uplight 3000K 60° to Luminconnect HD-MD1201, mounted as shown in the drawing.	nos	5					
G	F7 - 17W LED downlight 4000K 6inch IP44 to NVC NLED09506E-D or approved equivalent, mounted as shown in the drawing.	nos	17					
H	F8 - 9W LED surface mounted downlight white 3000K to NVC NLLED9184M or approved equivalent, mounted as shown in the drawing.	nos	23					
I	F10 - 12W LED Recessed downlight 6500K to NVC NDLED9314E or approved equivalent, mounted as shown in the drawing.	nos	27					
J	F11 - 2W LED Recessed spotlight 6500K to NVC NLED105 or approved equivalent, mounted as shown in the drawing.	nos	8					
K	F13 - 12.5W LED Rectangular IP68 underwater luminaire, 3000K, 50° beam angle to NVC NSLED4315 or approved equivalent, mounted as shown in the drawing.	nos	22					
To Collection:								

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	F16 - 35W LED Recessed adjustable spotlight 4000K honeycomb collimator to NVC NLED1807C/S or approved equivalent, mounted as shown in the drawing.	nos	12			
B	F17 - 18 LED T8 1200mm batten fitting to PHILIPS or approved equivalent.	nos	6			
C	F19 - 8W LED Recessed round downlight 3inch 4000K matte gold shield cover to NVC 8113A or approved equivalent, mounted as shown in the drawing.	nos	63			
D	F19B - 8W Recessed round downlight 3inch 4000K white shield cover to NVC 8113A or approved equivalent, mounted as shown in the drawing.	nos	12			
E	F19C - 8W Recessed round wall washer 3inch 4000K matte gold shield cover to NVC 81132A or approved equivalent, mounted as shown in the drawing.	nos	18			
F	F20A - 5W LED Wall luminaire 4000K copper to Demilux Intevision 9060 A-1 or approved equivalent, mounted as shown in the drawing.	nos	5			
G	F20B - 2x5W LED Wall luminaire 4000K copper to Demilux Intevision 9060 A-1 or approved equivalent, mounted as shown in the drawing.	no	1			
H	F21B - 3W LED Recessed downlight 2inch 4000K to NVC 8112D matte white shield cover or approved equivalent, mounted as shown in the drawing.	nos	33			
I	F21C - 3W LED Recessed wall washer 2inch 4000K to NVC 8113A2 matte gold shield cover or approved equivalent, mounted as shown in the drawing.	nos	6			
J	F22 - 12W LED Recessed spotlight IP65 4000K to NVC NSPLED181W or approved equivalent, mounted as shown in the drawing.	nos	14			
K	F25A - 80W LED Circular luminaire 1500mm dia 4000K gold 120° to Demilux Intevision 9063 c/w necessary accessories or approved equivalent.	no	1			
L	F25B - 70W LED Circular luminaire 1200mm dia 4000K gold 120° to Demilux Intevision 9063 c/w necessary accessories or approved equivalent.	no	1			
M	F25C - 55W LED Circular luminaire 1000mm dia 4000K gold 120° to Demilux Intevision 9063 c/w necessary accessories or approved equivalent.	no	1			
N	F25D - 48W LED Circular luminaire 1500mm dia 4000K gold 120° to Demilux Intevision 9063 800 c/w necessary accessories or approved equivalent.	no	1			
O	F26 - 5W LED Pendant luminaire 4000K white to Demilux Intevision MD9017B-300 or approved equivalent, mounted as shown in the drawing.	nos.	3			
P	F27 - 5W LED Pendant luminaire 4000K gold 120° c/w cable to Demilux Intevision 9060 pendant A-1 or approved equivalent, mounted as shown in the drawing.	nos.	5			
Q	F28 - 11x5W LED Chandelier 4000K gold c/w required accessories to Demilux Intevision 9028 square with module B5, mounted as shown in the drawing.	nos.	2			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	F31 - 145W LED Pendant luminaire 4000K white to Demilux Intevision MD9058-1200 or approved equivalent, mounted as shown in the drawing.	nos.	4			
B	F40 - 2x3W LED Wall mounted emergency lighting c/w 2hrs battery backup to Maxspid Minnie or approved equivalent, mounted as shown in the drawing.	no	4			
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					TO R/E3 SUMMARY:	

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
R/E	<u>ELECTRICAL INSTALLATION FOR HIGH COMMISSIONER'S RESIDENCE</u>					
[4]	<u>TELEPHONE AND COMPUTER SYSTEM</u>					
	<u>Telephone Services Installation</u> Supply, install, test and commission telephone system, PABX system and computer system in accordance with the specifications and drawings. All works herein shall be approved TelBru standards. Tenderer shall submit a complete detailed proposal including all equipment offered, catalogues and brochures together with this tender. The equipment and accessories listed below are for tendering purpose. The tenderer is to include all other equipment and accessories not included herein but deemed necessary to the intent of the specifications and requirement. Proposed brands for all the items shall be Dell/Cisco or equivalent.					
	Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.					
A	Supply and installation of Wall mounted FAT and ATB c/w suitable Splitters and other necessary accessories including termination, splicing of cables and testing as shown and indicated in the drawing.	lot	1			
B	Telephone point using 4 pair Cat 6 STP cable in concealed pvc conduit/trunking to outlets as shown and indicated in the drawing. Cost to include RJ45 shutter faceplate outlet, utility boxes, etc inclusive of termination at both ends, testing of Cat 6 cable, etc.	nos	12			
	<u>IP Telephony (PABX) System</u>					
C	Supply & Install includes IP Telephony server, IP telephone Gateway user end point Licence. Tenderer must include all the necessary accessories to proper function of PABX network (Cisco or approved equivalent)					
D	Supply and install factory fabricated 22U 19" Wall/Floor mounted equipment rack, fully vented, front safety glass door & lock set, quick release side doors, 8 way power bar, etc. Cost inclusive of patch panels, management panels, other necessary accessories to cater for the above services for PABX Services.					
E	24 Port POE Switch for IP PABX	nos	2			
F	12 Core Rack mount ODF c/w accessories as shown and indicated in the drawing.	lots	2			
G	12 core single mode outdoor type fibre optic cable run in cable trunking for computer backbone structured cabling inclusive of both ends termination and testing as shown in the drawing from and to PABX Racks. Contractor to verify exact length of cable.	lot	1			
H	Operator Level IP Phone	lot	1			
I	Executive Level IP Phone	lot	2			
J	Staff Level IP Phone	lot	12			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	Interconnection works for the new PABX equipment and accessories as indicated in the drawings/specification inclusive of all manufacturer specified cable, suitable sized MDF, patchcord, pigtail, adaptors, connectors, and all necessary accessories, etc. This include interlinking works to the other system/services where specified/required (i.e Fire Alarm System, CCTV system, Computer Structure Cabling System) with necessary works such as programming, calibration, configuring, etc.	lot	1			
B	2c single mode FO cable in concealed conduit for the interconnection between ATB, FAT, modem etc, c/w termination, FO connectors, and other accessories. <u>Computer Network Installation</u>	lot	1			
C	Supply and install factory fabricated 42U 19" wall mounted 1000 x 1000 equipment rack, fully vented, front safety glass door & lock set, quick release side doors, 8 way power bar, etc. Cost inclusive of patch panels, switch panels, management panels, other necessary accessories to cater for the above services.	lot	1			
D	24 core single mode outdoor type incoming fibre optic cable run in telephone pipe duct, trunking/cable tray inclusive of both ends termination/splicing and testing as shown in the drawing from existing TelBru FO Exchange Station to Equipment Rack. Contractor to verify exact length of cable and coordinate with authorities the nearest tapping point works shall be c/w termination, connection, adaptors, joint kits, connectors, and all necessary accessories, etc.	m	1,000			
E	Termination of telecommunication cable at MDF/PABX, FAT, ATB, ODF etc. This include sufficient telephone cable module block, fibre optic termination kits, and label with all necessary accessories, etc.	lot	1			
F	Computer point using 4 pair Cat 6 STP cable in concealed pvc conduit/trunking to outlets as shown and indicated in the drawing. Cost to include RJ45 shutter faceplate outlet, utility boxes, etc inclusive of termination at both ends, testing of Cat 6 cable, etc.	nos	3			
G	Supply and installation of Patch Panel for the above network switch c/w termination and all the necessary accessories.	lot	1			
H	Supply and installation of Cable Management Panel for the above network switch c/w termination and all the necessary accessories.	lot	1			
I	1 meter length factory terminated Cat 6 patch cord for equipment rack.	lot	1			
J	3 meter length factory terminated Cat 6 patch cord for work station.	nos	6			
K	<u>Telephone & Computer Ducts</u> Construct 4 way telephone foot way joint box no. 3 (FJB3) in situ mix on site c/w foot way covers, cable bearers and reinforced concrete work etc to TelBru standard. Indicative location shown in the site plan. All works and materials to TelBru standards.	nos	2			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	2 x 100 dia uPVC telephone cable duct encased in concrete c/w nylon pull cables, end caps, laid approx. 1m from ground, asphalt & across drain inclusive of excavation, sand fill, compaction, cutting and reinstatement to approval.	m	60			
B	Allow costs for draw pit of 600 x 600 mm for telephone & fiber cable duct entry to building c/w chequered plate cover, draw rope, 2 way 100 dia uPVC with sealant at both ends as shown in the drawing.	lot	1			
C	Allow cost for taping 2 x 100 dia telephone pipe duct into existing telephone manhole.	lot	1			
D	Comms earthing using 1c/70mm ² PVC earth cable c/w earth bar, insulator, heavy duty earth chamber and necessary accessories to achieve 1 ohm or less link to main earthing system	lot	1			
E	Liaison with TelBru or relevant authorities on incoming telephone and fibre optic connection.	lot	1			
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Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
R/E	<u>ELECTRICAL INSTALLATION FOR HIGH COMMISSIONER'S RESIDENCE</u>					
[5]	<u>FIRE PROTECTION SERVICES</u> Supply and install Fire Alarm Devices as per specification and drawings. All fire alarm devices shall be by Multron or equivalent and of approved Bomba Vendors. <u>Self-contained fire alarm devices c/w battery, detector base, etc and other necessary accessories:</u>					
A	Smoke detector <u>Supply and install of fire extinguishers and shall be by SRI or equivalent.</u>	no	6			
B	2.5 kg ABC dry powder extinguisher	no	6			
C	2.5 kg co ₂ fire extinguisher	no	2			
D	Fire blanket	no	6			
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TO R/E5 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
R/E	<u>ELECTRICAL INSTALLATION FOR HIGH COMMISSIONER'S RESIDENCE</u>					
[6]	<u>MATV SYSTEM</u> Supply and installation of MATV system as per drawings and specifications. Tenderer shall submit a complete detailed system proposal including all equipment offered, catalogues and brochures together with this tender. The equipment and accessories listed below are for tendering purpose. The tenderer is to include all other equipment and accessories not included herein but deemed necessary to the intent of the specifications and requirement. Proposed brands shall be Ikusi/Televes or equivalent.					
	<u>Antennae/Headend, Distribution Equipment and Accessories</u>					
A	RTB Analog and Digital Antennae c/w necessary accessories inclusive steel mounting stand/ supports/ mast.	lot	1			
B	Headend MATV Amplifier c/w necessary accessories	lot	1			
C	Astro 65cm dish w/ Televes Quattro LNBF or equivalent and necessary accessories inclusive steel mounting stand/ supports/ mast.	lot	1			
D	5in, 5out Amplifier to Televes or equivalent	lot	1			
E	5in, 8out/16out Multiswitch to Televes or equivalent	nos	2			
F	IF Tap-Off units to Televes or equivalent	nos	1			
G	Wiring of TV/SAT/FM 2 gang socket outlet by using of 2xRG6 (coaxial) cable in concealed conduit. Proposed brand for RG6 cable shall be Belden or equivalent.	nos	10			
H	Custom-made metal enclosure with hinged door for installation of amplifier and multiswitch c/w accessories.	nos	1			
I	Combiners, connectors and necessary accessories	lot	1			
J	Installation, termination, testing and commissioning for the whole system	lot	1			
	<u>Conduit and Trunking Works</u>					
K	Allow cost for labelling and marking of all cables, tap -off units and splitters.	lot	1			
L	Supply and install hot dipped galvanised heavy duty cable trunking c/w all necessary supports. Trunking covers shall utilise a quarter turn screw. Trunking for shall be of different colour from lighting, power and other services.	lot	1			
M	Supply and install various lengths of 25Ø/32Ø PVC conduit as per drawing and where necessary cast/concealed in wall/slab.	lot	1			
N	Allow cost for the engineering, design proposal, shop drawing and catalogues for approval.	lot	1			
O	Testing and Commissioning of MATV System	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
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TO R/E6 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
R/E	<u>ELECTRICAL INSTALLATION FOR HIGH COMMISSIONER'S RESIDENCE</u>					
[7]	<u>SECURITY SYSTEM</u> Supply and install card access control system integrated with IP video surveillance system as per drawing and specifications. Tenderer shall submit a complete detailed system proposal including all equipment offered, catalogues and brochures together with this tender. The equipment and accessories listed below are for tendering purpose. The tenderer is to include all other equipment and accessories for proper functioning and operation of the security system to the intent of specification and requirement.					
	<u>Camera System</u> Supply and install indoor and outdoor camera c/w but not limited to the following: i) DVD quality, day/night function, min lux 0.05 lux at F= 1.2 ii) Dual stream MPEG-4 SP video upto 4CIF/30pfs iii) Power over Ethernet (PoE) ready iv) One way audio supported v) QoS enabled (L3) video streaming vi) Backlight compensation vii) Auto iris control, variable focal c/w camera licenses viii) Other features that deemed necessary and required by the Client					
A	Fixed indoor IP mini dome camera to Samsung or equivalent	sets	6			
B	<u>Video Management System Software</u> Video Management System (VMS) software and licenses for efficient viewing, recording, replaying of acquired video/audio complying with requirements and specifications including but not limited to the following functions:- - 4CIF, 30 fps video stream - Health monitoring and analysis functions - Software development kit (SDK) - High level integration with card access system and IP cameras - Single and multi-site support - Support distributed remote viewing and remote storage - Able to export to DVD-RW driver	lot	1			
C	<u>Master Server</u> <u>Minimum Hardware Requirements:-</u> - Operating System: Windows 2003 SP1 <u>Master Server Cont'd</u> - Processor: Intel Pentium 4 or Pentium D or Pentium Xeon, 2.8 GHz Hyper-Thread enabled - Memory: 4 GB	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>Network: 10/100/1000Base-T</u> - DVD R/W Drive: Required - Hard Disk Partitions: C: (Operating System) = 15 GB D: (Database) = 10 GB L: DVD Drive c/w 20" LCD monitor <u>Required Software:</u> - Microsoft SQL Server 2000 with Service Pack 3 or latest - Microsoft Operations Manager 2005 or better - Video Management Software - all other necessary software and licenses and proper management and functioning of IP video surveillance system. <u>Digital Video Recorder</u>	Inclusive				
	Supply and install Recorder Server to Samsung SRN-1670D/470D or equivalent c/w external Raid 5 hot-swappable SATA hard disk array for recording and viewing of video images and which support minimum 15 channel recording at Full D1 at 30 fps. Disk array to be sized for fulltime recording for 30 days based on minimum 12.5 fps (at MPEG 4, CIF-4kb) for 15 no of IP cameras <u>Minimum Hardware Requirements:-</u> Operating System: Windows 2003 SP1, Windows XP SP2 Processor: Intel Pentium 4 or Pentium D or Pentium Xeon, 2.8 GHz Memory: 4 GB Network: 10.100/1000 Base-T DVD reader drive: Required C: (Operating System) = 15 GB D: (Database) = 10 GB L: DVD Drive c/w 20" high resolution LCD monitors	Inclusive				
A	Allow for necessary management software, operation system software and licenses for recorder server for proper management of larger-scale distributed video operations as specified	lot	1			
	<u>Network Devices</u>					
B	24 port network switch with 24 port 10/100 Base-T PoE ready Ethernet interface modules & 1x1000 Base-T module	no	1			
C	Network patch panels as required	lot	1			
D	Redundant power supply units, chassis fan, patch chords all necessary accessories required	lot	1			
E	Allow for all necessary management software for configuration of the switches and accessories	lot	1			
F	22U 19" equipment rack to house the CCTV equipment c/w all necessary accessories.	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	Supply and install of CAT 6 STP cabling of approved make, inclusive of conduit, trunking where required (average length 70m) from security equipment racks to camera points - ceiling of wall mounted.	nos	15			
B	Allow for CAT 6 patch chords from patch panels to the network devices (including network and distribution switches)	lot	1			
C	Cost & expenses for complete configuration, testing and commissioning of the transmission system to the satisfaction of consulting engineers and client.	lot	1			
D	Allow cost for the engineering, design proposal, shop drawing and catalogues for approval.	lot	1			
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TO R/E7 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
R/E	<u>ELECTRICAL INSTALLATION FOR HIGH COMMISSIONER'S RESIDENCE</u>					
[8]	<u>LIGHTNING PROTECTION SYSTEM</u> Supply, Install, Testing and Commissioning of the following including all necessary termination/fixing accessories as per drawing of Electrical Services and specifications:- Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.					
A	Air termination rod c/w the base. Make: D.E.S approved brand.	nos.	6			
B	25 x 3mm bare copper tape horizontal conductor c/w fixing accessories (saddle screws, square clamp, etc) run on roof level.	m	250			
C	1C x 70mm ² down conductor in 50mm dia. uPVC conduit chased in wall/column. Make: D.E.S approved brand.	m	120			
D	Oblong test joint clamp c/w recessed w/p termination box. Make: D.E.S approved brand.	nos.	6			
E	Earthing pit c/w copperbond earth rod & H.D. cover. Make: D.E.S approved brand.	set	6			
F	Testing and commissioning of lightning protection system.	lot	1			
To Collection:						
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TO R/E8 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
R/E	<u>ELECTRICAL INSTALLATION FOR HIGH COMMISSIONER'S RESIDENCE</u>					
[9]	<u>EXTERNAL WORKS</u>					
	<u>LV Reticulation Mains</u> Supply and install submain cables as per drawings & specification. Cost of hot dipped galvanised cable ladder, tray, trunking, required shall be included in the pricing of cable. The size of cable ladder/cable tray and containment provided shall be adequate for cable spacings factor as per latest EIR and IEE Regulations. Rates of cable laid underground shall include cost of trench excavation, sand bedding, pipesleeves, protective tile and reinstatement. Rates for cables shall be inclusive of cable identification tags at 10m intervals and at every bend. Cost quoted to be inclusive of termination of all incoming and outgoing cables including cable glands, lugs, etc as per drawing and specifications. Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.					
A	1x4c/95mm ² XLPE/SWA/PVC cable laid underground as per the DES specifications, c/w necessary pipesleeves and cable tray/trunking from the existing Feeder Pillar to SSB-RS. <u>Miscellaneous and Related Works</u>	lot	1			
B	Allow miscellaneous cost for concrete encased pipesleeves of 150mm dia for all road crossing, pipe jacking, hard standing areas, returfing, refurbishment and making good of existing ground.	lot	1			
C	Allow miscellaneous cost for providing floor openings, pipe sleeves through RC beams & slabs, fire stop barrier, fire seal pillows, etc for passage of sub-main cables, lighting and power wiring, telephone & computer system, fire alarm & fire protection system, water services, aircon services and other disciplines.	lot	1			
D	Allow cost for liaison with Authorities regarding power supply application and energization of the system. <u>Upgrading Works (if required)</u>	lot	1			
E	Allow cost for the upgrading of the existing substation inclusive of necessary and required materials. Cost to include liason to authorities and nearby residences.	lot	1			
F	Supply, install and commissioning of 500 kVA 11kV/433V outdoor type Distribution Transformer c/w all necessary accessories to DES specification ref: DES/11KV/TRF/REV '0' dated 26-7-1997.	lot	1			
G	800A Outdoor type 433V 3 Phase 50Hz Low Voltage Distribution Feeder Pillar as per DES Specification.	lot	1			
H	4x1c/500mm ² XLPE/AWA/PVC cable from transformer to MFP laid underground.	m	15			
I	Equipment body earthing system c/w necessary accessories to achieve below 1 ohm (for MFP, RMU & Transformer)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	Transformer neutral earthing using 2x120mm ² PVC earth cable c/w heavy duty earth chamber and necessary accessories to achieve 1 ohm or less link to main earthing system.	lot	1			
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<p><u>COLLECTION</u></p> <p><u>PAGE</u></p> <p>R/E9 (Page 1/2) - - - - -</p> <p>R/E9 (Page 2/2) - - - - -</p>						
TO R/E9 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
R/E	<u>ELECTRICAL INSTALLATION FOR HIGH COMMISSIONER'S RESIDENCE</u>					
[10]	<u>STANDBY DIESEL GENERATOR SET</u>					
	Supply, install, test and commission the standby generator system as per below mentioned specification.					
	<u>Generator</u>					
A	Standby generator set of 200 kVA capacity at 0.8 power factor, 415V 3 phase, 50Hz (prime - rating), less noise type c/w the following : <ul style="list-style-type: none"> - skid base fuel tank type (minimum 8 hours backup) - fabricated steel underframe - diesel engine c/w accessories - alternator c/w AVR - radiator - electronic governor - flexible connection to fuel piping and flexible below for connection to exhaust piping - Meters for water temperature, oil pressure, oil temperature, tachometer hour run - 2 nos starter motors - diesel fuel, oil, water and air filters - safety overspeed, high water temperature, low oil pressure trip and alarm devices - guards of all moving parts and all necessary labelling and name plates - anti vibration mounting pads - rate to include cable terminations, glands and lugs 	lot	1			
	<u>Batteries</u>					
B	Lead acid batteries c/w a non ferrous battery rack, interconnecting links, terminal shrouds and flexible cable tails to connect the battery to the starter. The battery should be sized for 6 successive starts of 6 seconds each with a 15 seconds rest period.	lot	1			
	<u>AMF Switchboard</u>					
C	Automatic mains failure switchboard of metalclad enclosure, floor standing to specification with front and rear access and complete with but not limited to the following : <ul style="list-style-type: none"> -1 x 250A 4P MCCB/ACB - main - External O/C & E/F protection of MCCB/ACB - Voltmeter c/w a selector switch - Ammeter c/w a selector switch - KWH, power factor, hour run and frequency meter - Mains available and generator available indicating lights - Battery charger c/w boost/trickle charger selector - Battery voltmeter and ammeter - Indicator lamps for operation of engine and controls protective devices - Selector switch for "Off" "Auto" "Manual" and "Test" - Push buttons for start/stop/alarm, cancel/lamp test/reset - Alarm siren - Contacts for remote monitoring 	lot	1			
To Collection:						
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Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>AMF Switchboard Cont'd</u> - Control relays, timer, under voltage sensing relay, low battery, voltage relay, etc to effect automatic main failure sensing and control of the generator - Cable termination plate, lugs and glands - Rates for switchboards to include cost for cable termination at the board - All necessary labels <u>Exhaust System</u>					
A	Radiator exhaust ducting c/w a flexible canvas section to connect the radiator to the discharge shaft. The ducting should be provided with an access hatch for cleaning out and should be constructed in accordance with BS DW142 with 1.2 mm thick galvanised sheet steel. The ducting should be reinforced with angle iron brackets.	lot	1			
B	Residential type exhaust silencer and piping using BS3601 pipes with welded joints c/w necessary spring isolation supports.	lot	1			
C	Allow cost of necessary inlet air attenuator and outlet air attenuator/silencer as per manufacturer's recommendation.	lot	1			
D	Exhaust piping to be lagged with 50mm thick sectional rock wool and clad with a 0.6mm thick stainless steel.	lot	1			
E	The discharge outlet shall be angled at 30 degree and provided with an anti vermin mesh. Where the exhaust pipes penetrate through the building structure, a G.I. sleeve shall be provided.	inclusive	-			
F	The sleeves shall be one pipe diameter larger than the exhaust pipe and space between the sleeved and pipe packed with rock wool and sealed with a rock wool and sealed with a non setting heat resistant compound.	inclusive	-			
	<u>Power and Control Wiring</u> Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.					
G	4C/120mm ² XLPE/SWA/PVC on cable laid underground as per the DES specifications, c/w necessary pipesleeves and cable tray/trunking from the existing Feeder Pillar to SSB-RS.	m	100			
H	Multicore control cable 5c/2.5mm ² between the generator and the AMF panel laid on tray & power supply sensing cable from AMF to SSB-RS.	lot	1			
	<u>Earthing System</u>					
I	Neutral earthing using 2 x 120 mm ² PVC earth cable c/w earth chamber and necessary accessories to achieve below 1 ohm.	lot	1			
J	Frame earthing using 70 mm ² PVC earth cable linking the generator, AMF panel, fuel tank frame in ring formation to earth rods in earth chamber to achieve the earthing value as per DES requirements.	lot	1			
K	1m wide x 6mm thick rubber along the front and back of the AMF panel.	lot	1			
L	Provide a framed schematic and control drawing in the genset room.	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	Allow cost for mild steel checkered plate with anti-rust painting finish covering all HV and LV electrical trenches, genset trenches, etc that is within this contract. Contractor to propose plate arrangements.	lot	1			
To Collection:						
<u>COLLECTION</u>						
<u>PAGE</u>						
R/E10 (Page 1/3) - - - - -						
R/E10 (Page 2/3) - - - - -						
R/E10 (Page 3/3) - - - - -						
TO R/E10 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
TUC	<u>TESTS UPON COMPLETION</u>					
A	<p>Cost and expenses for the complete acceptance testing and commissioning of the entire M&E Services Installation to the satisfaction of the consulting engineers and authority.</p> <p>A complete testing and commissioning reports and test data shall be provided and documented for submission. Cost shall include all expenses for plant, tools, test instrument and agents, electricity, water, and factory's commissioning expenses for major equipment and relevant authorities inspection fees.</p> <p>The complete system testing and commissioning and documentation shall cover the entire installation under this contract but not limited to the following:</p> <ul style="list-style-type: none"> - Main Switchboard and Control Panels - Air Conditioning System - Exhaust & Ventilation System - Electrical System - Fire Detection & Protection System - Telecommunication System - MATV System - Access Control & CCTV System - Specialist System - and all other works associated with other M&E services installation and works covered in main contract <p><u>Contract Comprehensive Maintenance</u></p>	lot	1			
B	<p>Provide all-in comprehensive and routine maintenance for the whole of Mechanical and Electrical Services Installation covering the twelve (12) months defect liability period or as stipulated in the contract including replacement of wear and tear and consumable parts.</p> <p>The contractor is required to produce record of monthly maintenance log sheets and trend log data of the entire system installation for record and for sign off by client for maintenance works performed.</p> <p><u>Submissions</u></p>	lot	1			
C	<p>Submit design calculations and engineering drawings for major equipments, M&E services shop drawings coordinated with other services for review/ approval.</p>	lot	1			
D	<p>Submit necessary samples for review/ approval and display at site office where appropriate.</p>	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	<p><u>As-Built Drawings and O&M Manual</u></p> <p>Submit six (6) sets of hard copies final as-built record drawings, equipment engineering drawings properly bound in folder files along with soft copies and O&M manual and necessary parts replacements as recommended by manufacturer. Costs shall include spare parts lists of the major equipments, components and consumables.</p> <p><u>List of O&M Manual</u></p> <p>(A) Air -conditioning and Mechanical Ventilaiton (i) Equipment (ii) Pipe work (iii) Duct work (iv) Diffusers, grilles and dampers (B) Fire protection (C) Plumbing (D) Electrical (E) Telecommunication (F) Specialist Services</p> <p><u>Content of O&M Manuals</u></p> <p>a) SOP (normal operation, service, breakdown, emergency) b) Catalogues and technical literature c) Maintenance Schedule and checklist d) As-Built Drawings e) Consumables and spare parts list f) Contact Person in case of emergency g) Coordinatated Drawings /Schematic diagram/ IO list points h) Equipment certificate / calibration certificated / warning i) T&C report document</p>	lot	1			
To Collection:						
	<p><u>COLLECTION</u></p> <p><u>PAGE</u></p> <p>TUC/1 - - - - -</p> <p>TUC/2 - - - - -</p>					
TO TUC (8A) SUMMARY:						

BILL 8B

(CHANCERY, NON-RG & RG)

Section	Description	Bill No.	Amount	
			\$	c
BILL 8B				
	<u>SUMMARY OF PRICES OF M&E WORKS FOR CHANCERY, STAFF RESIDENCES AND AUXILIARY FACILITIES BUILDING</u>			
	<u>CHANCERY</u>			
CH/M	<u>Mechanical Services</u>			
[1]	EQUIPMENT			
[2]	PIPEWORK			
[3]	DUCTWORK			
[4]	DIFFUSERS, GRILLES & DAMPERS			
[5]	ELECTRICAL			
[6]	FIRE HOSE REEL			
[7]	POOL POND			
[8]	PLUMBING			
CH/E	<u>Electrical Services</u>			
[1]	SWITCHBOARDS AND DISTRIBUTION BOARDS			
[2]	LV RETICULATION MAINS			
[3]	GENERAL LIGHTING AND POWER SERVICES			
[4]	LIGHT FITTINGS AND ACCESSORIES			
[5]	TELEPHONE AND COMPUTER SYSTEM			
[6]	CONVENTIONAL FIRE ALARM SYSTEM			
[7]	STANDBY DIESEL GENERATOR SET			
[8]	HT CABLES AND RELATED EQUIPMENT			
[9]	PA SYSTEM			
[10]	MATV SYSTEM			
[11]	SECURITY SYSTEM			
[12]	LIGHTNING PROTECTION SYSTEM			
[13]	EXTERNAL WORKS			
CH/L	<u>Lift Services</u>			
[1]	LIFT SERVICES INSTALLATION			
	<u>NON-REPRESENTATIONAL GRADE (BLOCK A)</u>			
NRG/M	<u>Mechanical Services</u>			
[1]	EQUIPMENT			
[2]	PIPEWORK			
[3]	ELECTRICAL			
NRG/E	<u>Electrical Services</u>			
[1]	SWITCHBOARDS and LV RETICULATION MAINS			
[2]	GENERAL LIGHTING and POWER SERVICES			
[3]	LIGHT FITTINGS and ACCESSORIES			
[4]	TELEPHONE SYSTEM			
[5]	FIRE ALARM SYSTEM			
[6]	MATV SYSTEM			
[7]	LIGHTNING PROTECTION SYSTEM			
[8]	TESTS UPON COMPLETION			
NRG/L	<u>Lift Services</u>			
[1]	LIFT SERVICES INSTALLATION			
TOTAL CARRIED FORWARD TO NEXT PAGE :				

Section	Description	Bill No.	Amount	
			\$	c
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE :				
	<u>REPRESENTATIONAL GRADE (BLOCK B)</u>			
RG/M	<u>Mechanical Services</u>			
[1]	EQUIPMENT			
[2]	PIPEWORK			
[3]	ELECTRICAL			
RG/E	<u>Electrical Services</u>			
[1]	SWITCHBOARDS and LV RETICULATION MAINS			
[2]	GENERAL LIGHTING and POWER SERVICES			
[3]	LIGHT FITTINGS and ACCESSORIES			
[4]	TELEPHONE SYSTEM			
[5]	FIRE ALARM SYSTEM			
[6]	MATV SYSTEM			
[7]	SECURITY SYSTEM			
[8]	LIGHTNING PROTECTION SYSTEM			
TUC	<u>Tests Upon Completion</u>			
TO M&E SUMMARY PAGE (BILL 8B) :				

MECHANICAL SERVICES
(BILL OF QUANTITIES)

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/M	<u>MECHANICAL SERVICES FOR CHANCERY</u>					
[1]	<u>EQUIPMENT</u>					
	DUCTED DX SPLIT SYSTEM (Carrier or approved equivalent) Supply, installation, testing and commissioning of the Air Conditioning System as shown and indicated in the drawing. All material supply & works carry out shall be as per DES requirements and approved vendors products. Rate quoted shall be inclusive of supply and termination of all power and control cables to equipment including necessary cable, glands, lugs, earthing, conduit/ HDGS cable tray and other necessary accessories. Air Cooled Split Conditioning system consisting of AHU and matching air cooled condensing unit compressor shall be fully inverter type) c/w sight glass, refrigerant & oil, refrigerant filter, brackets and supports, power & control wiring and other necessary accessories as specified and as shown in the drawing. Outdoor condition: 34.0 deg C/28.5 deg C DB/WB Indoor condition: 22.0 deg C DB, +/- 1 deg C, 55% +/-5% RH please refer to technical specifications					
A	Air Handling Unit (AHU-1) Air flow capacity: 5,516 L/S (19,867 CMH) Total static pressure: 610 Pa (indicative only) Total coil load: 112.2 KW Total sensible load: 79.8 KW	set	1			
B	Matching Air Cooled Condensing Unit	set	1			
C	Air Handling Unit (AHU-2) Air flow capacity: 3,773 L/S (13,589 CMH) Total static pressure: 623 Pa (indicative only) Total coil load: 63.6 KW Total sensible load: 51.8 KW	set	1			
D	Matching Air Cooled Condensing Unit	set	1			
E	Ducted Fan coil Unitt (DFCU-G) Air flow capacity: 1266 L/S (4560CMH) Total static pressure: 623 Pa (indicative only) Total coil load: 22 KW Total sensible load: 16.6 KW	set	1			
F	Matching Air Cooled Condensing Unit	set	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<p><u>INVERTER MULTI SYSTEM (Carrier or approved equivalent)</u></p> <p>Air Cooled Condensing Unit (CU) shall be floor mounted type, each unit shall have a minimum of 2 compressors per module and all compressors shall be fully inverter type and completely possible to operate at ranges of partial loads. Compressors shall be reliable twin rotary type with DC motors. condenser fan motor shall be high efficiency DC motor capable of operating at 32 different steps. Condensers shall be copper tube and aluminum-type. The outdoor unit shall be able to handle equivalent pipe lengths up to 235 meters. Fan Coil Unit (FCU) complete with air filter and all necessary accessories for satisfactory operation.</p> <p>Outdoor condition: 34.0 deg C/28.5 deg C DB/WB Indoor condition: 22.0 deg C DB, +/- 1 deg C, 55% +/-5% RH please refer to technical specifications</p> <p><u>OUTDOOR CONDENSING UNIT</u> RATING CAPACITY</p> <p>A VRF-G1 (40.1 KW) set 1</p> <p>B VRF-G2 (55.5 KW) set 1</p> <p>C VRF-F1 (54.6 KW) set 1</p> <p>D VRF-F2 (47.6 KW) set 1</p> <p><u>INVERTER TYPE FAN COIL UNITS</u> Inclusive of remote THERMOSTAT control unit Cassette (Ceiling Mounted Type Unit)</p> <p>RATING CAPACITY</p> <p>E FCU-G1.1 (4.0 KW) no 1</p> <p>F FCU-G1.2 (4.0 KW) no 1</p> <p>G FCU-G1.3 (1.5 KW) no 1</p> <p>H FCU-G1.4 (4.8 KW) no 1</p> <p>I FCU-G1.5 (4.8 KW) no 1</p> <p>J FCU-G1.6 (3.4 KW) no 1</p> <p>K FCU-G1.7 (0.8 KW) no 1</p> <p>L FCU-G1.8 (2.7 KW) no 1</p> <p>M FCU-G1.9 (5.4 KW) no 1</p>					
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>INVERTER TYPE FAN COIL UNITS (CONTINUED)</u>					
A	FCU-G1.10 (5.4 KW)	no	1			
B	FCU-G1.11 (3.1KW)	no	1			
C	FCU-G2.1 (0.9 KW)	no	1			
D	FCU-G2.2 (6.7 KW)	no	1			
E	FCU-G2.3 (8.9 KW)	no	1			
F	FCU-G2.4 (8.6 KW)	no	1			
G	FCU-G2.5 (5.8 KW)	no	1			
H	FCU-G2.6 (5.8 KW)	no	1			
I	FCU-G2.7 (7.5 KW)	no	1			
J	FCU-G2.8 (11.3 KW)	no	1			
K	FCU-G2.9 (11 KW)	no	1			
L	FCU-F1.1 (2.5 KW)	no	1			
M	FCU-F1.2 (3.7 KW)	no	1			
N	FCU-F1.3 (3.7 KW)	no	1			
O	FCU-F1.4 (3.1 KW)	no	1			
P	FCU-F1.5 (7.2KW)	no	1			
Q	FCU-F1.6 (3.6 KW)	no	1			
R	FCU-F1.7 (3.3 KW)	no	1			
S	FCU-F1.8 (2.6 KW)	no	1			
T	FCU-F1.9 (3.3 KW)	no	1			
U	FCU-F1.10 (5.3 KW)	no	1			
V	FCU-F1.11 (5.3 KW)	no	1			
W	FCU-F1.12 (10.9 KW)	no	1			
X	FCU-F2.1 (10.1 KW)	no	1			
Y	FCU-F2.2 (3.3 KW)	no	1			
Z	FCU-F2.3 (5.9 KW)	no	1			
AA	FCU-F2.4 (5.4 KW)	no	1			
AB	FCU-F2.5 (5.4 KW)	no	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>INVERTER TYPE FAN COIL UNITS (CONTINUED)</u>					
A	FCU-F2.6 (5.9 KW)	no	1			
B	FCU-F2.7 (4.0 KW)	no	1			
C	FCU-F2.8 (4.0 KW)	no	1			
D	FCU-F2.9 (3.6 KW)	no	1			
E	CONTINGENCY SUM				15,000.00	
	DX-Split Air Conditioning system consisting of fan coil unit (Cassette Type)and matching air cooled condensing unit, refrigerant, brackets and supports, power & control wiring and other necessary accessories as specified and as shown in the drawing.					
F	FCU/CU-G (11.0 KW)	set	1			
G	FCU/CU-GH (2.6 KW)	sets	2			
To Collection:						
	<u>COLLECTION</u>					
	<u>PAGE</u>					
	CH./M1 (page 1/4) - - - - -	-	-	-		
	CH./M1 (page 2/4) - - - - -	-	-	-		
	CH./M1 (page 3/4) - - - - -	-	-	-		
	CH./M1 (page 4/4) - - - - -	-	-	-		
TO CH/M1 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/M	<u>MECHANICAL SERVICES FOR CHANCERY</u>					
[2]	<u>PIPEWORK</u>					
	<u>REFRIGERANT PIPEWORK</u>					
	Solid drawn copper tube c/w 20mm thick THERMAL insulation and white PVC Denso wrap tape encased in heavy duty PVC impact resistant industrial trunking, fittings, liquid line solenoid valves, TX valves, sight glasses and filter driers, supports, brackets and as specified. All systems to be pressure tested, evacuated and dehydrated before charging with refrigerant. (where two refrigerant lines system is offered Tenderer is to price for the 2 lines accordingly). Testing, evacuation and dehydration of both refrigeration systems, before charging with refrigerant, and include initial refrigerant charge. Note : All test pressures and evacuation pressures to be submitted in type written form to the Engineer.					
	<u>REFRIGERANT PIPE</u>					
	<u>(DX SYSTEM)</u>					
A	AHU-1/CU-1	lot	1			
B	AHU-2/CU-2	lot	1			
C	DFCU-G	lot	1			
D	FCU/CU-G	lot	1			
	<u>(INVERTER SYSTEM)</u>					
	MAIN LINE					
E	VRF-G1 9 (40.1 KW)	lot	1			
F	VRF-G2 (55.5 KW)	lot	1			
G	VRF-F1 (54.6 KW)	lot	1			
H	VRF-F2 (47.6 KW)	lot	1			
	BRANCH LINE					
I	FCU-G1.1 (4.0 KW)	lot	1			
J	FCU-G1.2 (4.0 KW)	lot	1			
K	FCU-G1.3 (1.5 KW)	lot	1			
L	FCU-G1.4 (4.8 KW)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	FCU-G1.5 (4.8 KW)	lot	1			
B	FCU-G1.6 (3.4 KW)	lot	1			
C	FCU-G1.7 (0.8 KW)	lot	1			
D	FCU-G1.8 (2.7 KW)	lot	1			
E	FCU-G1.9 (5.4 KW)	lot	1			
F	FCU-G1.10 (3.1 KW)	lot	1			
G	FCU-G1.11 (4.0 KW)	lot	1			
H	FCU-G2.1 (0.9 KW)	lot	1			
I	FCU-G2.2 (11.6 KW)	lot	2			
J	FCU-G2.3 (8.9 KW)	lot	1			
K	FCU-G2.4 (8.6 KW)	lot	1			
L	FCU-G2.5 (5.8 KW)	lot	1			
M	FCU-G2.6 (5.8 KW)	lot	1			
N	FCU-G2.7 (7.5 KW)	lot	1			
O	FCU-G2.8 (4.3 KW)	lot	1			
P	FCU-F1.1 (2.5 KW)	lot	1			
Q	FCU-F1.2 (3.7 KW)	lot	1			
R	FCU-F1.3 (3.7 KW)	lot	1			
S	FCU-F1.4 (3.1 KW)	lot	1			
T	FCU-F1.5 (7.2KW)	lot	1			
U	FCU-F1.6 (3.6 KW)	lot	1			
V	FCU-F1.7 (3.3 KW)	lot	1			
W	FCU-F1.8 (2.6 KW)	lot	1			
X	FCU-F1.9 (3.3 KW)	lot	1			
Y	FCU-F1.10 (5.3 KW)	lot	1			
Z	FCU-F1.11 (5.3 KW)	lot	1			
AA	FCU-F1.12 (10.9 KW)	lot	1			
AB	FCU-F2.1 (10.1 KW)	lot	1			
AC	FCU-F2.2 (3.3 KW)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
BRANCH LINE (CONTINUED)						
A	FCU-F2.3 (5.9 KW)	lot	1			
B	FCU-F2.4 (5.4 KW)	lot	1			
C	FCU-F2.5 (5.4 KW)	lot	1			
D	FCU-F2.6 (5.9 KW)	lot	1			
E	FCU-F2.7 (4.0 KW)	lot	1			
F	FCU-F2.8 (4.0 KW)					
G	FCU-F2.9 (3.6 KW)	lot	1			
<u>VRF DISTRIBUTION JOINT KITS</u>						
H	VRF-G1 9 (40.1 KW)	lot	1			
I	VRF-G2 (55.5 KW)	lot	1			
J	VRF-F1 (54.6 KW)	lot	1			
K	VRF-F2 (47.6 KW)	lot	1			
L	FCU-G1.1 (4.0 KW)	lot	1			
M	FCU-G1.2 (4.0 KW)	lot	1			
N	FCU-G1.3 (1.5 KW)	lot	1			
O	FCU-G1.4 (4.8 KW)	lot	1			
P	FCU-G1.5 (4.8 KW)	lot	1			
Q	FCU-G1.6 (3.4 KW)	lot	1			
R	FCU-G1.7 (0.8 KW)	lot	1			
S	FCU-G1.8 (2.7 KW)	lot	1			
T	FCU-G1.9 (5.4 KW)	lot	1			
U	FCU-G1.10 (5.4 KW)	lot	1			
V	FCU-G1.11 (4.0KW)	lot	1			
W	FCU-G2.1 (0.9 KW)	lot	1			
X	FCU-G2.2 (11.6 KW)	lot	2			
Y	FCU-G2.3 (8.9 KW)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
<u>VRF DISTRIBUTION JOINT KITS (CONTINUED)</u>						
A	FCU-G2.4 (8.6 KW)	lot	1			
B	FCU-G2.5 (5.8 KW)	lot	1			
C	FCU-G2.6 (5.8 KW)	lot	1			
D	FCU-G2.7 (7.5 KW)	lot	1			
E	FCU-G2.8 (11.3 KW)	lot	1			
F	FCU-F1.1 (2.5 KW)	lot	1			
G	FCU-F1.2 (3.7 KW)	lot	1			
H	FCU-F1.3 (3.7 KW)	lot	1			
I	FCU-F1.4 (3.1 KW)	lot	1			
J	FCU-F1.5 (7.2KW)	lot	1			
K	FCU-F1.6 (3.6 KW)	lot	1			
L	FCU-F1.7 (3.3 KW)	lot	1			
M	FCU-F1.8 (2.6 KW)	lot	1			
N	FCU-F1.9 (3.3 KW)	lot	1			
O	FCU-F1.10 (5.3 KW)	lot	1			
P	FCU-F1.11 (5.3 KW)	lot	1			
Q	FCU-F1.12 (10.9 KW)	lot	1			
R	FCU-F2.1 (10.1 KW)	lot	1			
S	FCU-F2.2 (3.3 KW)	lot	1			
T	FCU-F2.3 (5.9 KW)	lot	1			
U	FCU-F2.4 (5.4 KW)	lot	1			
V	FCU-F2.5 (5.4 KW)	lot	1			
W	FCU-F2.6 (5.9 KW)	lot	1			
X	FCU-F2.7 (4.0 KW)	lot	1			
Y	FCU-F2.8 (4.0 KW)	lot	1			
Z	FCU-F2.9 (3.6 KW)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>SOLENOID VALVE KITS</u>					
A	VRF-G1 9 (40.1 KW)	lot	1			
B	VRF-G2 (55.5 KW)	lot	1			
C	VRF-F1 (54.6 KW)	lot	1			
D	VRF-F2 (47.6 KW)	lot	1			
E	FCU-G1.1 (4.0 KW)	lot	1			
F	FCU-G1.2 (4.0 KW)	lot	1			
G	FCU-G1.3 (1.5 KW)	lot	1			
H	FCU-G1.4 (4.8 KW)	lot	1			
I	FCU-G1.5 (4.8 KW)	lot	1			
J	FCU-G1.6 (3.4 KW)	lot	1			
K	FCU-G1.7 (0.8 KW)	lot	1			
L	FCU-G1.8 (2.7 KW)	lot	1			
M	FCU-G1.9 (5.4 KW)	lot	1			
N	FCU-G1.10 (5.4 KW)	lot	1			
O	FCU-G1.11 (4.0KW)	lot	1			
P	FCU-G2.1 (0.9 KW)	lot	1			
Q	FCU-G2.2 (11.6 KW)	lot	2			
R	FCU-G2.3 (8.9 KW)	lot	1			
S	FCU-G2.4 (8.6 KW)	lot	1			
T	FCU-G2.5 (5.8 KW)	lot	1			
U	FCU-G2.6 (5.8 KW)	lot	1			
V	FCU-G2.7 (7.5 KW)	lot	1			
W	FCU-G2.8 (11.3 KW)	lot	1			
X	FCU-F1.1 (2.5 KW)	lot	1			
Y	FCU-F1.2 (3.7 KW)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
<u>SOLENOID VALVE KITS (CONTINUED)</u>						
A	FCU-F1.3 (3.7 KW)	lot	1			
B	FCU-F1.4 (3.1 KW)	lot	1			
C	FCU-F1.5 (7.2KW)	lot	1			
D	FCU-F1.6 (3.6 KW)	lot	1			
E	FCU-F1.7 (3.3 KW)	lot	1			
F	FCU-F1.8 (2.6 KW)	lot	1			
G	FCU-F1.9 (3.3 KW)	lot	1			
H	FCU-F1.10 (5.3 KW)	lot	1			
I	FCU-F1.11 (5.3 KW)	lot	1			
J	FCU-F1.12 (10.9 KW)	lot	1			
K	FCU-F2.1 (10.1 KW)	lot	1			
L	FCU-F2.2 (3.3 KW)	lot	1			
M	FCU-F2.3 (5.9 KW)	lot	1			
N	FCU-F2.4 (5.4 KW)	lot	1			
O	FCU-F2.5 (5.4 KW)	lot	1			
P	FCU-F2.6 (5.9 KW)	lot	1			
Q	FCU-F2.7 (4.0 KW)	lot	1			
R	FCU-F2.8 (4.0 KW)	lot	1			
S	FCU-F2.9 (3.6 KW)	lot	1			
<u>BALL VALVE AND FITTINGS</u>						
T	VRF-G1 9 (40.1 KW)	lot	1			
U	VRF-G2 (55.5 KW)	lot	1			
V	VRF-F1 (54.6 KW)	lot	1			
W	VRF-F2 (47.6 KW)	lot	1			
X	FCU-G1.1 (4.0 KW)	lot	1			
Y	FCU-G1.2 (4.0 KW)	lot	1			
Z	FCU-G1.3 (1.5 KW)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
<u>BALL VALVE AND FITTINGS (CONTINUED)</u>						
A	FCU-G1.4 (4.8 KW)	lot	1			
B	FCU-G1.5 (4.8 KW)	lot	1			
C	FCU-G1.6 (3.4 KW)	lot	1			
D	FCU-G1.7 (0.8 KW)	lot	1			
E	FCU-G1.8 (2.7 KW)	lot	1			
F	FCU-G1.9 (5.4 KW)	lot	1			
G	FCU-G1.10 (5.4 KW)	lot	1			
H	FCU-G1.11 (3.1KW)	lot	1			
I	FCU-G2.1 (0.9 KW)	lot	2			
J	FCU-G2.2 (6.7 KW)	lot	1			
K	FCU-G2.3 (8.9 KW)	lot	1			
L	FCU-G2.4 (8.6 KW)	lot	1			
M	FCU-G2.5 (5.8 KW)	lot	1			
N	FCU-G2.6 (5.8 KW)	lot	1			
O	FCU-G2.7 (7.5 KW)	lot	1			
P	FCU-G2.8 (11.3 KW)	lot	1			
Q	FCU-F1.1 (2.5 KW)	lot	1			
R	FCU-F1.2 (3.7 KW)	lot	1			
S	FCU-F1.3 (3.7 KW)	lot	1			
T	FCU-F1.4 (3.1 KW)	lot	1			
U	FCU-F1.5 (7.2KW)	lot	1			
V	FCU-F1.6 (3.6 KW)	lot	1			
W	FCU-F1.7 (3.3 KW)	lot	1			
X	FCU-F1.8 (2.6 KW)	lot	1			
Y	FCU-F1.9 (3.3 KW)	lot	1			
Z	FCU-F1.10 (5.3 KW)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
<u>BALL VALVE AND FITTINGS (CONTINUED)</u>						
A	FCU-F1.11 (5.3 KW)	lot	1			
B	FCU-F1.12 (10.9 KW)	lot	1			
C	FCU-F2.1 (10.1 KW)	lot	1			
D	FCU-F2.2 (3.3 KW)	lot	1			
E	FCU-F2.3 (5.9 KW)	lot	1			
F	FCU-F2.4 (5.4 KW)	lot	1			
G	FCU-F2.6 (5.9 KW)	lot	1			
H	FCU-F2.7 (4.0 KW)	lot	1			
I	FCU-F2.8 (4.0 KW)	lot	1			
J	FCU-F2.9 (3.6 KW)	lot	1			
CONDENSATE DRAIN PIPE 20mm dia. pipes (unless otherwise specified) to BS 3505 Class D c/w 15mm thick insulation concealed within walls and run in HD UPVC trunking c/w traps, fittings, brackets and supports.						
K	<u>AHU-1/CU-1</u>	lot	1			
L	<u>AHU-2/CU-2</u>	lot	1			
M	<u>DFCU-G</u>	lot	1			
N	<u>FCU/CU-G</u>	lot	1			
O	FCU-G1.1 (4.0 KW)	lot	1			
P	FCU-G1.2 (4.0 KW)	lot	1			
Q	FCU-G1.3 (1.5 KW)	lot	1			
R	FCU-G1.4 (4.8 KW)	lot	1			
S	FCU-G1.5 (4.8 KW)	lot	1			
T	FCU-G1.6 (3.4 KW)	lot	1			
U	FCU-G1.7 (0.8 KW)	lot	1			
V	FCU-G1.8 (2.7 KW)	lot	1			
W	FCU-G1.8 (2.7 KW)	lot	1			
X	FCU-G1.9 (5.4 KW)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CONDENSATE DRAIN PIPE (CONTINUED)						
A	FCU-G1.10 (5.4 KW)	lot	1			
B	FCU-G1.11 (3.1KW)	lot	1			
C	FCU-G2.1 (0.9 KW)	lot	1			
D	FCU-G2.2 (6.7 KW)	lot	2			
E	FCU-G2.3 (8.9 KW)	lot	1			
F	FCU-G2.4 (8.6 KW)	lot	1			
G	FCU-G2.5 (5.8 KW)	lot	1			
H	FCU-G2.6 (5.8 KW)	lot	1			
I	FCU-G2.7 (7.5 KW)	lot	1			
J	FCU-G2.8 (11.3 KW)	lot	1			
K	FCU-F1.1 (2.5 KW)	lot	1			
L	FCU-F1.2 (3.7 KW)	lot	1			
M	FCU-F1.3 (3.7 KW)	lot	1			
N	FCU-F1.4 (3.1 KW)	lot	1			
O	FCU-F1.5 (7.2KW)	lot	1			
P	FCU-F1.6 (3.6 KW)	lot	1			
Q	FCU-F1.7 (3.3 KW)	lot	1			
R	FCU-F1.8 (2.6 KW)	lot	1			
S	FCU-F1.9 (3.3 KW)	lot	1			
T	FCU-F1.10 (5.3 KW)	lot	1			
U	FCU-F1.11 (5.3 KW)	lot	1			
V	FCU-F1.12 (10.9 KW)	lot	1			
W	FCU-F2.1 (10.1 KW)	lot	1			
X	FCU-F2.2 (3.3 KW)	lot	1			
Y	FCU-F2.3 (5.9 KW)	lot	1			
Z	FCU-F2.4 (5.4 KW)	lot	1			
AA	FCU-F2.5 (5.4 KW)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CONDENSATE DRAIN PIPE (CONTINUED)						
A	FCU-F2.6 (5.9 KW)	lot	1			
B	FCU-F2.7 (4.0 KW)	lot	1			
C	FCU-F2.8 (4.0 KW)	lot	1			
D	FCU-F2.9 (3.6 KW)	lot	1			
E	FCU-GH (2.6 KW)	lot	1			
To Collection:						
<u>COLLECTION</u>						
<u>PAGE</u>						
	CH./M2 (page 1/10) - - - - -	-	-	-		
	CH./M2 (page 2/10) - - - - -	-	-	-		
	CH./M2 (page 3/10) - - - - -	-	-	-		
	CH./M2 (page 4/10) - - - - -	-	-	-		
	CH./M2 (page 5/10) - - - - -	-	-	-		
	CH./M2 (page 6/10) - - - - -	-	-	-		
	CH./M2 (page 7/10) - - - - -	-	-	-		
	CH./M2 (page 8/10) - - - - -	-	-	-		
	CH./M2 (page 9/10) - - - - -	-	-	-		
	CH./M2 (page 10/10) - - - - -	-	-	-		
TO CH/M2 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/M	<u>MECHANICAL SERVICES FOR CHANCERY</u>					
[3]	<u>DUCTWORK</u>					
	Ductwork shall comply with Section 5 of the General Specification of the Department of Electrical Services, specification for the Heating and Ventilating Contractors' Association, DW/142 for Sheet Metal Ductwork specification.					
	The price and rate submitted by the tenderer shall be fully inclusive value of work described herein, as shown on specification, drawings as well as inclusive of all expenses, wastage, incidental works, accessories, anchorage, support and other details specified in the specification drawings or indicated in technical specifications.					
	<u>SUPPLY AND RETURN AIR DUCT</u> (c/w 48kg/cu.m. thermal insulation)					
A	0.6mm (22G)	sq.m.	193			
B	0.8mm (20G)	sq.m.	275			
C	1.0mm (18G)	sq.m.	365			
	<u>Supply/Return Air Duct</u> (c/w 48kg/cu.m. thermal insulation)					
D	200 mm dia. flexible pre-insulated duct	m	114			
E	250 mm dia. flexible pre-insulated duct	m	26			
	<u>Fresh Air Duct (Bare Duct)</u>					
F	0.8mm (20G)	sq.m.	10			
	<u>Exhaust Air Duct (Bare Duct)</u>					
G	200 mm dia. flexible duct	m	65			
	<u>Sound Attenuation</u>					
H	AHU - 1 (15mm thk. Internal duct lined)	lot	1			
I	AHU - 2 (15mm thk. Internal duct lined)	lot	1			
J	Vibration Isolator (for DFCU-G)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	<u>DUCTED WALL MOUNT RANGE HOOD</u> Size: 1200mm x 493mm x 262.5mm 4-speed motor with timer/Auto-Shut-Off 430 grade High Quality Stainless Steel Dishwasher-safe Baffle filters Directional Lighting Made of Zline or approved equal.	lots	6			
B	<u>Ductwork</u> c/w bends, transformation connection etc. (SS 304) -300mmx250mm	lots	6			
C.	<u>GAS COOKER RANGE</u> Dual fuel Cooker with a 4-burner gas hob, conventional oven and grill and fanned main oven. c/w gas tank, pressure hose and gas regulator Made of Belling or approved equal.	lots	6			
<u>COLLECTION</u>						
<u>PAGE</u>						
	CH./M3 (page 1/2) - - - - -	-	-	-		
	CH./M3 (page 2/2) - - - - -	-	-	-		
TO CH/M3 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/M	<u>MECHANICAL SERVICES FOR CHANCERY</u>					
[4]	<u>DIFFUSERS, GRILLES, AND DAMPERS</u> Diffuser, Grilles & Dampers shall be manufactured by ASLI or approved equivalent. Material: Aluminium A6063. Surface Finished: Baked White Powder Coat. Extruded Aluminium with powdered coated oven baked diffuser c/w opposed blade damper.					
	Supply Air Grilles (Wall Mount Double Deflection) c/w OBD <u>NECK SIZE</u>					
A	900 mm x 300 mm, 45 deg. 6.0m air throw, NC (less than 20)	no.	1			
B	4-Slots Linear Air Diffuser (1.2m) c/w Plenum Box with 48 Kg/cu.m. insulation	nos.	102			
C	4-Slots Linear Air Diffuser (1.2m) c/w BLANK-OFF Supply Air Diffuser (Directional Ceiling Diffuser) c/w OBD <u>NECK SIZE</u>	nos.	60			
D	500mm x 500 mm	no.	3			
E	550mm x 550 mm	nos.	2			
F	2-00mm x 200 mm	nos.	2			
G	150mm x 150 mm Single Deflection Return Air Grilles c/w OBD <u>NECK SIZE</u>	nos.	1			
H	600 mm x 600 mm	nos.	2			
I	600 mm x 450 mm	nos.	3			
J	200 mm x 125 mm <u>VOLUME CONTROL DAMPER</u> Volume Control Balancing Damper (Aerofoil V-groove profile) Gear/Steel linkage drive with double nylon bushing (for friction free operation). Opposed blade type c/w quadrant regulator shafting to indicate blade position. <u>NECK SIZE</u>	nos.	2			
K	1600 mm x 550 mm	no	1			
L	1350 mm x 400 mm	no	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	VOLUME CONTROL DAMPER (CONTINUED)					
A	1300 mm x 400 mm	no	1			
B	1150 mm x 400 mm	no	2			
C	1050 mm x 350 mm	no	1			
D	1000 mm x 300 mm	no	1			
E	850 mm x 300 mm	no	1			
F	800 mm x 400 mm	no	2			
G	600 mm x 300 mm	nos	1			
H	550 mm x 350 mm	nos	4			
I	550 mm x 300 mm	nos	6			
J	500 mm x 300 mm	nos	7			
K	500 mm x 250 mm	nos	2			
L	400 mm x 300 mm	no	2			
M	350 mm x 200 mm	nos	5			
N	300 mm x 300 mm	nos	1			
O	200 mm dia.	nos	74			
P	250 mm dia.	nos	24			
Q	300 mm dia.	nos	4			
	<u>FRESH AIR LOUVERS</u>					
	Extruded Aluminium wall mounted external air intake louvre (powdered coated oven baked) complete with stainless steel insect proof screen mounting frame and lockable opposed blade damper. Complete with SS Insect Screen wire mesh and OBD					
	<u>NECK SIZE</u>					
R	750 mm x 450 mm	no	1			
S	600 mm x 300 mm	no	1			
T	350 mm x 200 mm	no	1			
U	350 mm x 200 mm	no	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	Single Deflection EXHAUST AIR GRILLES c/w OBD					
A	300 mm x 250 mm	nos	2			
B	200 mm x 125 mm	nos	4			
	<u>EXHAUST AIR LOUVER</u> Extruded Aluminium wall mounted external air intake louvre (powdered coated oven baked)					
	<u>NECK SIZE</u>					
C	300 mm x 150 mm	nos	2			
To Collection:						
<u>COLLECTION</u>						
<u>PAGE</u>						
	CH./M4 (page 1/2) - - - - -	-	-	-		
	CH./M4 (page 2/2) - - - - -	-	-	-		
TO CH/M4 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/M	<u>MECHANICAL SERVICES FOR CHANCERY</u>					
[5]	<u>ELECTRICAL</u> <u>Electrical and Controls</u> All components, cables and controls shall be of types and qualities as specified in Section 3, "ELECTRICAL", of the DES General Specification for Air Conditioning Installations, the Electrical Installation Part of this Specification and IEE Regulations and installed to standards as similarly specified.					
	<u>AC Switchboard (Control Panel)</u> c/w main Isolator, earth-fault relay, 7-days programmable time switch, DPU Controller, timer controlled timer switch bypass (0-8 hr adjustable), Auto-Off Manual switch, Start and Stop push button switch, provision for fire link connection, all switchgear, run/trip/stop indicator lights for AHU(fans)/CU (compressors) and all accessories as specified and as shown on the drawings.					
A	AHU-1/CU-1 (Location : AHU Rm, Multi Purpose Hall)	lot	1			
B	AHU-2/CU-2 (Location: AHU Rm-Chancery Hall)	lot	1			
	<u>Automatic Controls</u> All automatic controls necessary for the operation and control of the Inverter Split System including thermostat and associated electrical power and control wiring.					
C	AHU-1/CU-1	lot	1			
D	AHU-2/CU-2	lot	1			
E	DFCU-G	lot	1			
	<u>VRF SYSTEM</u>					
F	Simplified Remote Controllers (VFR G1)	lot	1			
G	Simplified Remote Controllers (VFR G2)	lot	1			
H	Simplified Remote Controllers (VFR F1)	lot	1			
I	Simplified Remote Controllers (VFR F2)	lot	1			
	<u>Power Supply and Control Cables</u> All interconnecting power supply wiring between local isolating switch and condensing unit and associated indoor unit, run in high impact conduit, trunking and HDGS cable tray.					
J	AHU-1/CU-1	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>Power Supply and Control Cables (Continued)</u>					
A	AHU-2/CU-2	lot	1			
B	DFCU-G	lot	1			
	<u>VRF SYSTEM</u>					
C	VFR G1	lot	1			
D	VFR G2	lot	1			
E	VFR F1	lot	1			
F	VFR F2	lot	1			
G	FCU- Chancery (Ground Floor)	lots	19			
H	FCU- Chancery (First Floor)	lots	21			
I	FCU - Consular (Ground)	lots	9			
	<u>DX SYSTEM</u>					
J	DFCU-G1/CU-G1 - (Ground Floor)	lots	1			
K	FCU/CU- (Ground Floor)	lots	3			
L	REMOTE CONTROL	lots	58			
	<u>EXHAUST FAN (Made of KDK or approved equiv.)</u> c/w automatic backdraft damper and terminated to architectural louvre.					
	<u>Ceiling Mount Ducted Fan</u>					
M	EF/C-(G1&G2) Cap: 255 cmh; SP: 25 Pa	set	2			
N	EF/C-G5 (Cap: 128 cmh; SP: 40 Pa)	set	1			
O	EF/C-G10 (Cap: 128 cmh; SP: 40 Pa)	set	1			
	<u>Inline Exhaust Ducted Fan</u>					
P	EF/C-(G3&G4) Cap: 380 cmh; SP: 50 Pa	sets	2			
	<u>Inline Ducted Fresh Air Fan</u>					
Q	EF/C-G11 (Cap: 1380 cmh; SP: 50 Pa)	set	1			
	<u>Wall Mounted type c/w automatic backdraft damper</u>					
R	EF/C-G6 (Cap: 540 cmh)	set	1			
S	EF/C-G7,G8,G9,F1) Cap: 128 cmh	sets	3			
T	EF/C-(F2,F3,F4,F5,&F6) Cap: 255 cmh	sets	5			
U	EF/C-G12 (Cap: 1380 cmh; SP: 25Pa)	set	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
ISOLATOR SWITCHES						
A	VFR G1	no	1			
B	VFR G2	no	1			
C	VFR F1	no	1			
D	VFR F2	no	1			
E	CU-1	no	1			
F	CU-2	no	1			
G	DCU-G1	no	1			
H	AIR CURTAIN (Made of KDK) c/w bracket and support Length: 1400mm; Air Throw: 3-3.5m	sets	6			
	<u>Variable Speed Drive</u> (Made of Schneider or approved equivalent)					
I	For AHU-1	no.	1			
J	For AHU-2	no.	1			
To Collection:						
<u>COLLECTION</u>						
<u>PAGE</u>						
CH/M5/(page 1/3) - - - - -						
CH/M5/(page 2/3) - - - - -						
CH/M5/(page 3/3) - - - - -						
TO CH/M5 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/M	<u>MECHANICAL SERVICES FOR CHANCERY</u>					
[6]	<u>FIRE HOSE REEL</u>					
	<u>EQUIPMENTS</u> To supply and install the following equipment and materials inclusive of all associated mechanical and electrical controls, power cables, interconnection control wiring as specified and shown on the drawings					
A	Electric driven pumpset single stage end suction centrifugal pump c/w squirrel cage electric motor, TEFC, 415V/3 PH/50HZ 2900 rpm (max.) Capacity: 3.0 l/s at 42M TDH	sets	2			
B	Diaphragm Tank Capacity: 60 liters	lot	1			
	<u>FIRE INDICATION PANEL</u>					
C	Manual and automatic control operation, Start and Stop push button	lot	1			
D	Control and power wiring to pumpset, float and pressure switches, complete with alarm bell, sensing devices inter-connecting control wiring in G.I. conduit/HDGS trunking. All cables to be heat resistant shielded type.	lot	1			
	<u>PIPEWORK, FITTINGS AND ACCESSORIES</u>					
	Supply and install the following, including all accessories and fixtures necessary and in accordance with the specifications described herein and as shown on the drawings.					
	All piping (above ground) should be medium gauge black steel pipe to BS 1387, c/w fittings, bends, elbows, joints, hanger, bracket and support, etc.					
	<u>PIPE</u>					
E	50 mm diameter	m	175			
F	25 mm diameter	m	175			
	<u>Gate Valves</u>					
G	50 mm diameter	nos	8			
H	25 mm diameter	nos	6			
	<u>Check Valves</u>					
I	50mm diameter	nos	2			
	<u>Strainers</u>					
J	50mm diameter	nos	2			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>PIPEWORK, FITTINGS AND ACCESSORIES (CONTINUED)</u>					
A	Flexible Connections 50mm diameter	nos	6			
B	Fire Hydrant (Pillar Type) c/w 80mm dia. Sluice valve and adaptor	lot	2			
	<u>Fire Hosereel Fitting Accessories</u>					
C	Pressure gauge c/w petcock (0-100 psi).	nos	5			
D	25 mm dia . Automatic Air Relief Valve.	nos	2			
E	Float and Pressure Switches	lot	1			
	Painting of Pipework & Pumps Painting including one rust inhibitive primer, one undercoat and 2 finishing red gloss paint for all pipeworks, pumps, brackets and supports.	lot	1			
F	Hose reel breakglass outlet plate and key for hose reel compartment.	nos	4			
G	Fire Hose Reel c/w 30M 20mm hose, 20mm s.s.nozzle, gate valve, valve locking device, and all accessories.	lots	4			
H	All perspex signage/nameplates as specified and shown on the drawing including hosereel signboard	nos	4			
I	4.5 kg. CO2 portable Fire Extinguisher c/w stainless steel bracket	nos	4			
J	9 litres water/CO2 portable Fire Extinguisher c/w stainless steel bracket	nos	4			
	FHR Water Storage Tank Pressed stainless steel (304) water storage tank c/w all stainless steel nuts and bolts, accessories, as specified and shown on drawings. Including 150mm I-beam base tank, anchor to 750mm high R.C. plinth.					
K	Size: 2m x 2m x 2m (Location - Ground Level)	lot	1			
To Collection:						
	<u>COLLECTION</u>					
	<u>PAGE</u>					
	CH./M6 (page 1/2) - - - - -	-	-	-		
	CH./M6 (page 2/2) - - - - -	-	-	-		
TO CH/6 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/M	<u>MECHANICAL SERVICES FOR CHANCERY</u>					
[7]	<u>POOL POND</u>					
	<u>EQUIPMENTS</u>					
	To supply and install the following equipment and materials inclusive of all associated mechanical and electrical controls, power cables, interconnection control wiring as specified and shown on the drawings					
A	Pool Pond Self-Priming Pumpset (Made of Hyward or approved equivalent). Single stage end suction centrifugal pump c/w squirrel cage electric motor, TEFC, 415V/3 PH/50HZ 2900 rpm (max.) Capacity: 183 l/min at 42 TDH	sets	4			
B	Sand Filter c/w accessories Capacity: 183 L/min	lot	2			
C	<u>CONTROL PANEL (PP-CP) - PKS or approved equivalent</u> Manual and automatic control operation, Start and Stop push button switch, indication of pump run and trip, wiring in G.I. concealed conduit, and etc as specified.	lot	2			
D	Control and power wiring to pumpset, float and pressure switches, complete with inter-connecting control wiring in PVC conduit/HDGS tray	lot	2			
	<u>PIPEWORK, FITTINGS AND ACCESSORIES</u>					
	Supply and install the following, including all accessories and fixtures necessary and in accordance with the specifications described herein and as shown on the drawings.					
	All piping and fittings shall be HDPE pipe c/w HDGS (hanger, bracket and support), etc.					
	<u>PIPE</u>					
E	50 mm diameter	m	80			
F	25 mm diameter	lot	2			
	<u>Gate Valves</u>					
G	50 mm diameter	nos	14			
H	25 mm diameter	nos	4			
	<u>Check Valves</u>					
I	50 mm diameter	nos	4			
	<u>Strainers</u>					
J	50 mm diameter	nos	4			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount		
					\$	c	
	<u>PIPEWORK, FITTINGS AND ACCESSORIES (CONTINUED)</u>						
A	Flexible Connections 50mm diameter	nos	8				
	<u>Fitting and Accessories</u>						
B	Pressure gauge c/w petcock (0-100 psi).	nos	8				
C	25 mm dia . Automatic Air Relief Valve.	nos	2				
	<u>Painting of Pipework & Pumps</u>						
D	Painting including one rust inhibitive primer, one undercoat and 2 finishing red gloss paint for all pipeworks, pumps, brackets and supports.	lots	2				
E	Pool Basket Strainer c/w all accessories and as per drawings. (Hayward or approved equivalent)	lots	2				
F	Chlorinator Feeder (2gpm) - Hayward or approved equivalent	sets	2				
G	Submersible Pumpset (Made of Flyght or approved equivalent) Capacity: 90 l/min; TDH: 3.0m	sets	2				
To Collection:							
<u>COLLECTION</u>							
<u>PAGE</u>							
	CH./M7 (page 1/2) - - - - -	-	-	-			
	CH./M7 (page 2/2) - - - - -	-	-	-			
TO CH/M7 SUMMARY:							

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/M	<u>MECHANICAL SERVICES FOR CHANCERY</u>					
[8]	<u>PLUMBING EQUIPMENTS</u> To supply and install the following equipment and materials inclusive of all associated mechanical and electrical controls, power cables, interconnection control wiring as specified and shown on the drawings					
A	Domestic water pumpset Single stage end suction centrifugal pump c/w squirrel cage electric motor, TEFC, 415V/3 PH/50HZ 2900 rpm (max.) Capacity: 3.0 l/s at 42m TDH	sets	2			
B	Diaphragm Tank c/w accessories Capacity: 227 liters	lot	1			
C	<u>CONTROL PANEL (DWP)</u> Manual and automatic control operation, Start and Stop push button switch, indication of pump run and trip, wiring in G.I. concealed conduit, and etc as specified.	lot	1			
D	Control and power wiring to pumpset, float and pressure switches, complete with inter-connecting control wiring in PVC conduit/HDGS tray	lot	1			
E	Sand Filter c/w accessories Capacity: 353 l/min	lot	1			
	<u>PIPEWORK, FITTINGS AND ACCESSORIES</u> Supply and install the following, including all accessories and fixtures necessary and in accordance with the specifications described herein and as shown on the drawings. All piping and fittings should be stainless steel to BS 304 c/w HDGS (hanger, bracket and and support), etc.					
	<u>PIPE</u>					
F	65 mm diameter	m	50			
G	25 mm diameter	m	110			
	<u>Gate Valves</u>					
H	65 mm diameter	nos	8			
I	25 mm diameter	nos	3			
	<u>Check Valves</u>					
J	65 mm diameter	nos	2			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount		
					\$	c	
	<u>PIPEWORK, FITTINGS AND ACCESSORIES (CONTINUED)</u>						
A	<u>Strainers</u> 65 mm diameter	nos	2				
B	Flexible Connections 65mm diameter	nos	6				
	<u>Fitting and Accessories</u>						
C	Pressure gauge c/w petcock (0-100 psi).	nos	4				
D	25 mm dia . Automatic Air Relief Valve.	nos	2				
E	Float and Pressure Switches	lot	1				
F	Painting of Pipework & Pumps Painting including one rust inhibitive primer, one undercoat and 2 finishing red gloss paint for all pipeworks, pumps, brackets and supports.	lot	1				
	<u>Domestic Water Storage Tank</u> Pressed stainless steel (304) water storage tank c/w all stainless steel nuts and bolts, accessories, as specified and shown on drawings. Including 150mm I-beam base tank, anchor to 750mm high R.C. plinth.						
G	Size: 2m x 4m x 2m (Location - Ground Level)	lot	1				
To Collection:							
<u>COLLECTION</u>							
<u>PAGE</u>							
	CH./M8 (page 1/2) - - - - -	-	-	-			
	CH./M8 (page 2/2) - - - - -	-	-	-			
TO CH/M8 SUMMARY:							

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
NRG/M	<u>MECHANICAL SERVICES FOR NON-REPRESENTATIONAL GRADE (BLOCK A)</u>					
[1]	<u>EQUIPMENT</u> Supply, installation, testing and commissioning of the Air Conditioning System as shown and indicated in the drawing. All material supply & works carry out shall be as per DES requirements and approved vendors products. DX-Split Air Conditioning system consisting of fan coil unit and matching air cooled condensing unit, refrigerant, brackets and supports, power & control wiring and other necessary accessories as specified and as shown in the drawing. Rate quoted shall be inclusive of supply and termination of all power and control cables to equipment including necessary cable, glands, lugs, earthing, conduit/ HDGS cable tray and other necessary accessories. <u>DX SPLIT SYSTEM (Carrier or approved equivalent)</u>					
	<u>GROUND FLOOR</u>					
A	STORAGE (6.5 KW)	set	1			
B	LIVING & DINING AREA (5.2 KW)	set	1			
C	BEDROOM (2.6 KW)	set	1			
	<u>FIRST & SECOND FLOOR</u>					
D	LIVING/DINING AREA (9.75 KW)	set	4			
E	MASTER BEDROOM (3.9 KW)	set	4			
F	BEDROOM 01 (3.9KW)	set	4			
G	BEDROOM 02 (2.6 KW)	set	4			
H	KITCHEN (2.6 KW)	set	4			
	<u>THIRD FLOOR</u>					
I	LIVING/DINING AREA (9.7.5 KW)	set	2			
J	MASTER BEDROOM (3.9 KW)	set	1			
K	BEDROOM 01 (3.9KW)	set	1			
L	BEDROOM 02 (2.6 KW)	set	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>DX SPLIT SYSTEM (Carrier or approved equivalent)</u> <u>CONTINUED</u>					
	<u>THIRD FLOOR</u>					
A	BEDROOM 03 (2.6 KW)	set	1			
B	KITCHEN (2.6 KW)	set	1			
To Collection:						
	<u>COLLECTION</u>					
	<u>PAGE</u>					
	NRG/M1 (page 1/2) - - - - -	-	-	-		
	NRG/M1 (page 2/2) - - - - -	-	-	-		
TO NRG/M1 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
NRG/M	<u>MECHANICAL SERVICES FOR NON-REPRESENTATIONAL GRADE (BLOCK A)</u>					
[2]	<u>PIPEWORK</u>					
	<u>REFRIGERANT PIPEWORK</u>					
	Solid drawn copper tube c/w 20mm thick THERMAL insulation and white PVC Denso wrap tape encased in heavy duty PVC impact resistant industrial trunking, fittings, liquid line solenoid valves, TX valves, sight glasses and filter driers, supports, brackets and as specified. All systems to be pressure tested, evacuated and dehydrated before charging with refrigerant. (where two refrigerant lines system is offered Tenderer is to price for the 2 lines accordingly).					
	Testing, evacuation and dehydration of both refrigeration systems, before charging with refrigerant, and include initial refrigerant charge. Note : All test pressures and evacuation pressures to be submitted in type written form to the Engineer.					
	<u>REFRIGERANT PIPE</u>					
	<u>GROUND FLOOR</u>					
A	STORAGE (6.5 KW)	lot	1			
B	LIVING & DINING AREA (5.2 KW)	lot	1			
C	BEDROOM (2.6 KW)	lot	1			
	<u>FIRST & SECOND FLOOR</u>					
D	LIVING/DINING AREA (9.7 KW)	lots	4			
E	MASTER BEDROOM (3.9 KW)	lots	4			
F	BEDROOM 01 (3.9KW)	lots	4			
G	BEDROOM 02 (2.6 KW)	lots	4			
H	KITCHEN (2.6 KW)	lots	4			
I	<u>THIRD FLOOR</u>					
J	LIVING/DINING AREA (9.7 KW)	lot	2			
K	MASTER BEDROOM (3.9 KW)	lot	1			
L	BEDROOM 01 (3.9KW)	lot	1			
M	BEDROOM 02 (2.6 KW)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>REFRIGERANT PIPE (CONTINUED)</u>					
A	BEDROOM 03 (2.6 KW)	lot	1			
B	KITCHEN (2.6 KW)	lot	1			
	CONDENSATE DRAIN PIPE 20mm dia. pipes (unless otherwise specified) to BS 3505 Class D c/w 15mm thick insulation concealed within walls and run in HD UPVC trunking c/w traps, fittings, brackets and supports.					
	<u>GROUND FLOOR</u>					
C	STORAGE (6.5 KW)	lot	1			
D	LIVING & DINING AREA (5.2 KW)	lot	1			
E	BEDROOM (2.6 KW)	lot	1			
	<u>FIRST AND SECOND FLOOR</u>					
F	LIVING/DINING AREA (9.7 KW)	lot	4			
G	MASTER BEDROOM (3.9 KW)	lot	4			
H	BEDROOM 01 (3.9KW)	lot	4			
I	BEDROOM 02 (2.6 KW)	lot	4			
J	KITCHEN (2.6 KW)	lot	4			
	<u>THIRD FLOOR</u>					
K	LIVING/DINING AREA (9.7 KW)	lot	2			
L	MASTER BEDROOM (3.9 KW)	lot	1			
M	BEDROOM 01 (3.9KW)	lot	1			
N	BEDROOM 02 (2.6 KW)	lot	1			
O	BEDROOM 03 (2.6 KW)	lot	1			
P	KITCHEN (2.6 KW)	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>COLLECTION</u>					
	<u>PAGE</u>					
	NRG/M2 (page 1/3) - - - - -	-	-	-		
	NRG/M2 (page 2/3) - - - - -	-	-	-		
	NRG/M2 (page 3/3) - - - - -	-	-	-		
TO NGR/M2 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
NRG/M	<u>MECHANICAL SERVICES FOR NON-REPRESENTATIONAL GRADE (BLOCK A)</u>					
[3]	<u>ELECTRICAL</u>					
	<u>Electrical and Controls</u> All components, cables and controls shall be of types and qualities as specified in Section 3, "ELECTRICAL", of the DES General Specification for Air Conditioning Installations, the Electrical Installation Part of this Specification and IEE Regulations and installed to standards as similarly specified.					
	<u>Power Supply and Control Cables</u> All interconnecting power supply wiring between local isolating switch and condensing unit and all interconnecting power and control wiring between condensing unit and associated indoor unit, run in high impact conduit, trunking and HDGS cable tray.					
	<u>DX SINGLE SPLIT SYSTEM (Carrier or approved equivalent)</u>					
A	Ground Floor	lots	4			
B	First Floor	lots	10			
C	Second Floor	lots	10			
D	Third Floor	lots	7			
E	REMOTE CONTROLLERS	lots	31			
	<u>EXHAUST AIR FAN (Made of KDK or approved equiv.)</u>					
	Ceiling Mount Ducted Exhaust Fan c/w backdraft damper and EAL					
F	EF/NRG-(G1) Cap: 145 cmh; SP: 50 Pa	set	1			
G	EF/NRG-(F1&F5) Cap: 383 cmh; SP: 50 Pa	sets	2			
H	EF/NRG-(S1&S5) Cap: 383 cmh; SP: 50 Pa	sets	2			
I	EF/NRG-(T1) Cap: 300 cmh; SP: 50 Pa	set	1			
	Wall Mounted type c/w automatic backdraft damper					
J	EF/NRG-(G2) Cap: 128 cmh	set	1			
K	EF/NRG-(F2,F3,F4,F6,F7&F8) Cap: 128 cmh	sets	6			
L	EF/NRG-(S2,S3,S4,S6,S7&S8) Cap: 128 cmh	sets	6			
M	EF/NRG-(T2,T3,T4,T5,T6&T7) Cap: 128 cmh	sets	6			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>KITCHEN EXHAUST HOOD</u> Supply & installation of 3-sided Type Kitchen Exhaust Hood constructed from HIGH QUALITY finish c/w hood light, grease filter, hangers etc and as per specifications, drawings and all accessories for a complete satisfactory and operational system					
A	DUCTED WALL MOUNT RANGE HOOD <u>Size: 750mm x 750mm</u> 4-speed motor with timer/auto-shut-off control 430 grade high quality stainless steel Dishwasher-safe baffle filters Directional lighting Mad of Zline or approved equal	lot	6			
B	<u>DUCTWORK/LOUVER</u> 1. 300mmx250mm stainless steel exhaust duct c/w bends, transformation and connected to EAL 2. 450mmx400mm Exhaust Air Louver c/w S.S. bird's wire mesh	lot	6			
C	GAS COOKER RANGE Dual fuel cooker with 4-burner gas hob, conventional oven and grill and main oven c/w gas 45kg LPG tank, pressure hose, and gas regulator. Made of Belling or approved equal.	lot	6			
To Collection:						
	<u>COLLECTION</u>					
	<u>PAGE</u>					
	NRG/M3 (page 1/3) - - - - -	-	-	-		
	NRG/M3 (page 2/3) - - - - -	-	-	-		
	NRG/M3 (page 3/3) - - - - -	-	-	-		
TO NRG/M3 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
RG/M	<u>MECHANICAL SERVICES FOR REPRESENTATIONAL GRADE (BLOCK B)</u>					
[1]	<u>EQUIPMENT</u>					
	Supply, installation, testing and commissioning of the Air Conditioning System as shown and indicated in the drawing. All material supply & works carry out shall be as per DES requirements and approved vendors products.					
	DX-Split Air Conditioning system consisting of fan coil unit and matching air cooled condensing unit, refrigerant, brackets and supports, power & control wiring and other necessary accessories as specified and as shown in the drawing.					
	Rate quoted shall be inclusive of supply and termination of all power and control cables to equipment including necessary cable, glands, lugs, earthing, conduit/ HDGS cable tray and other necessary accessories.					
	<u>DX SPLIT SYSTEM (Carrier or approved equivalent)</u>					
	<u>GROUND FLOOR</u>					
A	LIVING ROOM (3.9 KW)	set	2			
B	BEDROOM (2.6KW)	set	2			
	<u>FIRST & SECOND FLOOR</u>					
C	LIVING AREA (6.5 KW)	set	2			
D	DINING AREA (3.9 KW)	set	2			
E	BEDROOM 01 (2.6KW)	set	2			
F	KITCHEN (2.6KW)	set	2			
	<u>SECOND FLOOR</u>					
G	MASTER BEDROOM (3.9KW)	set	2			
H	FAMILY LOUNGE (3.9KW)	set	2			
I	FAMILY LOUNGE CORRIDOR (7.8 KW)	set	2			
J	BEDROOM 02 (2.6KW)	set	2			
K	BEDROOM 03 (2.6KW)	set	2			
TO RG/M1 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
RG/M	<u>MECHANICAL SERVICES FOR REPRESENTATIONAL GRADE (BLOCK B)</u>					
[2]	<u>PIPEWORK</u> <u>REFRIGERANT PIPEWORK</u> Solid drawn copper tube c/w 20mm thick THERMAL insulation and white PVC Denso wrap tape encased in heavy duty PVC impact resistant industrial trunking, fittings, liquid line solenoid valves, TX valves, sight glasses and filter driers, supports, brackets and as specified. All systems to be pressure tested, evacuated and dehydrated before charging with refrigerant. (where two refrigerant lines system is offered Tenderer is to price for the 2 lines accordingly). Testing, evacuation and dehydration of both refrigeration systems, before charging with refrigerant, and include initial refrigerant charge. Note : All test pressures and evacuation pressures to be submitted in type written form to the Engineer.					
	<u>REFRIGERANT PIPE</u>					
	<u>BLOCK B</u>					
A	<u>GROUND FLOOR</u>					
B	LIVING ROOM (3.9 KW)	lots	2			
	BEDROOM (2.6KW)	lots	2			
	<u>FIRST FLOOR</u>					
C	LIVING AREA (6.5 KW)	lots	2			
D	DINING AREA (3.9 KW)	lots	2			
E	BEDROOM 01 (2.6KW)	lots	2			
	KITCHEN (2.6KW)	lots	2			
	<u>SECOND FLOOR</u>					
F	MASTER BEDROOM (3.9KW)	lots	2			
G	FAMILY LOUNGE (3.9KW)	lots	2			
H	FAMILY LOUNGE CORRIDOR (7.8 KW)	lots	2			
I	BEDROOM 02 (2.6KW)	lots	2			
J	BEDROOM 03 (2.6KW)	lots	2			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
RG/M	<u>MECHANICAL SERVICES FOR REPRESENTATIONAL GRADE (BLOCK B)</u>					
[3]	<u>ELECTRICAL</u>					
	<u>Electrical and Controls</u> All components, cables and controls shall be of types and qualities as specified in Section 3, "ELECTRICAL", of the DES General Specification for Air Conditioning Installations, the Electrical Installation Part of this Specification and IEE Regulations and installed to standards as similarly specified.					
	<u>Power Supply and Control Cables</u> All interconnecting power supply wiring between local isolating switch and condensing unit and all interconnecting power and control wiring between condensing unit and associated indoor unit, run in high impact conduit, trunking and HDGS cable tray.					
	<u>DX SINGLE SPLIT SYSTEM (Carrier or approved equivalent)</u>					
A	Ground Floor	lots	4			
B	First Floor	lots	8			
C	Second Floor	lots	10			
D	REMOTE CONTROLLERS	lots	22			
	<u>EXHAUST AIR FAN (Made of KDK or approved equiv.)</u>					
	Ceiling Mount Ducted Exhaust Fan c/w backdraft damper and EAL					
E	EF/RG-(G1&G2) Cap: 128 cmh; SP: 50 Pa	set	2			
F	EF/RG-(F5,F6,F7,F8,F9&F10) Cap: 128 cmh; SP: 50 Pa	sets	6			
G	EF/RG-(T1,T2,T3,T4,T5&T6) Cap: 128 cmh; SP: 50 Pa	sets	6			
	Wall Mounted type c/w automatic backdraft damper					
H	EF/RG-(G3&G4) Cap: 128 cmh	set	2			
I	EF/RG-(F1,F2,F3&F4) Cap: 128 cmh	sets	4			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>KITCHEN EXHAUST HOOD</u> Supply & installation of 3-sided Type Kitchen Exhaust Hood constructed from HIGH QUALITY finish c/w hood light, grease filter, hangers etc and as per specifications, drawings and all accessories for a complete satisfactory and operational system					
A	DUCTED WALL MOUNT RANGE HOOD <u>Size: 750mm x 750mm</u> 4-speed motor with timer/auto-shut-off control 430 grade high quality stainless steel Dishwasher-safe baffle filters Directional lighting Mad of Zline or approved equal	lots	4			
B	DUCTWORK/LOUVER 1. 300mmx250mm stainless steel exhaust duct c/w bends, transformation and connected to EAL	lots	4			
	2. 450mmx400mm Exhaust Air Louver c/w S.S. bird's wire mesh	lots	4			
C	GAS COOKER RANGE Dual fuel cooker with 4-burner gas hob, conventional oven and grill and main oven c/w gas 45kg LPG tank, pressure hose, and gas regulator. Made of Belling or approved equal.	lots	4			
To Collection:						
A	AUTOMATIC SECURITY GATE SYSTEM Supply and installation of Heavy duty high quality automatic gate system c/w motorised control and interconnecting power wiring, and complete all necessary accessories including remote controls. The automatic gate shall be control and manually open and close from a switch located inside the residence (2-location to be confirmed).	lot	1			
B	Gate Remote Control Access	nos.	20			
C	Manually operated switch c/w power and control wiring and all accessories for a complete operable system.	lot	1			
<u>COLLECTION</u>						
<u>PAGE</u>						
	RG/M3 (page 1/2) - - - - -	-	-	-		
	RG/M3 (page 2/2) - - - - -	-	-	-		
TO RG/M3 SUMMARY:						

ELECTRICAL SERVICES
(BILL OF QUANTITIES)

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/E	<u>ELECTRICAL INSTALLATION FOR CHANCERY</u>					
[1]	<u>SWITCHBOARDS AND DISTRIBUTION BOARDS</u>					
	<u>Main Switchboard</u> Supply, install, test and commission factory assembled modular type tested Form 4 construction, front access IP42 (IEC) floor mounted metal clad board and other accessories as detailed in the drawings and specifications. (Cost to be inclusive of termination of all cables, including cable glands, lugs, etc. as per drawings/ specifications).					
A	800A MSB (Main switchboard) c/w metering and instrumentation, etc as per the drawing and the DES standards.	lot	1			
B	Allow cost for liaison with Authorities regarding power supply application and energization of the system.	lot	1			
C	Allow cost for providing first aid resuscitation chart near the main switchboards.	lot	1			
D	Supply and installation of CT KWH meter complete with linking of telephone outlet and allow for the necessary liaison with Authorities (including QP testing and certification).	lot	1			
E	Earthing of the switchboards and distribution boards as per specifications and drawings.	lot	1			
	<u>Sub-Switchboard / Distribution Boards</u> Distribution boards shall be constructed to Form I and IP42, electrical grounding, all necessary accessories as shown in the drawing, . All cable terminals shall be provided with numbered identification ferrules. Cost quoted to be inclusive of termination of all incoming/ outgoing cables including cable gland, lugs, number ferrules, etc. as per drawings/specifications.					
F	SSB-CH (including CH-GLP) as per drawing	lot	1			
G	SSB-MPH (including MPH-LP) as per drawing	lot	1			
H	SSB-CON as per drawing	lot	1			
I	DBCH-PP as per drawing	lot	1			
J	DBCH-FF as per drawing	lot	1			
K	DB-GH1 as per drawing	lot	1			
L	DB-GH2 as per drawing	lot	1			
M	DBMPH - PP as per drawing	lot	1			
N	DBCON - PP as per drawing	lot	1			
O	DB-SS as per drawing	lot	1			
	<u>Miscellaneous and Related Works</u>					
P	Allow miscellaneous cost for concrete encased pipesleeves of 150mm dia for all road crossing, hard standing areas, returfing, refurbishment and making good of existing ground.	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	Allow miscellaneous cost for providing floor openings, pipe sleeves through RC beams & slabs, fire stop barrier, fire seal pillows, etc for passage of sub-main cables, lighting and power wiring, telephone & computer system, fire alarm & fire protection system, water services, aircon services and other disciplines.	lot	1			
To Collection:						
<u>COLLECTION</u>						
<u>PAGE</u>						
CH/E1 (Page 1/2) - - - - -						
CH/E1 (Page 2/2) - - - - -						
TO CH/E1 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/E	<u>ELECTRICAL INSTALLATION FOR CHANCERY</u>					
[2]	<p><u>LV RETICULATION MAINS (INTERNAL)</u></p> <p>Supply and install submain cables as per drawings & specification. Cost of hot dipped galvanised cable ladder, tray, trunking, required as specified shall be included in the pricing of cable. The size of cable ladder/cable tray and containment provided shall be adequate for cable spacings factor as per latest EIR and IEE Regulations.</p> <p>Rates of cable laid underground shall include cost of trench excavation, sand bedding, pipesleeves, protective tile and reinstatement. Rates for cables shall be inclusive of cable identification tags at 10m intervals and at every bend.</p> <p>Cost quoted to be inclusive of termination of all incoming and outgoing cables including cable glands, lugs, etc as per drawing and specifications.</p> <p>Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.</p> <p>4x1c/25mm² PVC/SWA/PVC cable + 1c/16mm² CPC laid in cable tray/trunking c/w necessary accessories to the following:</p> <p>A From SSB-CH to DBCH-FF (inclusive of CH-FPP) m 15</p> <p>B From SSB-CH to DBCH-PP m 10</p> <p>C From SSB-CON to CON-PP m 10</p> <p>D 1x2c/16mm² PVC/SWA/PVC cable laid underground, pipesleeves and cable tray c/w necessary accessories from SSB-CON to DB-GH1. m 60</p> <p>E 1x4c/25mm² FR/LSZH armoured cable + 1c/16mm² CPC in cable c/w necessary accessories from SSB-CH to Lift-1. m 40</p> <p>F 1x4c/16mm² PVC/SWA/PVC cable laid underground, pipesleeves and cable tray c/w necessary accessories from SSB-MPH to MPH-PP. m 10</p> <p>G 1x2c/10mm² PVC/SWA/PVC cable laid underground, pipesleeves and cable tray c/w necessary accessories from DB-GH1 to DB-GH2. m 15</p>					
To Collection:						
	<u>COLLECTION</u>					
	<p><u>PAGE</u></p> <p>CH/E2 (Page 1/1) - - - - -</p>					
TO CH/E2 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/E	<u>ELECTRICAL INSTALLATION FOR CHANCERY</u>					
[3]	<p><u>GENERAL LIGHTING AND POWER SERVICES</u> Supply, installation and termination of light and power point in conduit/trunking as per drawing and specification.</p> <p>Rates for lighting and power point shall be inclusive of providing cable marker sleeved with the circuit number identified. Unless otherwise specified all switch plates and power point switch plate shall be of moulded white plastic range accessories approved by DES. CPC earth cable shall be provided inside back box and terminated with cable connector whether the switch plate is of plastic or of metallic range.</p> <p>Cost quoted to be inclusive of termination of all incoming/ outgoing cables including cable glands, lugs, etc as per drawing and specifications.</p> <p>NOTES:</p> <p>i) all utility boxes for switches, outlets, etc shall be of flush mounted, factory fitted with moulded brass nut and not of self tapping screw type.</p> <p>ii) conduit adapter fitted to boxes for use of switches, outlets, etc shall be with lock nuts and securely tightened.</p> <p>iii) all exposed conduit and flexible conduit inside ceiling voids shall be of color coded.</p> <p>iv) flexible conduit shall be of corrugated polyamide (nylon) flexible conduit and fittings shall be of manufacturer recommended.</p> <p>v) light fittings shall be of factory provided supports and brackets with independent hangers from other installations.</p> <p>vi) SSO switches are to T&J Electric "Radiance" White.</p> <p><u>Unless otherwise specified Color Code for Service Raceway & Conduits are as follows:</u></p> <p>- lighting and power ----- orange - fire detection ----- red - telephone & computer ---- green - PA system ----- yellow - security system ----- white - AC & BMS ----- blue</p>					
A	Lighting point c/w wiring in PVC conduit using 3x1c/1.5mm ² PVC cable c/w 10A switch plate and gang as per switching arrangement shown in the lighting drawings.	nos	788			
B	Emergency lighting point in PVC conduit using 3x1c/1.5mm ² PVC cable c/w key switch as shown in the drawing.	nos	50			
C	Exit sign lighting point in concealed PVC conduit using 3x1c/1.5mm ² PVC cable.	nos	30			
D	Exhaust fan wiring point in concealed PVC conduit using 3x1c/2.5mm ² PVC cable c/w fused spur outlet similar to MK, Clipsal, Legrand or equivalent next to fan and switch at the door.	nos	14			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	In-line Exhaust fan wiring point in concealed PVC conduit using 3x1c/2.5mm ² PVC cable c/w fused spur outlet, control timer and accessories similar to MK, Clipsal, Legrand or equivalent next to fan and 2nos 2way 10A switch at the door.	nos	2			
B	Double pole power switch c/w indicating lamp for LCD projectors to MK, Clipsal, Legrand or approved equivalent.	no	1			
C	Power point in concealed PVC conduit using 6 nos 2.5mm ² PVC cable as per single line diagram and terminated with the following outlets priced separately as below.	nos	178			
D	Power point in concealed PVC conduit using 3x1c/4mm ² PVC cable as per single line diagram and terminated with the following outlets priced separately as below.	nos.	2			
E	13A single SSO mounted as shown in the drawing similar to MK, Clipsal, T&J white plastic finish or equivalent.	nos	100			
F	13A twin weatherproof SSO mounted as shown in the drawing similar to MK, Clipsal, T&J white plastic finish or equivalent.	nos	4			
G	13A twin SSO mounted as shown in the drawing similar to MK, Clipsal, legrand or equivalent.	nos	74			
H	15A single SSO using 3x1c/4mm ² PVC cable mounted as shown in the drawing similar to MK, Clipsal, T&J white plastic finish or equivalent.	nos	2			
I	Supply and installation of hand dryer wiring point in concealed PVC conduit using 3x1c/4mm ² PVC cable c/w fused spur outlet similar to MK Logic 1067, Clipsal, T&J or equivalent.	nos	6			
J	20A fused spur outlet with indicating lamp (For fire alarm panel) similar to MK, Clipsal, Legrand or approved equivalent.	no	1			
K	Supply and installation of 300 x 300 x 80mm floor mounted service box, 3 compartment single trap c/w accessories similar to MK or equivalent. Cost to include 1 no twin 13A SSO, 1 no RJ45 outlet and 1 no RJ11 outlet to suit service box. Service box cover c/w lifting handle, cable outlet and to suit floor finish.	nos	48			
L	Dimmer rack/controller and switch for Multi Purpose Hall lighting to DES approved equivalent.	lot	1			
M	Power point using 3x1c/4mm ² PVC cable in concealed PVC conduit c/w 20A SPN weatherproof isolator for Motor Gate.	nos	4			
N	<u>Miscellaneous and Related Works</u> Allow cost for circuit tagging and labelling of all cables and wiring circuits (incoming/outgoing cables and corresponding DB name) using numeric sleeves or self laminating wrapped around oil resistant nylon cable identification labels to brother, winco, brady, thorpe or approved equivalent. Labels shall apply to but not limited to the following: i) all DB, MSB, SSB, FAP, Tel & Computer, Secuty System, etc ii) socket outlets iii) switches iv) light fittings	lot	1			
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CH/E	<u>ELECTRICAL INSTALLATION FOR CHANCERY</u>					
[4]	<u>LIGHT FITTINGS AND ACCESSORIES</u> Supply and install DES approved light fittings as specified in the drawings and as indicated below or as per Engineer/SO requirement. All light fittings shall be provided with independent support to the structure and shall not depend to other system. Rates for light fittings shall be inclusive of providing a tape label with the circuit number identified and a strong adhesive used to bond the tape to the fittings. A system guarantee of 3 years by means of factory warranty certificate for all the light fittings. All LED light fittings offered must be of non degradable diffusers. All LEDs in the light fitting offered shall have a minimum lifetime to 70% luminous flux at 50,000 hours and shall be CREE, Nichia, Lumiled LEDs or approved equivalent. A system guarantee of 3 years by means of factory warranty certificate shall be submitted for all LED light fittings. Contractor to ensure LED light fitting offered shall met the design illumination requirement. Emergency packs are to be rated for a minimum of 2 hours duration or as specified and shall be non-maintained type.					
A	F1 - 12W LED Bollard 750mm high 3000k sanded black to NVC NGLLED 5612-1 or approved equivalent, mounted as shown in the drawing.	nos.	66			
B	F2 - 18.5W LED Wall-mounted luminaire 3000k 25° to NVC NWLED3544 fencing light, mounted as shown in the drawing.	nos	36			
C	F3 - 36W LED Post Top luminaire 3000K c/w 2500mm diecast aluminium pole foundation c/w required accessories to NVC NPTLED352 or approved equivalent, mounted as shown in the drawing.	no	18			
D	F4 - 9W LED Uplighter 3000K to NVC NFLED5012 or approved equivalent, as shown in the drawing.	nos	25			
E	F5 - 6W LED Inground Uplight 3000K 20° to NVC NLED4203 or approved equivalent, as shown in the drawing.	nos	65			
F	F7 - 17W LED downlight 4000K 6inch IP44 to NVC NLED09506E-D or approved equivalent, mounted as shown in the drawing.	nos	20			
G	F8 - 9W LED surface mounted downlight white 3000K to NVC NLED9184M or approved equivalent, mounted as shown in the drawing.	nos	15			
H	F9 - LED Linear recessed lighting aluminium white 70mm 6000K to Colours D8420-24-52mm 420 LEDs/m c/w required accessories or approved equivalent, as shown in the drawing. (Refer to details)	m	30			
I	F10 - 12W LED recessed downlight 6500K to NVC NDLED9314E or approved equivalent, mounted as shown in the drawing.	nos	98			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	F11 - 2W LED Recessed spotlight 6500K to NVC NLED105 or approved equivalent, mounted as shown in the drawing.	nos	4			
B	F12 - LED Linear recessed lighting aluminium trimless white 70mm 6000K to Colours D8420-24-52mm 420 LEDs/m c/w required accessories or approved equivalent, as shown in the drawing. (Refer to details)	nos	7			
C	F13 - 12.5W LED Rectangular IP68 underwater luminaire, 3000K, 50° beam angle to NVC NSLED4315 or approved equivalent, mounted as shown in the drawing.	nos	27			
D	F14 - 4W LED Recessed wall step light 3000K to NVC NWLED5566, mounted as shown in the drawing.	nos	31			
E	F15 - 43W LED Recessed 600x600mm lighting luminaire 6500K to NVC NPNLED4514/43W/66 or approved equivalent, mounted as shown in the drawing.	nos	43			
F	F16 - 35W LED Recessed adjustable spotlight 4000K honeycomb collimator to NVC NLED1807C/S or approved equivalent, mounted as shown in the drawing.	nos	16			
G	F17 - 18 LED T8 1200mm batten fitting to PHILIPS or approved equivalent.	nos	24			
H	F19 - 8W LED Recessed round downlight 3inch 4000K matte gold shield cover to NVC 8113A or approved equivalent, mounted as shown in the drawing.	nos	60			
I	F19C - 8W LED Recessed round wall washer 3inch 4000K matte gold shield cover to NVC 81132A or approved equivalent, mounted as shown in the drawing.	nos	3			
J	F21A - 3W LED Recessed downlight 2inch 4000K to NVC 8112D matte gold shield cover or approved equivalent, mounted as shown in the drawing.	nos	20			
K	F22 - 12W LED Recessed spotlight IP65 4000K to NVC NSPLED181W or approved equivalent, mounted as shown in the drawing.	nos	4			
L	F24 - Chandelier 24 x 5W LED H5 light fitting 4000K copper with 3 ring layers c/w necessary accessories to Demilux Intevision MD9028R3IN1 or approved equivalent.	no	1			
M	F29 - 28W LED Linear recessed wall washer 1229mm 4000K to Colours LES0FW c/w required accessories or approved equivalent, mounted as shown in the drawing.	nos.	21			
N	F30 - 38W LED Linear recessed lighting aluminium 1229mm 70mm 4000K to Colours LR70DD c/w required accessories or approved equivalent, mounted as shown in the drawing.	nos.	120			
O	F32 - 2W LED Recessed downlight 4000K white to NVC NLED105 or approved equivalent, mounted as shown in the drawing.	nos	5			
P	F33 - 4W LED Recessed steplight 3000K to NVC NWLED5572A or approved equivalent, mounted as shown in the drawing.	nos	11			
Q	F34 - 40W LED Pendant array 4000K to Demilux Intevision 9060 Line Down A-8 or approved equivalent, mounted as shown in the drawing.	no	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	F35 - 48W LED Circular pendant 6500K to Demilux Intevision 9072IN800 or approved equivalent, mounted as shown in the drawing.	no	2			
B	F36 - 3x28W LED Linear pendant 1210mm black module to Colours LS50G c/w necessary accessories or approved equivalent, mounted as shown in the drawing.	no	1			
C	F37 - 20W LED Wall mounted luminaire 24° white 4000K to Demilux Intevision 0549W2 20 or approved equivalent.	nos.	14			
D	F39 - 1W LED Recessed round emergency lighting c/w 1hr battery backup to Maxspid Minnie or approved equivalent, mounted as shown in the drawing.	nos.	31			
E	F40 - 2x3W LED Wall mounted emergency lighting c/w 2hrs battery backup to Maxspid Minnie or approved equivalent.	nos.	20			
F	F41 - "KELUAR" LED double/single-sided, self-contained, ceiling/wall mounted sign light c/w 2 hrs emergency battery pack to Maxspid Leder or approved equivalent, mounted as shown in the drawing.	nos.	30			
G	Flexible LED Strip, 160 LEDs/m 24V to Colours or approved equivalent.	m	130			
H	Power supply, connectors and necessary accessories for maximum 15m per installation for flexible LED strip.	sets	6			
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Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/E	<u>ELECTRICAL INSTALLATION FOR CHANCERY</u>					
[5]	<u>TELEPHONE AND COMPUTER SYSTEM</u>					
	<u>Telephone Services Installation</u> Supply, install, test and commission telephone system, PABX system and computer system in accordance with the specifications and drawings. All works herein shall be approved TelBru standards. Tenderer shall submit a complete detailed proposal including all equipment offered, catalogues and brochures together with this tender. The equipment and accessories listed below are for tendering purpose. The tenderer is to include all other equipment and accessories not included herein but deemed necessary to the intent of the specifications and requirement. Proposed brands for all the items shall be Dell/Cisco or equivalent.					
	Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.					
A	Supply and installation of wall-mounted FAT and ATB c/w suitable Splitters and other necessary accessories including termination, splicing of cables and testing as shown and indicated in the drawing.	lot	1			
B	Supply and install wall mounted Fibre Joint Enclosure as per specifications and JTB approved make. Rates to include termination of all incoming and outgoing cable and jumper cable, provision of a laminated schematic diagram, termination chart, identification label and 1 set of layout drawing showing the location of telephone outlets in the area served.	lot	1			
C	Telephone point using 4 pair Cat 6 STP cable in concealed pvc conduit/trunking to outlets as shown and indicated in the drawing. Cost to include RJ45 shutter faceplate outlet, utility boxes, etc inclusive of termination at both ends, testing of Cat 6 cable, etc.	nos	45			
	<u>IP Telephony (PABX) System</u>					
D	Supply & Install includes IP Telephony server, IP telephone Gateway user end point Licence. Tenderer must include all the necessary accessories to proper function of PABX network (Cisco or approved equivalent)	lot	1			
E	Supply and install factory fabricated 22U 19" Floor mounted equipment rack, fully vented, front safety glass door & lock set, quick release side doors, 8 way power bar, etc. Cost inclusive of patch panels, management panels, other necessary accessories to cater for the above services for PABX Services.	lot	1			
F	24 Port POE Switch for IP PABX	nos	2			
G	12 Core Rack mount ODF c/w accessories as shown and indicated in	lots	2			
H	12 core single mode outdoor type fibre optic cable run in cable trunking for computer backbone structured cabling inclusive of both ends termination and testing as shown in the drawing from and to PABX Racks. Contractor to verify exact length of cable.	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	Operator Level IP Phone	lot	2			
B	Executive Level IP Phone	lot	2			
C	Staff Level IP Phone	lot	45			
D	Interconnection works for the new PABX equipment and accessories as indicated in the drawings/specification inclusive of all manufacturer specified cable, suitable sized MDF, patchcord, pigtail, adaptors, connectors, and all necessary accessories, etc. This include interlinking works to the other system/services where specified/required (i.e Fire Alarm System, CCTV system, Computer Structure Cabling System) with necessary works such as programming, calibration, configuring, etc.	lot	1			
E	2c single mode FO cable in concealed conduit for the interconnection between ATB, FAT, modem etc, c/w termination, FO connectors, and other accessories. <u>Computer Network Installation</u>	lot	1			
F	Supply and install factory fabricated 42U 19" wall mounted 1000 x 1000 equipment rack, fully vented, front safety glass door & lock set, quick release side doors, 8 way power bar, etc. Cost inclusive of patch panels, switch panels, management panels, other necessary accessories to cater for the above services.	lots	2			
G	24 core single mode outdoor type incoming fibre optic cable run in telephone pipe duct, trunking/cable tray inclusive of both ends termination/splicing and testing as shown in the drawing from existing TelBru FO Exchange Station to Equipment Rack. Contractor to verify exact length of cable and coordinate with authorities the nearest tapping point works shall be c/w termination, connection, adaptors, joint kits, connectors, and all necessary accessories, etc.	m	1,000			
H	Termination of telecommunication cable at MDF/PABX, FAT, ATB, ODF etc. This include sufficient telephone cable module block, fibre optic termination kits, and label with all necessary accessories, etc.	lot	1			
I	Computer point using 4 pair Cat 6 STP cable in concealed pvc conduit/trunking to outlets as shown and indicated in the drawing. Cost to include RJ45 shutter faceplate outlet, utility boxes, etc inclusive of termination at both ends, testing of Cat 6 cable, etc.	nos	32			
J	Supply and installation of Patch Panel for the above network switch c/w termination and all the necessary accessories.	lots	2			
K	Supply and installation of Cable Management Panel for the above network switch c/w termination and all the necessary accessories.	lots	2			
L	Supply and laying of 4c fibre optic cable for the interconnection between two racks c/w termination and splicing.	lot	1			
M	Supply and laying of 50 pairs jelly-filled cable for the interconnection between two racks c/w termination, splicing and all the necessary accessories.	lot	1			
N	Supply and installation of suitable-sized MDF/ODF c/w termination, splicing and all the necessary accessories.	lots	2			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	1 meter length factory terminated Cat 6 patch cord for equipment rack.	lot	1			
B	3 meter length factory terminated Cat 6 patch cord for work station.	nos	42			
<u>Telephone & Computer Ducts</u>						
C	Construct 4 way telephone foot way joint box no. 3 (FJB3) in situ mix on site c/w foot way covers, cable bearers and reinforced concrete work etc to TelBru standard. Indicative location shown in the site plan. All works and materials to TelBru standards.	nos	5			
D	2 x 100 dia uPVC telephone cable duct encased in concrete c/w nylon pull cables, end caps, laid approx. 1m from ground, asphalt & across drain inclusive of excavation, sand fill, compaction, cutting and reinstatement to approval.	m	250			
E	Allow costs for draw pit of 600 x 600 mm for telephone & fiber cable duct entry to building c/w chequered plate cover, draw rope, 2 way 100 dia uPVC with sealant at both ends as shown in the drawing.	lots	2			
F	Allow cost for taping 2 x 100 dia telephone pipe duct into existing telephone manhole.	lot	1			
G	Comms earthing using 1c/70mm ² PVC earth cable c/w earth bar, insulator, heavy duty earth chamber and necessary accessories to achieve 1 ohm or less link to main earthing system.	lots	2			
H	Liaison with TelBru or relevant authorities on incoming telephone and fibre optic connection.	lot	1			
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Item No.	Description	Unit	Qty	Rate	Amount	
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CH/E	<u>ELECTRICAL INSTALLATION FOR CHANCERY</u>					
[6]	<u>CONVENTIONAL FIRE ALARM SYSTEM</u> Supply and install of an Analogue Addressable microprocessor type automatic fire alarm system as per specification and drawings.					
A	4-Zone Conventional Fire Alarm panel c/w text display, keyboard printer, sealed maintenance batteries and all accessories to Multron or approved equivalent.	lot	1			
B	Mimic panel with programmable LED's showing silk screen diagrammatic layout plan of the whole building. The silkscreen shall clearly identify the location of all the fire protection detectors, devices, escape routes and individual alarm zones. Coloured and numbered for easy identification. <u>Supply and installation c/w wiring point using 1x2c/1.5mm² fire resistant cable in conduit from the fire alarm panel to the following devices</u>	lot	1			
C	Smoke detector	no	44			
D	Heat detector	no	7			
E	Manual breakglass	no	11			
	<u>Supply and installation c/w wiring point using 1x2c/2.5mm² fire resistant cable in conduit from the fire alarm panel to the following devices</u>					
F	Alarm Bell <u>Wiring point using 1x2c/1.5mm² fire resistant cable or as per requirement in conduit from interface unit to the following devices. Cost inclusive of providing relay to the panel/equipment as per requirement.</u>	no	11			
G	Lift control panel	lot	1			
H	Power supply for the Fire Alarm Panel using 2x4mm ² + 1x4mm ² CPC cable run through PVC conduit or trunking. <u>Supply of Spare Detector/Devices only</u>	lot	1			
I	Smoke detectors	no	5			
J	Heat detectors	no	5			
K	Manual breakglass	no	5			
L	Loop card module	no	1			
M	Glass for breakglass	no	5			
N	Fire alarm transmitter/digital communication to link fire alarm panel to alarm signal to Fire Department.	lot	1			
O	Allow cost for lightning surge protection devices for fire alarm panel and external signal cables	lot	1			
P	1 set of log book, manuals re cord drawing, checklists, component list and test form for the above control panel <u>Supply and install of fire extinguishers and shall be by SRI or</u>	lot	1			
Q	2.0 kg ABC dry powder extinguisher	no	9			
R	2.0 kg CO ₂ fire extinguisher	no	6			
S	Fire blanket	no	3			
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Item No.	Description	Unit	Qty	Rate	Amount	
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Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/E	<u>ELECTRICAL INSTALLATION FOR CHANCERY</u>					
[7]	<u>STANDBY DIESEL GENERATOR SET</u> Supply, install, test and commission the standby generator system as shown in the drawings and in accordance with the specification. Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.					
A	<u>Generator</u> Standby generator set of 500 kVA capacity at 0.8 power factor, 415V 3 phase, 50Hz (prime - rating) c/w the following : - skid base fuel tank type (minimum 8 hours backup) - fabricated steel underframe - diesel engine c/w accessories - alternator c/w AVR - radiator - electronic governor - flexible connection to fuel piping and flexible below for connection to exhaust piping - Meters for water temperature, oil pressure, oil temperature, tachometer hour run - 2 nos starter motors - diesel fuel, oil, water and air filters - safety overspeed, high water temperature, low oil pressure trip and alarm devices - guards of all moving parts and all necessary labelling and name plates - anti vibration mounting pads - rate to include cable terminations, glands and lugs	lot	1			
B	<u>Batteries</u> Lead acid batteries c/w a non ferrous battery rack, interconnecting links, terminal shrouds and flexible cable tails to connect the battery to the starter. The battery should be sized for 6 successive starts of 6 seconds each with a 15 seconds rest period.	lot	1			
C	<u>AMF Switchboard</u> Automatic mains failure switchboard of metalclad enclosure, floor standing to specification with front and rear access and complete with but not limited to the following : - 1 x 800A 4P MCCB/ACB - main - External O/C & E/F protection of MCCB/ACB - Voltmeter c/w a selector switch - Ammeter c/w a selector switch - KWH, power factor, hour run and frequency meter - Mains available and generator available indicating lights - Battery charger c/w boost/trickle charger selector - Battery voltmeter and ammeter - Indicator lamps for operation of engine and controls protective devices - Selector switch for "Off" "Auto" "Manual" and "Test"	lot	1			
To Collection:						
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Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<ul style="list-style-type: none"> - Push buttons for start/stop/alarm, cancel/lamp test/reset - Alarm siren - Contacts for remote monitoring - Control relays, timer, under voltage sensing relay, low battery, voltage relay, etc to effect automatic main failure sensing and control of the generator - Cable termination plate, lugs and glands - Rates for switchboards to include cost for cable termination at the board - All necessary labels 					
	<u>Exhaust System</u>					
A	Radiator exhaust ducting c/w a flexible canvas section to connect the radiator to the discharge shaft. The ducting should be provided with an access hatch for cleaning out and should be constructed in accordance with BS DW142 with 1.2 mm thick galvanised sheet steel. The ducting should be reinforced with angle iron brackets.	lot	1			
B	Residential type exhaust silencer and piping using BS3601 pipes with welded joints c/w necessary spring isolation supports.	lot	1			
C	Allow cost of necessary inlet air attenuator and outlet air attenuator/silencer as per manufacturer's recommendation.	lot	1			
D	Exhaust piping to be lagged with 50mm thick sectional rock wool and clad with a 0.6mm thick stainless steel.	lot	1			
E	The discharge outlet shall be angled at 30 degree and provided with an anti vermin mesh. Where the exhaust pipes penetrate through the building structure, a G.I. sleeve shall be provided.	inclusive				
F	The sleeves shall be one pipe diameter larger than the exhaust pipe and space between the sleeved and pipe packed with rock wool and sealed with a rock wool and sealed with a non setting heat resistant compound.	clusive				
	<u>Fuel Tank</u>					
G	Design and construct cylindrical fuel tank of mild steel construction and anti-rust paint finishes c/w 48 hours diesel fuel reserved (80% tank capacity), level indicator, low fuel level switch, vent cowl, drain pipe, support and mounting brackets, and other accessories.	lot	1			
H	Wiring from low fuel level switch to AMF panel consisting of 3x1c/1.5 mm ² PVC in conduit.	lot	1			
I	Construct a bund wall of 300mm high all around the fuel day tank. Walls and floor shall be finished w/ an impervious material coating and non-chemical reaction to fuel.	lot	1			
	<u>Power and Control Wiring</u>					
J	4nos 1C/500mm ² XLPE/AWA/PVC on cable ladder or tray from the generator to the MSB..	m	20			
K	Multicore control cable 5c/2.5mm ² between the generator and the AMF panel laid on tray & power supply sensing cable from AMF to MSB.	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>Earthing System</u>					
A	Neutral earthing using 2 x 120 mm ² PVC earth cable c/w earth chamber and necessary accessories to achieve below 1 ohm.	lot	1			
B	Frame earthing using 70 mm ² PVC earth cable linking the generator, AMF panel, fuel tank frame in ring formation to earth rods in earth chamber to achieve the earthing value as per DES requirements.	lot	1			
	<u>Genset Plant Room Earthing</u>					
C	Allow cost for common earth bar and necessary earthing to the whole of electrical and genset installation.	lot	1			
	<u>Fuel Piping</u>					
	All the piping shall be ASTM grade A53 Sch 40 pipes. Rates shall be inclusive of all elbows, tees, brackets and accessories.					
	Rates should include for painting with 2 coats of primer and 2 coats of bituminous paint.					
D	25mm dia supply pipe from the day tank to the generator.	lot	1			
E	25mm dia return pipe from the generator to the day tank.	lot	1			
F	1m wide x 6mm thick rubber along the front and back of the AMF panel.	lot	1			
G	Provide a framed schematic and control drawing in the genset room.	lot	1			
H	Supply a manual and in-line rotary vane pump specifically designed for petroleum products and install a supply fuel oil line feeding the day tank. The pump shall have a built in rotary vane head and easy turn crank handle, cast iron body, 19mm inlet and outlet with removable steel spout 100mm suction pipe and a 50 mm bung adapter. It shall be capable of delivering at a rate of about 12 turns per gallon with a suction lift on 1500mm.	lot	1			
I	Allow cost for mild steel checkered plate with anti-rust painting finish covering all HV and LV electrical trenches, genset trenches, etc that is within this contract. Contractor to propose plate arrangements.	lot	1			
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Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/E	<u>ELECTRICAL INSTALLATION FOR CHANCERY</u>					
[8]	<u>HT CABLES AND RELATED EQUIPMENTS</u> Supply, installation, testing and commissioning of the 11kV cables based on engineering, procurement and construct basis. (All material supply & works carry out shall be as per DES requirements). The works call for the supply and installation of 11kV cables, 11kV ring main unit, distribution transformer, HV earthing, jointing, related accessories and all associated works for the 11kV power system installation. The tendering party shall liaise with DES on the scope of works, specifications, schedule of works in this bill noting that the work undertaken shall be by approved specialist Contractor. Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.					
A	Allow cost for mobilisation and demobilisation of plant/equipment, setting out of works, transportation of materials, insurances and associated works.	lot	1			
B	Supply, install and commissioning of 500 kVA 11kV/433V outdoor type Distribution Transformer c/w all necessary accessories to DES specification ref: DES/11KV/TRF/REV '0' dated 26-7-1997.	lot	1			
C	Supply, install and commissioning of 2R1T Non-extensible Ring Main Unit (RMU) equipment c/w all necessary accessories to DES specification ref: DES/11KV/RMU/REV '0' dated 26-7-1997.	lot	1			
D	Supply and delivery of 1 x 3C/185 mm ² XLPE, Leadsheathed/DSTA/PVC 6.35/11KV cable as shown on the drawings and as per DES Specification as DES/11KV/HVC (Rev. "1" dated 11th October 2001). Price quoted above inclusive of supply & delivery of cables, excavation, preparation of cable trench, timber shoring, installation of cable rollers & pulling wires, laying of cables, backfilling, compaction, dewatering of cable trench, PVC protective tiles, concrete cable markers, turfing, making good of surface, manpower, discard of unwanted earth & debris and all associated works.	m	1650			
E	Jointing and termination of 11kV 185mm ² HV cables. The quoted price is inclusive of all jointing and termination materials, accessories, jointing and termination service by specialist joiner, all preparation and associated works.	lot	1			
F	Allow cost for the testing & commissioning of 11/0.433kV transformers, 11kV RMU, 11kV earthing grid, 11kV cable system & protection system, etc.	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	Allow cost for the isolation and disconnection of the existing 11kV network by authorities engineers inclusive of switching operation and related work at 11kV switchgears, cable identification, spiking of cables, skilled manpower for supervision, witnessing of site testing of LV MSB and all associated testing to ensure safety & engineering requirement is complied.	lot	1			
B	All cost for liaison with authorities, survey works, mapping of existing cables, investigation works, trial pits, excavation, backfilling, returfing, protective measures and materials for existing HT cable, other related works in conjunction with HT power connection.	lot	1			
C	<u>Miscellaneous and Related Works</u> Encased in concrete for open road cutting and crossing inclusive of Class C uPVC pipe, safety signage & lighting, excavation, backfilling of pits after completion of work, clearing of site and all associated works.	lot	1			
D	Road crossing pipe sleeves installation by pipe jacking inclusive of 4-way cable ducts across main road. Works inclusive of excavation work for drilling pit & receiving pit, site preparation work, pipe jacking equipment, supply & installation of 150mm dia, danger and warning signs at roads, application and approval by authorities, etc. Pipesleeves for electrical services entering the building, substation, external lighting, power cables etc in concrete encased and road crossing inclusive of excavation, backfill materials etc as per drawing and as necessary. Pipesleeves shall be 2ways minimum unless otherwise specified.	m	20			
E	200mm diameter uPVC pipesleeves	m	50			
F	150mm diameter uPVC pipesleeves	m	40			
G	100mm diameter uPVC pipesleeves	m	20			
H	Equipment grounding system as per DES standards c/w necessary accessories to achieve less than 1 ohm (for MSB, MSB & Genset, RMU & Transformer)	lot	1			
I	Transformer neutral earthing using 2x120mm ² PVC earth cable c/w heavy duty earth chamber and necessary accessories to achieve less than 1 ohm.	lot	1			
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TO CH/E8 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/E	<u>ELECTRICAL INSTALLATION FOR CHANCERY</u>					
[9]	<u>PA SYSTEM</u> Supply and installation of PA system as per drawings and specifications. Tenderer shall submit a complete detailed system proposal including all equipment offered, catalogues and brochures together with this tender. The equipment and accessories listed below are for tendering purpose. The tenderer is to include all other equipment and accessories not included herein but deemed necessary to the intent of the specifications and requirement.					
	<u>Sound System</u>					
A	8-Channel Audio Mixer (Rack Mountable)	unit	1			
B	Monitoring speaker c/w Line Matching Transformer 70V/100V, Enclosure & Ceiling Baffle	lot	1			
C	Ceiling mounted Loudspeaker c/w Line Matching Transformer 70V/100V, Enclosure & Baffle	units	12			
D	Power Amplifier c/w Line Transformer 100W 70V/100V (Rack Mountable)	unit	2			
E	Graphic Equaliser, 1-Ch 31-Bands (Rack Mountable)	unit	1			
F	Mic XLR Wall Receptacles	no	1			
G	Handheld dynamic microphone c/w 5 meter cable	no	2			
H	Computer RGBHV\Audio; Audio Input Receptacles on Wall.	lot	1			
I	22U 19" Equipment Rack on castors c/w Front Glass Lockable Door, side & rear doors, mounting hardwares & accessories, power/mains supply rail, ventilation fans, cable straps, etc.	no	1			
J	Supply & Install Audio Cables as laid in Conduits, Trunkings & Trays	lot	1			
K	Equipment Installation & Termination, Testing & Commissioning	lot	1			
L	DVD/VCD/CD cum VCR player (multi-system) c/w IR remote controller.	lot	1			
M	Allow cost for the engineering, design proposal, shop drawing and catalogues for approval.	lot	1			
To Collection:						
	<u>COLLECTION</u>					
	<u>PAGE</u> CH/E9 (Page 1/1) - - - - -					
TO CH/E9 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/E	<u>ELECTRICAL INSTALLATION FOR CHANCERY</u>					
[10]	<u>MATV SYSTEM</u> Supply and installation of MATV system as per drawings and specifications. Tenderer shall submit a complete detailed proposal including all equipment offered, catalogues and brochures together with this tender. The equipment and accessories listed below are for tendering purpose. The tenderer is to include all other equipment and accessories not included herein but deemed necessary to the intent of the specifications and requirement. Proposed brands shall be Ikusi/Televes or equivalent.					
	<u>Antennae/Headend, Distribution Equipment and Accessories</u>					
A	RTB Analog and Digital Antennae c/w necessary accessories inclusive steel mounting stand/ supports/ mast.	lot	1			
B	Headend MATV Amplifier c/w necessary accessories	lot	1			
C	Astro 65cm dish w/ Televes Quattro LNBF or equivalent and necessary accessories inclusive steel mounting stand/ supports/ mast.	lot	1			
D	5in, 5out Amplifier to Televes or equivalent	lot	1			
E	5in, 8out/16out Multiswitch to Televes or equivalent	nos	2			
F	IF Tap-Off units to Televes or equivalent	nos	2			
G	Wiring of TV/SAT/FM 2 gang socket outlet by using of 2xRG6 (coaxial) cable in concealed conduit. Proposed brand RG6 cable shall be Belden or equivalent.	nos	8			
H	Custom-made metal enclosure with hinged door for installation of amplifier and multiswitch c/w accessories.	nos	1			
I	Combiners, connectors and necessary accessories.	lot	1			
J	Installation, termination, testing and commissioning for the whole system.	lot	1			
	<u>Conduit and Trunking Works</u>					
K	Allow cost for labelling and marking of all cables, tap -off units and splitters.	lot	1			
L	Supply and install hot dipped galvanised heavy duty cable trunking c/w all necessary supports. Trunking covers shall utilise a quarter turn screw. Trunking for shall be of different colour from lighting , power and other services.	lot	1			
M	Supply and install various lengths of 25Ø/32Ø PVC conduit as per drawing and where necessary cast/concealed in wall/slab.	lot	1			
N	Allow cost for the engineering, design proposal, shop drawing and catalogues for approval.	lot	1			
O	Testing and Commissioning of MATV System	lot	1			
To Collection:						
	<u>COLLECTION</u>					
	<u>PAGE</u> CH/E10 (Page 1/1) - - - - -					
TO CH/10 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/E	<u>ELECTRICAL INSTALLATION FOR CHANCERY</u>					
[11]	<p><u>SECURITY SYSTEM</u> Supply and install card access control system integrated with IP video surveillance system as per drawing and specifications. Tenderer shall submit a complete detailed proposal including all equipment offered, catalogues and brochures together with this tender. The equipment and accessories listed below are for tendering purpose. The tenderer is to include all other equipment and accessories for proper functioning and operation of the security system to the intent of specification and requirement.</p> <p><u>Camera System</u> Supply and install indoor and outdoor camera c/w but not limited to the following: i) DVD quality, day/night function, min lux 0.05 lux at F= 1.2 ii) Dual stream MPEG-4 SP video upto 4CIF/30pfs iii) Power over Ethernet (PoE) ready iv) One way audio supported v) QoS enabled (L3) video streaming vi) Backlight compensation vii) Auto iris control, variable focal c/w camera licenses vii) Other features that deemed necessary and required by the Client</p>					
A	Fixed indoor IP mini dome camera to Samsung or equivalent	sets	17			
B	<u>Video Management System Software</u> Video Management System (VMS) software and licenses for efficient viewing, recording, replaying of acquired video/audio complying with requirements and specifications including but not limited to the following functions:- - 4CIF, 30 fps video stream - Health monitoring and analysis functions Software development kit (SDK) - High level integration with card access system and IP cameras - Single and multi-site support - Support distributed remote viewing and remote storage - Able to export to DVD-RW driver	lot	1			
C	<u>Master Server</u> <u>Minimum Hardware Requirements:-</u> - Operating System: Windows 2003 SP1 - Processor: Intel Pentium 4 or Pentium D or Pentium Xeon, 2.8 GHz Hyper-Thread enabled - Memory: 4 GB <u>Network: 10/100/1000Base-T</u> - DVD R/W Drive: Required - Hard Disk Partitions: C: (Operating System) = 15 GB D: (Database) = 10 GB L: DVD Drive c/w 20" LCD monitor	lot	1			
		Inclusive				
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>Required Software:</u> - Microsoft SQL Server 2000 with Service Pack 3 or latest - Microsoft Operations Manager 2005 or better - Video Management Software - all other necessary software and licenses and proper management and functioning of IP video surveillance system <u>Digital Video Recorder</u> Supply and install Recorder Server to Samsung SRN-1670D/470D or equivalent c/w external Raid 5 hot-swappable SATA hard disk array for recording and viewing of video images and which support minimum 15 channel recording at Full D1 at 30 fps. Disk array to be sized for fulltime recording for 30 days based on minimum 12.5 fps (at MPEG 4, CIF-4kb) for 15 no of IP cameras <u>Minimum Hardware Requirements:-</u> Operating System: Windows 2003 SP1, Windows XP SP2 Processor: Intel Pentium 4 or Pentium D or Pentium Xeon, 2.8 GHz Hyper-Thread enabled Memory: 4 GB Network: 10.100/1000 Base-T DVD reader drive: Required C: (Operating System) = 15 GB D: (Database) = 10 GB L: DVD Drive c/w 20" high resolution LCD monitors	Inclusive				
A	Allow for necessary management software, operation system software and licenses for recorder server for proper management of larger-scale distributed video operations as specified	lot	1			
	<u>Network Devices</u> B 24 port network switch with 24 port 10/100 Base-T PoE ready Ethernet interface modules & 1x1000 Base-T module C Network patch panels as required D Redundant power supply units, chasis fan, patch chords all necessary accessories required E Allow for all necessary management software for configuration of the switches and accessories F 22U 19" equipment rack to house the CCTV equipment c/w all necessary accessories G Supply and install of CAT 6 STP cabling of approved make, inclusive of conduit, trunking where required (average length 70m) from security equipment racks to camera points - ceiling of wall mounted H Allow for CAT 6 patch chords from patch panels to the network devices (including network and distribution switches) I Cost & expenses for complete configuration, testing and commissioning of the transmission system to the satisfaction of consulting engineers and client J Allow cost for the engineering, design proposal, shop drawing and catalogues for approval.	no	1			
		lot	1			
		lot	1			
		lot	1			
		lot	1			
		lot	1			
		lot	1			
		nos	17			
		lot	1			
		lot	1			
		lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
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TO CH/E11 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/E	<u>ELECTRICAL INSTALLATION FOR CHANCERY</u>					
[12]	<u>LIGHTNING PROTECTION SYSTEM</u> Supply, Install, Testing and Commissioning of the following including all necessary termination/fixing accessories as per drawing of Electrical Services and specifications:- Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.					
A	Air termination rod c/w the base. Make: D.E.S approved brand.	nos.	6			
B	25 x 3mm bare copper tape horizontal conductor c/w fixing accessories (saddle screws, square clamp, etc) run on roof level.	m	180			
C	1C x 70mm ² down conductor in 50mm dia. uPVC conduit chased in wall/column. Make: D.E.S approved brand.	m	120			
D	Oblong test joint clamp c/w recessed w/p termination box. Make: D.E.S approved brand.	nos.	6			
E	Earthing pit c/w copperbond earth rod & H.D. cover. Make: D.E.S approved brand.	set	6			
F	Testing and commissioning of lightning protection system.	lot	1			
To Collection:						
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TO CH/E12 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/E	<u>ELECTRICAL INSTALLATION FOR CHANCERY</u>					
[13]	<u>EXTERNAL WORKS</u>					
	<u>LV Reticulation Mains</u>					
	Supply and install submain cables as per drawings & specification. Cost of hot dipped galvanised cable ladder, tray, trunking, required as specified shall be included in the pricing of cable. The size of cable ladder/cable tray and containment provided shall be adequate for cable spacings factor as per latest EIR and IEE Regulations.					
	Rates of cable laid underground shall include cost of trench excavation, sand bedding, pipesleeves, protective tile and reinstatement. Rates for cables shall be inclusive of cable identification tags at 10m intervals and at every bend.					
	Cost quoted to be inclusive of termination of all incoming and outgoing cables including cable glands, lugs, etc as per drawing and specifications.					
	Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.					
A	4nos 1x4c/500mm ² XLPE/AWA/PVC cable from transformer to MSB laid inside cable trench.	m	20			
B	1x4c/120mm ² XLPE/SWA/PVC cable + 1c/70mm ² CPC laid underground, pipesleeves and cable tray from MSB to SSB-CH (including CH-GLP)	m	35			
C	1x4c/70mm ² XLPE/SWA/PVC cable + 1c/50mm ² CPC laid underground, pipesleeves and cable tray from MSB to SSB-MPH (inclusive of MPH-LP)	m	70			
D	1x4c/70mm ² PVC/SWA/PVC cable + 1c/35mm ² CPC laid underground, pipesleeves and cable tray from MSB to SSB-CON.	m	150			
	4x1c/25mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories.					
E	From MSB to DB-SS 1x4c/16mm ² PVC/SWA/PVC cable + 1c/16mm ² CPC laid in cable tray c/w necessary accessories.	m	10			
F	From MSB to HR - CP	m	15			
G	From MSB to DWP - CP	m	15			
H	1x4c/10mm ² PVC/SWA/PVC cable laid underground, pipesleeves and cable tray c/w necessary accessories for fencing lighting.	m	350			
I	1x4c/6mm ² PVC/SWA/PVC cable laid underground, pipesleeves and cable tray c/w necessary accessories for bollard lighting.	m	260			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
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TO ELECTRICAL SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
NRG/E	<u>ELECTRICAL INSTALLATION FOR NON-REPRESENTATIONAL GRADE (BLOCK A)</u>					
[1]	<u>SWITCHBOARDS AND LV RETICULATION MAINS</u>					
	<u>Sub-Switchboard / Distribution Boards</u> Supply, install, test and commission factory assembled modular type tested Form 4 construction, front access IP42 (IEC) floor mounted metal clad board and other accessories as detailed in the drawings and specifications. (Cost to be inclusive of termination of all cables, including cable glands, lugs, etc. as per drawings/ specifications). Distribution boards shall be constructed to Form I and IP42, electrical grounding, all necessary accessories as shown in the drawing, . All cable terminals shall be provided with numbered identification ferrules. Cost quoted to be inclusive of termination of all incoming/ outgoing cables including cable gland, lugs, number ferrules, etc. as per drawings/specifications.					
A	SSB-RHA as per drawing	lot	1			
B	DB-CLP as per drawing	lot	1			
C	DB-AG as per drawing	lot	1			
D	DB-AF1 as per drawing	lot	1			
E	DB-AF2 as per drawing	lot	1			
F	DB-AS1 as per drawing	lot	1			
G	DB-AS2 as per drawing	lot	1			
H	DB-AT as per drawing	lot	1			
	<u>LV Reticulation Mains</u> Supply and install submain cables as per drawings & specification. Cost of hot dipped galvanised cable ladder, tray, trunking, required as specified shall be included in the pricing of cable. The size of cable ladder/cable tray and containment provided shall be adequate for cable spacings factor as per latest EIR and IEE Regulations. Rates of cable laid underground shall include cost of trench excavation, sand bedding, pipesleeves, protective tile and reinstatement. Rates for cables shall be inclusive of cable identification tags at 10m intervals and at every bend. Cost quoted to be inclusive of termination of all incoming and outgoing cables including cable galnds, lugs, etc as per drawing and specifications. Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.					
I	1x4c/70mm ² XLPE/SWA/PVC cable + 1c/35mm ² CPC laid underground, pipesleeves and cable tray from MSB to SSB-RHA.	m	50			
J	1x4c/25mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories from SSB-RHA to DB-AG.	m	15			
K	1x4c/25mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories from SSB-RHA to DB-AF1.	m	15			
				To Collection:		

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	1x4c/16mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories from SSB-RHA to DB-AF2.	m	15			
B	1x4c/16mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories from SSB-RHA to DB-AS1.	m	15			
C	1x4c/16mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories from SSB-RHA to DB-AS2.	m	15			
D	1x4c/16mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories from SSB-RHA to DB-AT.	m	20			
<u>Miscellaneous and Related Works</u>						
E	Allow miscellaneous cost for concrete encased pipesleeves of 150mm dia for all road crossing, pipe jacking, hard standing areas, returfing, refurbishment and making good of existing ground.	lot	1			
F	Allow miscellaneous cost for providing floor openings, pipe sleeves through RC beams & slabs, fire stop barrier, fire seal pillows, etc for passage of sub-main cables, lighting and power wiring, telephone & computer system, fire alarm & fire protection system, water services, aircon services and other disciplines.	lot	1			
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TO NRG/E1 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
NRG/E	<u>ELECTRICAL INSTALLATION FOR NON-REPRESENTATIONAL GRADE (BLOCK A)</u>					
[2]	<p><u>GENERAL LIGHTING AND POWER SERVICES</u> Supply, installation and termination of light and power point in conduit/trunking as per drawing and specification.</p> <p>Rates for lighting and power point shall be inclusive of providing cable marker sleeved with the circuit number identified. Unless otherwise specified all switch plates and power point switch plate shall be of moulded white plastic range accessories approved by DES. CPC earth cable shall be provided inside back box and terminated with cable connector whether the switch plate is of plastic or of metallic range.</p> <p>Cost quoted to be inclusive of termination of all incoming/ outgoing cables including cable glands, lugs, etc as per drawing and specifications.</p> <p>NOTES:</p> <p>i) all utility boxes for switches, outlets, etc shall be of flush mounted, factory fitted with moulded brass nut and not of self tapping screw type.</p> <p>ii) conduit adapter fitted to boxes for use of switches, outlets, etc shall be with lock nuts and securely tightened.</p> <p>iii) all exposed conduit and flexible conduit inside ceiling voids shall be of color coded.</p> <p>iv) flexible conduit shall be of corrugated polyamide (nylon) flexible conduit and fittings shall be of manufacturer recommended.</p> <p>v) light fittings shall be of factory provided supports and brackets with independent hangers from other installations.</p> <p>vi) SSO switches are to T&J Electric "Radiance" White.</p> <p><u>Unless otherwise specified Color Code for Service Raceway & Conduits are as follows:</u></p> <p>- lighting and power - - - - - orange - fire detection - - - - - red - telephone & computer - - - - green - PA system - - - - - yellow - security system - - - - - white - AC & BMS - - - - - blue</p>					
A	Lighting point c/w wiring in PVC conduit using 3x1c/1.5mm ² PVC cable c/w 10A switch plate and gang as per switching arrangement shown in the lighting drawings.	nos	299			
B	Emergency lighting point in PVC conduit using 3x1c/1.5mm ² PVC cable c/w key switch as shown in the drawing.	nos	15			
C	Exhaust fan wiring point in concealed PVC conduit using 3x1c/2.5mm ² PVC cable c/w fused spur outlet similar to MK, Clipsal, Legrand or equivalent next to fan and switch at the door.	nos	25			
				To Collection:		

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	Power point in concealed PVC conduit using 6 nos 2.5mm ² PVC cable as per single line diagram and terminated with the following outlets priced separately as below.	nos	131			
B	Power point in concealed PVC conduit using 3x1c/4mm ² PVC cable as per single line diagram and terminated with the following outlets priced separately as below.	nos.	29			
C	13A single SSO mounted as shown in the drawing similar to MK, Clipsal, T&J white plastic finish or equivalent.	nos	21			
D	13A twin weatherproof SSO mounted as shown in the drawing similar to MK, Clipsal, T&J white plastic finish or equivalent.	nos	10			
E	13A twin SSO mounted as shown in the drawing similar to MK, Clipsal, legrand or equivalent.	nos	100			
F	15A single SSO using 3x1c/4mm ² PVC cable mounted as shown in the drawing similar to MK, Clipsal, T&J white plastic finish or equivalent.	no	29			
G	Cooker SSO w/ neon indicator using 3x1c/6mm ² PVC cable in concealed PVC conduit mounted as shown in the drawing.	no	6			
H	Water heater point in concealed PVC conduit using 3x1c/4mm ² PVC cable c/w connection outlet and flush 20A DP switch and pilot lamp and marked "water heater" similar to MK Logic 5423 WH WHI, Clipsal, T&J or equivalent.	nos	14			
I	<p><u>Miscellaneous and Related Works</u></p> <p>Allow cost for circuit tagging and labelling of all cables and wiring circuits (incoming/outgoing cables and corresponding DB name) using numeric sleeves or self laminating wrapped around oil resistant nylon cable identification labels to brother, winco, brady, thorpe or approved equivalent. Labels shall apply to but not limited to the following:</p> <p>i) all DB, MSB, SSB, FAP, Tel & Computer, Secuty System, etc ii) socket outlets iii) switches iv) light fittings</p>	lot	1			
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Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
NRG/E	<u>ELECTRICAL INSTALLATION FOR NON-REPRESENTATIONAL GRADE (BLOCK A)</u>					
[3]	<p><u>LIGHT FITTINGS AND ACCESSORIES</u></p> <p>Supply and install DES approved light fittings as specified in the drawings and as indicated below or as per Engineer/SO requirement. All light fittings shall be provided with independent support to the structure and shall not depend to other system.</p> <p>Rates for light fittings shall be inclusive of providing a tape label with the circuit number identified and a strong adhesive used to bond the tape to the fittings. A system guarantee of 3 years by means of factory warranty certificate for all the light fittings.</p> <p>All LED light fittings offered must be of non degradable diffusers. All LEDs in the light fitting offered shall have a minimum lifetime to 70% luminous flux at 50,000 hours and shall be CREE, Nichia, Lumiled LEDs or approved equivalent. A system guarantee of 3 years by means of factory warranty certificate shall be submitted for all LED light fittings. Contractor to ensure LED light fitting offered shall met the design illumination requirement.</p> <p>Emergency packs are to be rated for a minimum of 2 hours duration or as specified and shall be non-maintained type.</p>					
A	F1 - 6W LED Inground uplight 3000K 20° to NVC NLED4203 or approved equivalent, mounted as shown in the drawing.	nos	19			
B	F8 - 9W LED Surface-mounted downlight white 3000K to NVC NLLED9184M or approved equivalent, mounted as shown in the drawing.	nos	21			
C	F10 - 12W LED Recessed downlight 6500K to NVC NDILLED9314E or approved equivalent, mounted as shown in the drawing.	nos	48			
D	F19B - 8W LED Recessed round downlight 3inch 4000K white shield cover to NVC 8113A or approved equivalent, mounted as shown in the drawing.	nos	91			
E	F21B - 3W LED Recessed downlight 2inch 4000K to NVC 8112D matte white shield cover or approved equivalent, mounted as shown in the drawing.	nos	48			
F	F21C - 3W LED Recessed wall washer 2inch 4000K to NVC 8113A2 matte gold shield cover or approved equivalent, mounted as shown in the drawing.	nos	19			
G	F22 - 12W LED Recessed spotlight IP65 4000K to NVC NSPLED181W or approved equivalent, mounted as shown in the drawing.	nos	38			
H	F25D - 48W LED Circular luminaire 800mm dia 4000K gold 120° to Demilux Intevision 9063 800c/w necessary accessories or approved equivalent, mounted as shown in the drawing.	nos	5			
I	F38 - 6W LED Wall mounted luminaire 4000K to LUTEC CITY or approved equivalent, mounted as shown in the drawing.	nos	10			
				To Collection:		

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	F39 - 1W LED recessed round Emergency lighting c/w 2hr battery backup to Maxspid Minnie or approved equivalent, mounted as shown in the drawing.	nos.	12			
B	F40 - 2x3W LED Wall mounted emergency lighting c/w 2hr battery backup to Maxspid Minnie or approved equivalent, mounted as shown in the drawing.	nos.	3			
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Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
NRG/E	<u>ELECTRICAL INSTALLATION FOR NON-REPRESENTATIONAL GRADE (BLOCK A)</u>					
[4]	<u>TELEPHONE SYSTEM</u> <u>Telephone Services Installation</u> Supply, install, test and commission telephone system in accordance with the specifications and drawings. All works herein shall be approved TelBru standards. Tenderer shall submit a complete detailed proposal including all equipment offered, catalogues and brochures together with this tender. The equipment and accessories listed below are for tendering purpose. The tenderer is to include all other equipment and accessories not included herein but deemed necessary to the intent of the specifications and requirement. Proposed brands for all the items shall be Dell/Cisco or equivalent. Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.					
A	4c FOC cable run from Fibre Joint Enclosure to FAT at Block A c/w necessary accessories.	m	140			
B	Supply and installation of wall mounted FAT c/w suitable Splitters and other necessary accessories including termination, splicing of cables testing as shown and indicated in the drawing.	lot	1			
C	Supply and installation of wall mounted ATB c/w suitable Splitters and other necessary accessories including termination, splicing of cables testing as shown and indicated in the drawing.	lots	7			
D	Telephone point using 4 pair Cat 6 STP cable in concealed pvc conduit/trunking to outlets as shown and indicated in the drawing. Cost to include RJ45 shutter faceplate outlet, utility boxes, etc inclusive of termination at both ends, testing of Cat 6 cable, etc.	nos	12			
E	2c single mode FO cable in concealed conduit for the interconnection between ATB, FAT etc, c/w termination, FO connectors, and other accessories.	lot	1			
F	<u>Computer Network Installation</u> Termination of telecommunication cable at FAT, ATB, ONT, TB, modem, etc. This include sufficient telephone cable module block, fibre optic termination kits, and label with all necessary accessories, etc.	lot	1			
G	Supply and installation of access point using 4 pair Cat 6 STP cable in concealed pvc conduit/trunking to outlets as shown and indicated in the drawing. Cost to include RJ45 shutter faceplate outlet, utility boxes, etc inclusive of termination at both ends, testing of Cat 6 cable, etc.	nos	6			
H	<u>Telephone & Computer Ducts</u> Allow costs for draw pit of 600 x 600 mm for telephone & fiber cable duct entry to building c/w chequered plate cover, draw rope, 2 way 100 dia uPVC with sealant at both ends as shown in the drawing.	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	Liaison with TelBru or relevant authorities on incoming telephone and fibre optic connection.	lot	1			
To Collection:						
<p><u>COLLECTION</u></p> <p><u>PAGE</u></p> <p>NRG/E4 (Page 1/2) - - - - -</p> <p>NRG/E4 (Page 2/2) - - - - -</p>						
TO NRG/E4 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
NRG/E	<u>ELECTRICAL INSTALLATION FOR NON-REPRESENTATIONAL GRADE (BLOCK A)</u>					
[5]	<u>FIRE ALARM SYSTEM</u> Supply and install Fire Alarm Devices as per specification and drawings. All fire alarm devices shall be Multron or equivalent of approved Bomba Vendors. <u>Self-contained fire alarm devices c/w battery, detector base, etc and other necessary accessories:</u>					
A	Smoke detector <u>Supply and install of fire extinguishers shall be SRI or equivalent.</u>	no	8			
B	2.5 kg ABC dry powder extinguisher	no	6			
C	Fire blanket	no	6			
To Collection:						
	<u>COLLECTION</u>					
	<u>PAGE</u> NRG/E5 (Page 1/1) - - - - -					
TO NRG/E5 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
NRG/E	<u>ELECTRICAL INSTALLATION FOR NON-REPRESENTATIONAL GRADE (BLOCK A)</u>					
[6]	<u>MATV SYSTEM</u> Supply and installation of MATV system as per drawings and specifications. Tenderer shall submit a complete detailed proposal including all equipment offered, catalogues and brochures together with this tender. The equipment and accessories listed below are for tendering purpose. The tenderer is to include all other equipment and accessories not included herein but deemed necessary to the intent of the specifications and requirement. Proposed brands shall be Ikusi/Televes or equivalent.					
	<u>Antennae/Headend, Distribution Equipment and Accessories</u>					
A	RTB Analog and Digital Antennae c/w necessary accessories inclusive steel mounting stand/ supports/ mast.	lot	1			
B	Headend MATV Amplifier c/w necessary accessories	lot	1			
C	Astro 65cm dish w/ Televes Quattro LNBF or equivalent and necessary accessories inclusive steel mounting stand/ supports/ mast.	lot	1			
D	5in, 5out Amplifier to Televes or equivalent	lot	1			
E	5in, 8out/16out Multiswitch to Televes or equivalent	lot	1			
F	IF Tap-Off units to Televes or equivalent	lot	1			
G	Supply and installation for wiring of TV/SAT/FM 2 gang socket outlet by using of 2xRG6 (coaxial) cable in concealed conduit. (Proposed brand shall be of Belden or approved equivalent.)	nos	6			
H	Custom-made metal enclosure with hinged door for installation of amplifier and multiswitch c/w accessories.	nos	1			
I	Combiners, connectors and necessary accessories	lot	1			
J	Installation, termination, testing and commissioning for the whole system	lot	1			
	<u>Conduit and Trunking Works</u>					
K	Allow cost for labelling and marking of all cables, tap -off units and splitters.	lot	1			
L	Supply and install hot dipped galvanised heavy duty cable trunking c/w all necessary supports. Trunking covers shall utilise a quarter turn screw. Trunking for shall be of different colour from lighting , power and other services.	lot	1			
M	Supply and install various lengths of 25Ø/32Ø PVC conduit as per drawing and where necessary cast/concealed in wall/slab.	lot	1			
N	Allow cost for the engineering, design proposal, shop drawing and catalogues for approval.	lot	1			
O	Testing and Commissioning of MATV System	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>COLLECTION</u>					
	<u>PAGE</u>					
	NRG/E6 (Page 1/2) - - - - -					
	NRG/E6 (Page 2/2) - - - - -					
TO NRG/E6 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount		
					\$	c	
NRG/E	<u>ELECTRICAL INSTALLATION FOR NON-REPRESENTATIONAL GRADE (BLOCK A)</u>						
[7]	<u>LIGHTNING PROTECTION SYSTEM</u> Supply, Install, Testing and Commissioning of the following including all necessary termination/fixing accessories as per drawing of Electrical Services and specifications:- Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.						
A	Air termination rod c/w the base. Make: D.E.S approved brand.	nos.	8				
B	25 x 3mm bare copper tape horizontal conductor c/w fixing accessories (saddle screws, square clamp, etc) run on roof level.	m	180				
C	1C x 70mm ² down conductor in 50mm dia. uPVC conduit chased in wall/column. Make: D.E.S approved brand.	m	390				
D	Oblong test joint clamp c/w recessed w/p termination box. Make: D.E.S approved brand.	nos.	8				
E	Earthing pit c/w copperbond earth rod & H.D. cover. Make: D.E.S approved brand.	set	8				
F	Testing and commissioning of lightning protection system.	lot	1				
To Collection:							
<u>COLLECTION</u>							
<u>PAGE</u>							
NRG/E7 (Page 1/1) - - - - -							
TO NRG/E7 SUMMARY:							

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
RG/E	<u>ELECTRICAL INSTALLATION FOR REPRESENTATIONAL GRADE (BLOCK B)</u>					
[1]	<u>SWITCHBOARDS AND LV RETICULATION MAINS</u> <u>Sub-Switchboard / Distribution Boards</u> Supply, install, test and commission factory assembled modular type tested Form 4 construction, front access IP42 (IEC) floor mounted metalclad board and other accessories as detailed in the drawings and specifications. (Cost to be inclusive of termination of all cables, including cable glands, lugs, etc. as per drawings/ specifications). Distribution boards shall be constructed to Form I and IP42, electrical grounding, all necessary accessories as shown in the drawing. . All cable terminals shall be provided with numbered identification ferrules. Cost quoted to be inclusive of termination of all incoming/ outgoing cables including cable gland, lugs, number ferrules, etc. as per drawings/specifications.					
A	SSB-RHB as per drawing	lot	1			
B	DB-BG1 as per drawing	lot	1			
C	DB-BG2 as per drawing	lot	1			
D	DB-BF1 as per drawing	lot	1			
E	DB-BF2 as per drawing	lot	1			
	<u>LV Reticulation Mains</u> Supply and install submain cables as per drawings & specification. Cost of hot dipped galvanised cable ladder, tray, trunking, required as specified shall be included in the pricing of cable. The size of cable ladder/cable tray and containment provided shall be adequate for cable spacings factor as per latest EIR and IEE Regulations. Rates of cable laid underground shall include cost of trench excavation, sand bedding, pipesleeves, protective tile and reinstatement. Rates for cables shall be inclusive of cable identification tags at 10m intervals and at every bend. Cost quoted to be inclusive of termination of all incoming and outgoing cables including cable galnds, lugs, etc as per drawing and specifications. Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.					
F	1x4c/700mm ² XLPE/SWA/PVC cable + 1c/35mm ² CPC laid underground, pipesleeves and cable tray from MSB to SSB-RHB.	lot	1			
G	4x1c/25mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories from SSB-RHB to DB-BG1.	m	20			
H	4x1c/25mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories from SSB-RHB to DB-BG2.	m	20			
I	4x1c/25mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories from SSB-RHB to DB-BF1.	m	30			
J	4x1c/25mm ² PVC cable + 1c/16mm ² CPC laid in trunking c/w necessary accessories from SSB-RHB to DB-BF2.	m	30			
				To Collection:		

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
	<u>Miscellaneous and Related Works</u>					
A	Allow miscellaneous cost for concrete encased pipesleeves of 150mm dia for all road crossing, pipe jacking, hard standing areas, returfing, refurbishment and making good of existing ground.	lot	1			
B	Allow miscellaneous cost for providing floor openings, pipe sleeves through RC beams & slabs, fire stop barrier, fire seal pillows, etc for passage of sub-main cables, lighting and power wiring, telephone & computer system, fire alarm & fire protection system, water services, aircon services and other disciplines.	lot	1			
C	Allow cost for liaison with Authorities regarding power supply application and energization of the system.	lot	1			
To Collection:						
<u>COLLECTION</u>						
<u>PAGE</u>						
RG/E1 (Page 1/2) - - - - -						
RG/E1 (Page 2/2) - - - - -						
TO RG/E1 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount		
					\$	c	
RG/E	<u>ELECTRICAL INSTALLATION FOR REPRESENTATIONAL GRADE (BLOCK B)</u>						
[2]	<u>GENERAL LIGHTING AND POWER SERVICES</u> Supply, installation and termination of light and power point in conduit/trunking as per drawing and specification. Rates for lighting and power point shall be inclusive of providing cable marker sleeved with the circuit number identified. Unless otherwise specified all switch plates and power point switch plate shall be of moulded white plastic range accessories approved by DES. CPC earth cable shall be provided inside back box and terminated with cable connector whether the switch plate is of plastic or of metallic range. Cost quoted to be inclusive of termination of all incoming/ outgoing cables including cable glands, lugs, etc as per drawing and specifications. NOTES: i) all utility boxes for switches, outlets, etc shall be of flush mounted, factory fitted with moulded brass nut and not of self tapping screw type. ii) conduit adapter fitted to boxes for use of switches, outlets, etc shall be with lock nuts and securely tightened. iii) all exposed conduit and flexible conduit inside ceiling voids shall be of color coded. iv) flexible conduit shall be of corrugated polyamide (nylon) flexible conduit and fittings shall be of manufacturer recommended. v) light fittings shall be of factory provided supports and brackets with independent hangers from other installations. vi) SSO switches are to T&J Electric "Radiance" White. <u>Unless otherwise specified Color Code for Service Raceway & Conduits are as follows:</u> - lighting and power - - - - - orange - fire detection - - - - - red - telephone & computer - - - - green - PA system - - - - - yellow - security system - - - - - white - AC & BMS - - - - - blue						
A	Lighting point c/w wiring in PVC conduit using 3x1c/1.5mm ² PVC cable c/w 10A switch plate and gang as per switching arrangement shown in the lighting drawings.	nos	180				
B	Emergency lighting point in PVC conduit using 3x1c/1.5mm ² PVC cable c/w key switch as shown in the drawing.	nos	23				
C	Exhaust fan wiring point in concealed PVC conduit using 3x1c/2.5mm ² PVC cable c/w fused spur outlet similar to MK, Clipsal, Legrand or equivalent next to fan and switch at the door.	nos	20				
D	Power point in concealed PVC conduit using 6 nos 2.5mm ² PVC cable as per single line diagram and terminated with the following outlets priced separately as below.	nos	86				
				To Collection:			

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	Power point in concealed PVC conduit using 3x1c/4mm ² PVC cable as per single line diagram and terminated with the following outlets priced separately as below.	nos.	18			
B	13A single SSO mounted as shown in the drawing similar to MK, Clipsal, T&J white plastic finish or equivalent.	nos	3			
C	13A twin weatherproof SSO mounted as shown in the drawing similar to MK, Clipsal, T&J white plastic finish or equivalent.	nos	6			
D	13A twin SSO mounted as shown in the drawing similar to MK, Clipsal, legrand or equivalent.	nos	77			
E	15A single SSO using 3x1c/4mm ² PVC cable mounted as shown in the drawing similar to MK, Clipsal, T&J white plastic finish or equivalent.	no	18			
F	Cooker SSO w/ neon indicator using 3x1c/6mm ² PVC cable in concealed PVC conduit mounted as shown in the drawing.	no	4			
G	Water heater point in concealed PVC conduit using 3x1c/4mm ² PVC cable c/w connection outlet and flush 20A DP switch and pilot lamp and marked "water heater" similar to MK Logic 5423 WH WHI, Clipsal, T&J or equivalent.	nos	12			
<u>Miscellaneous and Related Works</u>						
H	Allow cost for circuit tagging and labelling of all cables and wiring circuits (incoming/outgoing cables and corresponding DB name) using numeric sleeves or self laminating wrapped around oil resistant nylon cable identification labels to brother, winco, brady, thorpe or approved equivalent. Labels shall apply to but not limited to the following: i) all DB, MSB, SSB, FAP, Tel & Computer, Secuty System, etc ii) socket outlets iii) switches iv) light fittings	lot	1			
To Collection:						
<u>COLLECTION</u>						
<u>PAGE</u> RG/E2 (Page 1/2) - - - - - RG/E2 (Page 2/2) - - - - -						
TO RG/E2 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount		
					\$	c	
RG/E	<u>ELECTRICAL INSTALLATION FOR REPRESENTATIONAL GRADE (BLOCK B)</u>						
[3]	<u>LIGHT FITTINGS AND ACCESSORIES</u>						
	Supply and install DES approved light fittings as specified in the drawings and as indicated below or as per Engineer/SO requirement. All light fittings shall be provided with independent support to the structure and shall not depend to other system.						
	Rates for light fittings shall be inclusive of providing a tape label with the circuit number identified and a strong adhesive used to bond the tape to the fittings. A system guarantee of 3 years by means of factory warranty certificate for all the light fittings.						
	All LED light fittings offered must be of non degradable diffusers. All LEDs in the light fitting offered shall have a minimum lifetime to 70% luminous flux at 50,000 hours and shall be CREE, Nichia, Lumiled LEDs or approved equivalent. A system guarantee of 3 years by means of factory warranty certificate shall be submitted for all LED light fittings. Contractor to ensure LED light fitting offered shall met the design illumination requirement.						
	Emergency packs are to be rated for a minimum of 2 hours duration or as specified and shall be non-maintained type.						
A	F8 - 9W LED surface mounted downlight white 3000K to NVC NLLLED9184M or approved equivalent, mounted as shown in the drawing.	nos	20				
B	F10 - 12W LED recessed downlight 6500K to NVC NDLLLED9314E or approved equivalent, mounted as shown in the drawing.	nos	14				
C	F17 - 18 LED T8 1200mm batten fitting to PHILIPS or approved equivalent, mounted as shown in the drawing.	nos	2				
D	F19B - 8W LED Recessed round downlight 3inch 4000K white shield cover to NVC 8113A or approved equivalent, mounted as shown in the drawing.	nos	60				
E	F21B - 3W LED Recessed downlight 2inch 4000K to NVC 8112D matte white shield cover or approved equivalent, mounted as shown in the drawing.	nos	28				
F	F21C - 3W LED wall washer 2inch 4000K to NVC 8113A2 matte gold shield cover or approved equivalent, mounted as shown in the drawing.	nos	14				
G	F22 - 12W LED Recessed spotlight IP65 4000K to NVC NSPLED181W or approved equivalent, mounted as shown in the drawing.	nos	20				
H	F25D - 48W LED Circular luminaire 800mm dia 4000K gold 120° to Demilux Intevision 9063 800 c/w necessary accessories or approved equivalent, mounted as shown in the drawing.	nos	4				
					To Collection:		

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	F38 - 6W LED Wall mounted luminaire 24° white 4000K to LUTEC CITY or approved equivalent, mounted as shown in the drawing.	nos.	18			
B	F39 - 1W LED Recessed round emergency lighting c/w 2hr battery to Maxspid Minnie or approved equivalent, mounted as shown in the drawing.	nos.	18			
C	F40 - 2x3W LED Wall mounted emergency lighting c/w 2hr battery to Maxspid Minnie or approved equivalent, mounted as shown in the drawing.	nos	5			
To Collection:						
<p><u>COLLECTION</u></p> <p><u>PAGE</u></p> <p>RG/E3 (Page 1/1) - - - - -</p> <p>RG/E3 (Page 1/2) - - - - -</p>						
TO NRG/E3 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
RG/E	<u>ELECTRICAL INSTALLATION FOR REPRESENTATIONAL GRADE (BLOCK B)</u>					
[4]	<u>TELEPHONE SYSTEM</u> <u>Telephone Services Installation</u> Supply, install, test and commission telephone system in accordance with the specifications and drawings. All works herein shall be approved TelBru standards. Tenderer shall submit a complete detailed proposal including all equipment offered, catalogues and brochures together with this tender. The equipment and accessories listed below are for tendering purpose. The tenderer is to include all other equipment and accessories not included herein but deemed necessary to the intent of the specifications and requirement. Proposed brands for all the items shall be Dell/Cisco or equivalent. Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.					
A	4c FOC cable run from Fibre Joint Enclosure to FAT at Block A c/w necessary accessories.	m	100			
B	Supply and installation of wall mounted FAT c/w suitable Splitters and other necessary accessories including termination, splicing of cables testing as shown and indicated in the drawing.	lot	1			
C	Supply and installation of wall mounted ATB c/w suitable Splitters and other necessary accessories including termination, splicing of cables testing as shown and indicated in the drawing.	lots	5			
D	Telephone point using 4 pair Cat 6 STP cable in concealed pvc conduit/trunking to outlets as shown and indicated in the drawing. Cost to include RJ45 shutter faceplate outlet, utility boxes, etc inclusive of termination at both ends, testing of Cat 6 cable, etc.	nos	8			
E	2c single mode FO cable in concealed conduit for the interconnection between ATB, FAT etc, c/w termination, FO connectors, and other accessories.	lot	1			
F	<u>Computer Network Installation</u> Termination of telecommunication cable at FAT, ATB, ONT, TB, modem, etc. This include sufficient telephone cable module black, fibre optic termination kits, and label with all necessary accessories, etc.	lot	1			
G	Supply and installation of access point using 4 pair Cat 6 STP cable in concealed pvc conduit/trunking to outlets as shown and indicated in the drawing. Cost to include RJ45 shutter faceplate outlet, utility boxes, etc inclusive of termination at both ends, testing of Cat 6 cable, etc.	nos	4			
H	<u>Telephone & Computer Ducts</u> Allow costs for draw pit of 600 x 600 mm for telephone & fiber cable duct entry to building c/w chequered plate cover, draw rope, 2 way 100 dia uPVC with sealant at both ends as shown in the drawing.	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	Liaison with TelBru or relevant authorities on incoming telephone and fibre optic connection.	lot	1			
To Collection:						
<u>COLLECTION</u>						
<u>PAGE</u>						
RG/E4 (Page 1/2) - - - - -						
RG/E4 (Page 2/2) - - - - -						
TO RG/E4 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
RG/E	<u>ELECTRICAL INSTALLATION FOR REPRESENTATIONAL GRADE (BLOCK B)</u>					
[5]	<u>FIRE ALARM SYSTEM</u> Supply and install Fire Alarm Devices as per specification and drawings. All fire alarm devices shall be Multron or equivalent of approved Bomba Vendors. <u>Self-contained smoke detector c/w battery, detector base, etc and other necessary accessories:</u>					
A	Smoke detector <u>Supply and install of fire extinguishers (SRI or equivalent)</u>	no	6			
B	2.5 kg ABC dry powder extinguisher	no	4			
C	Fire blanket	no	4			
To Collection:						
<u>COLLECTION</u>						
<u>PAGE</u>						
RG/E5 (Page 1/1) - - - - -						
TO RG/5 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
RG/E	<u>ELECTRICAL INSTALLATION FOR REPRESENTATIONAL GRADE (BLOCK B)</u>					
[6]	<u>MATV SYSTEM</u> Supply and installation of MATV system as per drawings and specifications. Tenderer shall submit a complete detailed system proposal including all equipment offered, catalogues and brochures together with this tender. The equipment and accessories listed below are for tendering purpose. The tenderer is to include all other equipment and accessories not included herein but deemed necessary to the intent of the specifications and requirement. Proposed brands shall be Ikusi/Televes or equivalent.					
	<u>Antennae/Headend, Distribution Equipment and Accessories</u>					
A	RTB Analog and Digital Antennae c/w necessary accessories inclusive steel mounting stand/ supports/ mast.	lot	1			
B	Headend MATV Amplifier c/w necessary accessories	lot	1			
C	Astro 65cm dish w/ Televes Quattro LNBF or equivalent and necessary accessories inclusive steel mounting stand/ supports/ mast.	lot	1			
D	5in, 5out Amplifier to Televes or equivalent	lot	1			
E	5in, 8out/16out Multiswitch to Televes or equivalent	lot	1			
F	IF Tap-Off units to Televes or equivalent	lot	1			
G	Wiring of TV/SAT/FM 2 gang socket outlet by using of 2xRG6 (coaxial) cable in concealed conduit. Proposed brand RG6 cable shall be Belden or equivalent.	nos	6			
H	Custom-made metal enclosure with hinged door for installation of amplifier and multiswitch c/w accessories.	nos	1			
I	Combiners, connectors and necessary accessories	lot	1			
J	Installation, termination, testing and commissioning for the whole system	lot	1			
	<u>Conduit and Trunking Works</u>					
K	Allow cost for labelling and marking of all cables, tap -off units and splitters.	lot	1			
L	Supply and install hot dipped galvanised heavy duty cable trunking c/w all necessary supports. Trunking covers shall utilise a quarter turn screw. Trunking for shall be of different colour from lighting , power and other services.	lot	1			
M	Supply and install various lengths of 25Ø/32Ø PVC conduit as per drawing and where necessary cast/concealed in wall/slab.	lot	1			
N	Allow cost for the engineering, design proposal, shop drawing and catalogues for approval.	lot	1			
O	Testing and Commissioning of MATV System	lot	1			
To Collection:						
	<u>COLLECTION</u>					
	<u>PAGE</u> RG/E6 (Page 1/1) - - - - -					
TO RG/E6 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount		
					\$	c	
RG/E	<u>ELECTRICAL INSTALLATION FOR REPRESENTATIONAL GRADE (BLOCK B)</u>						
[7]	<u>LIGHTNING PROTECTION SYSTEM</u>						
	Supply, Install, Testing and Commissioning of the following including all necessary termination/fixing accessories as per drawing of Electrical Services and specifications:- Bidder is to take note that the estimated quantity in this BOQ is for reference only. Bidder shall make necessary allowances and no additional claims will be allowed.						
A	Air termination rod c/w the base. Make: D.E.S approved brand.	nos.	8				
B	25 x 3mm bare copper tape horizontal conductor c/w fixing accessories (saddle screws, square clamp, etc) run on roof level.	m	180				
C	1C x 70mm ² down conductor in 50mm dia. uPVC conduit chased in wall/column. Make: D.E.S approved brand.	m	390				
D	Oblong test joint clamp c/w recessed w/p termination box. Make: D.E.S approved brand.	nos.	8				
E	Earthing pit c/w copperbond earth rod & H.D. cover. Make: D.E.S approved brand.	set	8				
F	Testing and commissioning of lightning protection system.	lot	1				
To Collection:							
	<u>COLLECTION</u>						
	<u>PAGE</u>						
	RG/E7 (Page 1/1) - - - - -						
TO RG/E7 SUMMARY:							

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
TUC	<u>TESTS UPON COMPLETION</u>					
A	<p>Cost and expenses for the complete acceptance testing and commissioning of the entire M&E Services Installation to the satisfaction of the consulting engineers and authority.</p> <p>A complete testing and commissioning reports and test data shall be provided and documented for submission. Cost shall include all expenses for plant, tools, test instrument and agents, electricity, water, and factory's commissioning expenses for major equipment and relevant authorities inspection fees.</p> <p>The complete system testing and commissioning and documentation shall cover the entire installation under this contract but not limited to the following:</p> <ul style="list-style-type: none"> - Main Switchboard and Control Panels - Air Conditioning System - Exhaust & Ventilation System - Electrical System - Fire Detection & Protection System - Telecommunication System - MATV System - Access Control & CCTV System - Specialist System - and all other works associated with other M&E services installation and works covered in main contract <p><u>Contract Comprehensive Maintenance</u></p>	lot	1			
B	<p>Provide all-in comprehensive and routine maintenance for the whole of Mechanical and Electrical Services Installation covering the twelve (12) months defect liability period or as stipulated in the contract including replacement of wear and tear and consumable parts.</p> <p>The contractor is required to produce record of monthly maintenance log sheets and trend log data of the entire system installation for record and for sign off by client for maintenance works performed.</p> <p><u>Submissions</u></p>	lot	1			
C	<p>Submit design calculations and engineering drawings for major equipments, M&E services shop drawings coordinated with other services for review/ approval.</p>	lot	1			
D	<p>Submit necessary samples for review/ approval and display at site office where appropriate.</p>	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	<p><u>As-Built Drawings and O&M Manual</u></p> <p>Submit six (6) sets of hard copies final as-built record drawings, equipment engineering drawings properly bound in folder files along with soft copies and O&M manual and necessary parts replacements as recommended by manufacturer. Costs shall include spare parts lists of the major equipments, components and consumables.</p> <p><u>List of O&M Manual</u></p> <p>(A) Air -conditioning and Mechanical Ventilaiton (i) Equipment (ii) Pipe work (iii) Duct work (iv) Diffusers, grilles and dampers (B) Fire protection (C) Plumbing (D) Electrical (E) Telecommunication (F) Specialist Services</p> <p><u>Content of O&M Manuals</u></p> <p>a) SOP (normal operation, service, breakdown, emergency) b) Catalogues and technical literature c) Maintenance Schedule and checklist d) As-Built Drawings e) Consumables and spare parts list f) Contact Person in case of emergency g) Coordinanated Drawings /Schematic diagram/ IO list points h) Equipment certificate / calibration certificated / warning i) T&C report document</p>	lot	1			
To Collection:						
<u>COLLECTION</u>						
	<p><u>PAGE</u></p> <p>TUC/1 - - - - -</p> <p>TUC/2 - - - - -</p>					
TO TUC (8B) SUMMARY:						

LIFT SERVICES
(BILL OF QUANTITIES)

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
CH/L	<u>LIFT SERVICES INSTALLATION</u>					
	Supply, installation, testing and commissioning of passenger/fireman's lift as detailed in general specification, schedule of lift technical specification , requirements and finishes, drawings inclusive comprehensive warranty and maintenance for 12 months period.					
	<u>PASSENGER LIFT (SIGMA OR APPROVED EQUAL)</u>					
A	MRL - Motor Room Less Lift 13 persons capacity 885 kg No. of stops: 2 Rated Speed: 1.0m/sec (60mpm) Door opening: 900mm (2 panel centre opening)	lot	1			
B	Emergency battery operated power supply with sealed type lead acid battery bank c/w battery charger and inverter for lift car lighting and ventilation and control (EBOPS).	lot	1			
C	All necessary equipment like COP,HPI/HBT as required. Provision for handicap use shall be included.					
D	Automatic Rescue Device operated power supply with leaded type lead acid battery bank c/w battery charge and inverter for emergency landing and rescue (ARD).	lot	1			
E	Lift supervisory and monitoring panel c/w master intercom and slave intercom at lift car and car machine.	lot	1			
F	Signal, power and control wirings from lift to lift supervisory and monitoring panel.	lot	1			
G	Automatic sump pump with integrated float switch (lift pit). Capacity: 2.5 l/s @ 4.5m(H) similar to Grundfos KP300 stainless steel submersible pump 450W/1ph/50Hz. Cost shall include 50 mm dia PVC piping discharge to nearest drain and piping connection c/w check valve as shown in drawings.	lot	1			
H	Galvanised iron (GI) cat ladder for lift pit	lot	1			
I	Lift Hoist Beams	lot	1			
J	Lift Power Distribution Board (DBS) as required.	lot	1			
K	Power and Lighting Services as shown in drawings for the servicing and maintenance lift and inside lift pits and sump power points.	lot	1			
L	To include the cost for interfacing with Fire Alarm Panel and lift system; i.e. laying of cables within the hoistway, interfacing, programming, testing and commissioning.	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	All finishes like jamb door, hall indicators, wall finishesd, ceiling finished, handrails, floor finishes shall be to S.O. approval. <u>Miscellaneous and Related Works</u>	lot	1			
B	Preparation of 3 sets shop drawings, as-built drawings, operational & maintenance manuals, test reports, "PE" and safe operation certificate and 5 sets of landing door key, 5 sets of COP keys.	lot	1			
C	Permits, notices, fees, etc.	lot	1			
D	Protection of work, etc.	lot	1			
E	Cleaning up, etc.	lot	1			
F	Notices & sign boards, etc.	lot	1			
G	Inspection fees for Bomba's inspection	lot	1			
				To Collection:		
<u>COLLECTION</u>						
<u>PAGE</u>						
	CH/L1 (page 1/2) - - - - -	-	-	-		
	CH/L1 (page 2/2) - - - - -	-	-	-		
TO CH/L1 SUMMARY:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
NRG/L	<u>LIFT SERVICES INSTALLATION</u>					
	Supply, installation, testing and commissioning of passenger/fireman's lift as detailed in general specification, schedule of lift technical specification , requirements and finishes, drawings inclusive comprehensive warranty and maintenance for 12 months period.					
	<u>PASSENGER LIFT (SIGMA OR APPROVED EQUAL)</u>					
A	MRL - Motor Room Less Lift 11 persons capacity 750 kg No. of stops: 4 Rated Speed: 1.0m/sec (60mpm) Door opening: 800mm (2 panel centre opening)	lot	1			
B	Emergency battery operated power supply with sealed type lead acid battery bank c/w battery charger and inverter for lift car lighting and ventilation and control (EBOPS).	lot	1			
C	All necessary equipment like COP,HPI/HBT as required. Provision for handicap use shall be included.					
D	Automatic Rescue Device operated power supply with leaded type lead acid battery bank c/w battery charge and inverter for emergency landing and rescue (ARD).	lot	1			
E	Lift supervisory and monitoring panel c/w master intercom and slave intercom at lift car and car machine.	lot	1			
F	Signal, power and control wirings from lift to lift supervisory and monitoring panel.	lot	1			
G	Automatic sump pump with integrated float switch (lift pit). Capacity: 2.5 l/s @ 4.5m(H) similar to Grundfos KP300 stainless steel submersible pump 450W/1ph/50Hz. Cost shall include 50 mm dia PVC piping discharge to nearest drain and piping connection c/w check valve as shown in drawings.	lot	1			
H	Galvanised iron (GI) cat ladder for lift pit	lot	1			
I	Lift Hoist Beams	lot	1			
J	Lift Power Distribution Board (DBS) as required.	lot	1			
K	Power and Lighting Services as shown in drawings for the servicing and maintenance lift and inside lift pits and sump power points.	lot	1			
L	To include the cost for interfacing with Fire Alarm Panel and lift system; i.e. laying of cables within the hoistway, interfacing, programming, testing and commissioning.	lot	1			
To Collection:						

Item No.	Description	Unit	Qty	Rate	Amount	
					\$	c
A	All finishes like jamb door, hall indicators, wall finishesd, ceiling finished, handrails, floor finishes shall be to S.O. approval. <u>Miscellaneous and Related Works</u>	lot	1			
B	Preparation of 3 sets shop drawings, as-built drawings, operational & maintenance manuals, test reports, "PE" and safe operation certificate and 5 sets of landing door key, 5 sets of COP keys.	lot	1			
C	Permits, notices, fees, etc.	lot	1			
D	Protection of work, etc.	lot	1			
E	Cleaning up, etc.	lot	1			
F	Notices & sign boards, etc.	lot	1			
G	Inspection fees for Bomba's inspection	lot	1			
				To Collection:		
<u>COLLECTION</u>						
<u>PAGE</u>						
	NRG/L2 (page 1/2) - - - - -	-	-	-		
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TO NRG/L2 SUMMARY:						

MECHANICAL AND ELECTRICAL
SERVICES
(SPECIFICATIONS)

AIR CONDITIONING AND
VENTILATION SERVICES
(SPECIFICATIONS)

SPECIFICATION FOR AIRCONDITIONING AND VENTILATION INSTALLATION

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
SECTION 1	Design Information	D/1 - D/1
SECTION 2	General Specifications	GS/1 - GS/3
SECTION 3	DX & VRF Air Conditioning System	DX/1 - DX/12
SECTION 4	Automatic Control System	ACC/1 - ACC/4
SECTION 5	Electrical Requirements	(Refer to Elect'l Specs)
SECTION 6	Thermal & Acoustic Insulation	TA/1 - TA/4
SECTION 7	Noise Control & Vibration Elimination	NVC/1 - NVC/4
SECTION 8	Testing, Balancing & Commissioning	T&C/1 - T&C/6
SECTION 9	<i>Deleted</i>	-
SECTION 10	Ductwork & Air Distribution	DAD/1 - DAD/15
SECTION 11	<i>Deleted</i>	-
SECTION 12	Pipework	PW/1 - PW/9
SECTION 13	<i>Deleted</i>	-
SECTION 14	Service and Maintenance	S&M/1 - S&M/7
SECTION 15	<i>Deleted</i>	-
SECTION 16	Ventilating Fan	V/1 - V/3
SECTION 17	Central Station Air Handling Unit	AHU/1 - AHU/2

SECTION 1 : DESIGN INFORMATION

1.1 General

Design Parameters:

- | | | |
|-----|------------------------------|---------------------------------------|
| (a) | Ambient : | 35°C DB/ 27.7°C WB |
| (b) | Indoor Air-conditioned Areas | 22°C DB \pm 1.0 °C; RH 55% \pm 5% |

SECTION 2 - GENERAL SPECIFICATION

2.1 **Scope**

This section of the Specification gives an overall view of the work to be carried, and Conditions and Regulations to be adhered to.

2.2 **Scope of Work**

The Contractor shall supply, install, commission and test the entire Air Conditioning and Ventilating System in accordance with the Specification and Tender Drawings and the *General Specifications for Air Conditioning Installation, December 1987* published by Department of Electrical Services.

The scope of works is for **Proposed Chancery, High Commissioner's Residence, Staff Residences and Auxiliary Facilities Building for the High Commission of India Brunei Darussalam**, but not limited to the following: furnishing of all labour, materials, drawings, catalogues and manuals, equipment and carrying out the installation, testing and commissioning of the Air Conditioning and Ventilating System.

The Contractor shall prepare all drawings as required by local authorities and include in his tender all costs incurred in submission. All testings required by the authorities shall be arranged by the Contractor and all costs incurred in all the testings shall be borne by the Contractor.

The Contractor shall be responsible for the separate earthing to all the switchboards installed by him.

2.3 **System Description**

2.3.1 *Dx Split and Inverter System*

The *Dx Split and Inverter System* shall be complete with AHU/FCU and its matching air-cooled condensing units and Inverter units, control electrical switchboard, control wiring, power cables, drain pipe, thermometers, pressure gauges, refrigerant pipe, valves and other necessary accessories required for the efficient and satisfactory operation of the entire system.

2.3.2 *Air Handling Units and Air Distribution System*

Furnish, install and commission where indicated on the Tender Drawings or as described in the Specification *Double Skinned Air Handling Units* and air distribution network. Ductwork shall be low pressure type. Noise levels within the air conditioned space shall not exceed the permissible limits recommended by the ASHRAE Standard.

2.3.3 *Ventilation And Exhaust System*

Supply, install and commission where indicated on the Tender Drawings or described in the specification the ventilation and exhaust system. The ventilation system shall provide sufficient fresh air not less than the quantity specified.

2.3.4 *Automatic Control System*

Provide complete automatic control system for the entire air conditioning and ventilating system as per Section 4.

2.4 **Drain**

Provide all drain pipings between relevant mechanical equipment and the adjacent drain points provided by others.

2.5 **Testing**

The Contractor shall perform pressure and performance testing of all equipment, pipework and ductwork forming part of the specified installation in accordance with *General Specifications for Air Conditioning Installations, December 1987* from Department of Electrical Services.

2.6 **Electrical Work**

Provide all electrical works associated with the mechanical installations as indicated in the Tender Drawings or as specified. These comprise switchboards, contactors, fuses; circuit breakers, relays, switchgears, indicating lights, wiring, fittings and equipment necessary for the proper functioning of all mechanical equipment and their control system in accordance with Section 5 herein.

2.7 **Concrete Plinths and Access Ladders**

The Contractor shall provide the miscellaneous incidental work associated with the above.

The extent of work is indicated in general terms on the Tender drawings or mechanical details which form part of this specification. These plans are listed in the Schedule of Drawings.

The Contractor shall ascertain for himself all exact dimensions, positions, heights and sequence of installations during the course of the works, either from the builder or through him from the suppliers of the specialised equipment so that full information and cooperation are obtained prior to the manufacture and installation of the various portions of his contract.

2.8 **Equipment and Materials**

2.8.1 *Locating Equipment*

All equipment within the buildings shall be entirely out of the way of lighting fixtures, doors, windows and other opening.

2.8.2 *Inspections & Tests*

The equipment and materials shall be inspected upon delivery. Equipment and appurtenances shall not be buried, concealed or insulated until they have been inspected, tested and approved.

All equipment, piping and accessories shall withstand the specified maximum test pressure. Tubes shall be plugged to prevent dirt and other unwanted materials from damaging the system.

2.8.3 *Guarantees*

All air conditioning and ventilating system shall be guaranteed by the Contractor for a period of Twelve (12) months from the date of final acceptance, viz. against defective materials and improper workmanship. Any part that fails, or any part of which failure become apparent within the said guarantee period shall be replaced promptly by the Contractor at his own cost.

2.8.4 *Time of Completion*

The Contractor shall complete the whole of the works covered by this specification, excluding defects liability and operational maintenance provisions, on or before the contract date for Practical Completion. The Contractor shall co-ordinate his work with the works of the Builder and shall comply with the Time Schedule prepared by the Builder.

2.9 **Operating and Maintenance Manuals**

The Contractor shall provide three (3) sets of comprehensive operating and maintenance manuals at the time of completion, in accordance with the *General Specifications for Air Conditioning Installation, December 1987* published by Department of Electrical Services.

- END OF SECTION 2 -

SECTION 3 - AIR CONDITIONING SYSTEM (PART 1)

3.0 DIRECT EXPANSION SYSTEM

3.1 Scope

This section of the Specification covers the provision of Direct Expansion Air Conditioning System.

3.2 Scope of Work

The Air Conditioning Nominated Sub-Contractor shall furnish, install, test and commission where shown in the Tender Drawings package direct expansion air conditioning unit in compliance with *General Specifications for Air Conditioning Installations, December 1987* from Department of Electrical Services, Negara Brunei Darussalam, except where otherwise specified.

The unit shall be delivered complete with condensing and fan coil units factory assembled and factory tested and the necessary accessories such as refrigerant filter drier, service valves, oil separator, muffler, solenoid valve, high and low pressure switches, under voltage and phase failure protection to ensure proper and smooth operation of the system.

3.3 Performance

Performance ratings of the unit shall comply with ARI Standard, ARI 210-74. The saturated suction temperature shall be $40 \pm ^\circ\text{F}$ and the saturated condensing temperature shall not exceed 105°F . The tenderer shall provide published performance data from the manufacturer. Where published combination ratings for the condensing units and the fan coil units are not available, system balance diagrams are to be provided, indicating clearly the saturated condensing temperature and saturated suction temperature.

3.4 System Components

3.4.1 Compressor

Reciprocating compressors shall be installed in accordance *General Specifications for Air Conditioning Installations, December 1987* as per DES requirements. Compressor shall be complete with high and low pressure safety switches, oil pressure switch and oil pressure regulating valve. Compressor motor shall have inherent thermal overload and overcurrent protection and be provide with under voltage and single phasing protection. Motors greater than 2 HP shall be 3 phase squirrel cage, totally enclosed type suitable for 415 Volt AC, 50Hz operation. Each motor shall have a rating of not less than 125% of the rated equipment brake horsepower, inherent overcurrent and shall be permanently lubricated. Motor winding shall have Class F insulation.

3.4.2 Air Cooled Condenser - General

Installation and selection of all air cooled condensers is to comply with *General Specifications for Air Conditioning Installations, December 1987* as per DES requirements.

The condenser shall be:-

- a) standard product of a well-known make.
- b) outdoor, low profile, heavy duty type and weather proof.
- c) complete with condenser coil, condenser fan, motor drives, moisture indicating glass, integral sub cooler and holding charge or refrigerant R-22.
- d) tested and rated in accordance with BS1586.

Condensing coil shall be constructed from seamless copper tubes and may either have copper or aluminium fins mechanically bonded to copper tubes with a maximum of 10 fins/inch. Coil shall be circuited for sub-cooling. The condenser shall be fitted with approved make propeller fans of ample capacity to provide the necessary air flow over the condensing coil arranged for vertical discharge. Fans shall be multi-blades type arranged so that the rotors may be removed from the unit without removing the casing and fan guards shall be provided for each fan. Fans shall be quiet in operation with tip speeds not exceeding 5,000 fpm. Fan bearing shall be ball or roller bearings rigidly mounted. Fan speed shall not exceed 1,000 rpm.

3.4.3 Evaporator Unit

Evaporator unit shall be complete with blower fan and cooling coil. Cooling coil shall be of direct expansion type complete with thermostatic expansion valve; constructed of seamless copper tubes of 1/2 in outside diameter mechanically expanded into the corrugated aluminium fins; designed and tested in accordance with the American National Standards Safety Code for Mechanical Refrigeration (ANS B9.1).

Fan shall be centrifugal type; have quiet operation; dynamically and statically balanced; of double width; designed for continuous operation at the maximum rated fan speed and motor horsepower. Fan shaft shall be solid steel, turned, ground and polished. Bearings shall be self-aligning and be provided with grease line extending to the drive side of the fan scroll.

Fan motor shall be totally enclosed fan cooled type and be provided with inherent thermal overload and overcurrent protection; class B insulation windings; power factor correction capacitor to achieve a minimum power factor of 0.85 operating at all load conditions; under voltage and single phasing protection; starter in accordance with DES requirements. Fan motor shall have sufficient capacity of not less than 20 per cent more than the fan brake-horse-power at design condition.

Condensate drain pain with 'Armaflex' type of insulation of thickness not less than 5/8 in thick shall be provided on each cooling coil.

3.5 Refrigerant Circuits

3.5.1 General

The refrigerant circuits, shall be designed and arranged in accordance with ASHRAE Standard and manufacturer's recommendation.

3.5.2 Design and Layout

The Nominated Sub-Contractor shall adhere to the circuit design, layout and pipe sizes as given in the drawings. A working layout drawing of the piping for the actual installation shall be prepared and submitted for the Engineer's approval, before installation of the pipes. Where pipe sizes differ from the Manufacturer's recommendation, the Air-Conditioning Nominated Sub-Contractor shall indicated clearly in his shop drawings.

The Nominated Sub-Contractor shall provide multiple independent refrigerant circuits for multiple (two or more) compressors system for easy part load and independent operations.

3.5.3 Suction Lines

3.5.3.1 General

Horizontal lines shall not be graded, but where a suction trap or suction line oil separator is provided, the suction line to the trap or oil separator shall have a grade of not less than 1/2 inch in 10 feet.

Suction piping shall be designed to give flexibility and to absorb the vibration from the compressors. Vibration shall not be transmitted to the building structure. At least three changes in direction shall be employed to achieve flexibility.

3.5.3.2 Suction Risers

Install double suction risers where load reduction affects the oil return or when multiple compressors are interconnected and controlled so that one or more may shut down while another continues to operate.

All vertical risers shall be sized for velocities that assure oil return at minimum load and total suction pressure drop shall be within practical limits and shall not reduce the cooling capacity required at design full load conditions.

3.5.4 Piping

a) Materials

Piping shall be Air Conditioning and Refrigeration (ACR) seamless copper tube as per BS 1306 - "Copper and Copper Alloy Pressure Piping System" and BS 2871 Part 2 and ANSI B9.1-1971 'Safety Code for Mechanical Refrigeration' Clause 9.3.

The wall thickness of copper tubes shall not be less than the thickness given in the following tables.

Outside Diameter (in)	Nominal Tube Size (in)	Type	Wall Thickness (in)
¼	c	Soft 'K'	0.030
d	¼	Soft 'K'	0.035
½	d	Soft 'K'	0.049
e	½	Soft 'K'	0.049
¾	e	Hard	0.042
f	¾	Hard	0.045
1 c	1	Hard	0.050
1 d	1 ¼	Hard	0.055
1 e	1 ½	Hard	0.060
2 c	2	Hard	0.070
2 e	2 ½	Hard	0.080
3 c	3	Hard	0.090
3 e	3 ½	Hard	0.100
4 c	4	Hard	0.110
5 c	5	Hard	0.125

Type K shall be used for high pressure piping and Type L for 'Low side' piping. All buried underground piping shall be type 'K' hard drawn.

Tubes shall be supplied sealed and shall remain sealed from manufactured to installation.

b) Pipe Joints

Pipe joints shall of the following types :-

i) Brazed (Capillary) Joints

Joints shall be of the socket type in which the joint is made by the flow of brazing alloy by capillary action along the annular space between the two mating surfaces. Joints shall be made by either forming a socket in the end of one of the pipes to be joined or by use of a capillary fitting complying with Clause 3.6.6 (c). Forming a socket in the end of the pipes shall be done by heating and by use of approved forming tools. Joints made by bellng the end of one of the tubes to be joined are not acceptable.

The brazing alloy shall be of the silver-copper-phosphorus type containing not less than 15% silver. Tubes to be jointed shall be cut so that the ends are perfectly square. There shall be no gaps left through which alloy can run into the line.

If possible, a pipe cutter shall be used. If a hack saw must be used, it shall always be guided with a mitre box to ensure a square even cut. Tubing shall be reamed to remove burr, being careful not to expand tubing while reaming. The mating surfaces where brazing alloy will be applied should be burnished until all dirt and oxide are removed.

Fine crocus cloth or fitting brushes especially made for this type of work shall be used. Inaccessible internal surfaces shall be cleaned with white spirit. Mating tubes shall overlap for a sufficient length to ensure that the joint will develop a strength equivalent the strength of the tube. The diametral clearance in the joint shall be approximately 0.005 inch to 0.010 inch.

Dry nitrogen shall be used to purge all air from the tubes before brazing. During the brazing process, a flow of nitrogen shall be maintained through the tubes to prevent oxidation. The nitrogen flow shall be kept to a minimum consistent with the making of a food clean joint free of oxidation on the internal tube surface.

ii) Flare Compression Joints

Flare compression fittings may be used for tubes up to and including 3/4 inch O.D. Tubes shall be fully annealed at the flare before and after flaring and shall seal without being strained.

Fittings shall comply with BSS 2051 Part 2, "Tube and Pipe Fittings for Engineering Purposes" and shall be of copper or copper alloy. They shall be of a type which maintains the full bore of the pipe. "Frost Proof" nuts shall be used. Flare fittings shall not be used where vibration occurs, or in positions where the piping is built-in or inaccessible.

c) Tube Fittings

i) Brazed (Capillary) Fittings

These fittings include bends, tees, sockets and the like which are of the type in which the joint is made to the tube by the flow of brazing alloy by capillary action along the annular space between the outside of the tube and the inside of the socket fitting.

Fittings shall be of copper of suitable corrosion resisting copper alloy, shall be of approved manufacture and shall be suitable for use in refrigeration piping. Fittings may be supplied with or without a groove containing silver brazing alloy.

The socket of each fitting shall be a close fit on the tube to which it is to be connected with a clearance in the annular space of approximately 0.005 inch to 0.019 inch and the length of the socket shall be such that the finished joints will develop sufficient strength for the service required.

d) Bends

For 90° bends, tubes up to and including ¾ inch O.D. may be bent to shape. Above ¾ inch O.D. bent tubes will be accepted and bend fittings complying with Clause 3.6.6 (c) shall be used. Bends shall be of long radius unless space limitations prevent their use, in which case, short radius may be used. The bending of tubes shall be carried out in an approved manner and care shall be taken to prevent malformation or damage to the structure of the materials. The inside radius of bent tubes shall not be less than two times the tube diameter.

Valves shall be of the packed back seating, key operated type fitted with suitable screwed sealing caps. Valves shall be forged brass construction where possible but cast iron or steel or cast brass valves may be approved. Precautions shall be taken to prevent valve distortion whilst the joint is being heated. Valves for pipes less than ¾ inch O.D. may be connected to tube by approved compression fittings, provided there is no vibration at the fittings. Valves for pipes over ¾ inch O.D. shall be capillary soldered connections.

3.5.5 Thermostatic Expansion Valves

Each thermostatic expansion valve shall be of diaphragm type fitted with an external equaliser bulb and tubing and adjustable external superheat control with seal cap. Thermostatic expansion valves shall have flare connections. The equaliser line shall be connected into the suction line adjacent to and on the compressor side of the remote sensing bulb. Connections to horizontal lines shall be made from the top to prevent oil logging.

The valve shall be tested and rated in accordance with BS 4740 Part1. Each expansion valve or its working parts shall be easily removable for cleaning. All adjusting screws etc., shall be fitted with sealing caps. A small easily removable strainer shall be incorporated in each expansion valve. Each expansion valve shall be individually adjusted to give minimum superheat at each coil suction header consistent with "dry gas" being delivered to the compressor. The thermal bulb shall be clamped securely to the suction pipe as recommended by the valve manufacturer to ensure intimate contact and rapid response.

3.5.6 Refrigerant Filter Drier

An angle-replaceable core type filter drier shall be installed in each liquid line. The filter drier shall be installed in each liquid line. The filter drier shall be sized for a maximum of 2 psi pressure drop at the design conditions. Filter drier shall have flare connections. After the system has been operating for one month, the filter drier core shall be discarded and shall be replaced by a new filter drier core.

3.5.7 Compressor Safety Controls

Each compressor shall be fitted with a combined high and low pressure safety cutout switch with manual re-set on both high and low side.

The high discharge pressure and low suction pressure cutout shall be connected to the compressor side of the isolating valves.

3.5.8 Refrigerant

Refer to *General Specifications for Air Conditioning Installations, December 1987*.

Pressure Testing will be carried out in compliance with *General Specifications for Air Conditioning Installations, December 1987*.

a) Initial Pressure Test

Upon completion of erection, the refrigeration circuit, except for pressure gauges, controls, and compressors, which may be valved off, shall be pressure tested with dry inert gas at the following pressures for the particular refrigerant to be used.

Refrigerant	Test Pressure	
	High Pressure Side	Low Pressure Side
R - 12	235 psig	140 psig
R - 22	435 psig	230 psig

A quantity of refrigerant should be added to the test gas to enable any leakage to be easily detected with a halide torch or electronic leak detector. If refrigerant is not added to the test gas, all joints, flanges and the line shall be tested for leaks with a mixture of four parts water, one part liquid soap and a small amount of glycerine, the mixture to be applied with a brush.

b) Repair of Leaks

Where leaks are detected, they shall be marked and repaired after the pressure of the system has been released. Brazed joints which leak shall be opened and re-made and shall not be repaired by the addition of silver brazing alloy to the joints. Component parts leaking from porosity shall be replaced.

c) Final Pressure Test

After all leaks have been repaired, the system shall be re-tested, with the test pressure maintained for a period of not less than 8 hours. No measurable drop in pressure should be detected after pressure measurements have been adjusted for temperature changes.

3.6 Installation and Erection of Refrigerant Systems

3.6.1 Piping Arrangement and Sizes

When final working drawings have been prepared by the Nominated Sub-Contractor and approval of the drawings has been received in writing from the Engineer, all work shall be in accordance with these drawings. Where the Engineer has arranged for modifications to the drawings, the modified drawings shall be adhered to without alteration.

3.6.2 Sealing of Tubes

Tube ends shall be plugged or kept closed at all times before installation and where practical; during construction, to prevent ingress of moisture and foreign matter.

3.6.3 Cleaning & Grading

Particular attention shall be paid to removing all dirt and foreign matter including flux, swarf and turnings from tubing and to keeping it dry.

Tubing shall be arranged in a workmanlike manner, true to alignment and grade - crooked or sagging tubing will not be accepted.

3.7 Condensate Drains

The insulation to be used on all condensate drain piping shall be chemically blown P.V.C. nitrile black-coloured rubber sponge type of material having a thermal conductivity not greater than 0.30 BTU/Hr/Sq.Ft/in/°F at a mean temperature of 75°F. It shall be supplied in tubular form, preferably without a longitudinal joint. The insulation shall be 1/2"-inch thick unless otherwise specified.

SECTION 3 - AIR CONDITIONING (PART 2)

3.8 VARIABLE REFRIGERANT FLOW

3.8.0 General Description of Works

The air-conditioning system shall exhibit 'Capacity Control' operating features providing very efficient energy conservation and maximum comfort to the users.

The system shall be air-cooled, variable refrigerant flow system consisting of modular outdoor units and multiple indoor units, each having capability to cool or heat at a time and serving the different requirements of the rooms and users.

The system shall be equipped with variable refrigerant flow controller, enabling to control the smallest indoor unit of 2.2 kW alone and the largest indoor unit of 28.0kW alone, without the aid of the hot gas by-pass system or variable air volume system.

The air-conditioning system of a particular zone shall automatically adapt to the number of fan coil units turned on by the room tenants. The system shall allow user-driven operating environment to be established where users can directly request their own choice of temperature, on / off, etc.

The condensing units shall be suitable for mix-match connection of 1-way air discharge cassette type, 2-way air discharge cassette type, 4-way air discharge cassette type, 4-way air discharge compact type,

, concealed ducted standard type, concealed duct high static pressure type, concealed duct slim type, under ceiling type, high wall type, floor standing cabinet type, floor standing concealed type, floor standing tall type and fresh air intake indoor unit type indoor units as shown in the drawing.

The condensing units shall be able to connect to a maximum of 13 indoor units for 8-HP system and 48 indoor units for the 48-HP system that is subjected to the maximum of 135% connectable outdoor / indoor capacity ratio.

The actual refrigerant piping length shall be extended up to 190 m (one way), and the equivalent refrigerant piping length shall be up to 235 m. The equivalent length of farthest piping from the 1st branch shall be 90m. When the outdoor unit is installed higher than the indoor unit, the vertical lift shall be up to 70 m, and when the outdoor unit is installed lower than the indoor unit, the vertical lift shall be up to 40m at the maximum case. The level difference between the indoor units shall be up to 40 m. Any oil traps shall not be required for the refrigerant piping system.

The piping branching flexibility shall be applicable any of Y-joint branching, header joint branching, header branching after Y branching, Y branching after header branching, header branching after header branching.

The system shall be suitable for operating on 230 (220-240) Volts / 50 Hz / 1 phase for fan coil unit and 400 (380-415) Volts /50Hz /3 phase for the condensing unit.

3.8.1 **REFRIGERANT**

The equipment shall run HFC refrigerant R410A , not on CFC or HCFC refrigerant.

3.8.2 **AIR COOLED CONDENSING UNIT**

The condensing unit shall be a factory-assembled unit consisting of individual compressor-condenser section and condenser fan housed in a sturdy weatherproof casing constructed from galvanized steel bonderised and finish with baked resin paint.

The chassis dimension is standardized as two type modular chassis with small capacity models and large capacity models. But the anchor bolt pitch is same as both models and previous model(SMMS). Therefore the chassis is for easier installation layout and easier handling in stock,moving.

Panel shall be easily removable to provide access for servicing. The condensing unit shall be fitted with its own electrical compartment with all necessary electrical and control components.

The condensing unit shall be designed to operate safely when connected to multiple fan coil units, which have a combined operating nominal capacity varying from 50 % to 135 % of indoor units. However, the actual system capacity shall increase up to maximum 110 % against outdoor cool capacity when outdoor / indoor cooling capacity ration of 135%.

The noise level for each unit shall not be more than 55 dBA (8HP single),57dBA(10HPsingle),59dBA(12HPsingle),60dBA(14HPsingle),61dBA(16HPsingle)and 66dBA (48HP 4 modular system) for system in cooling, which is, measured horizontally 1 m away and 1 m above ground at the standard conditions.

The condensing unit shall be modular in design and should be allowed for side by side installation with provision for piping connection at the front or at the bottom.

3.8.3 **COMPRESSOR**

The compressor shall be a highly efficient hermetic type DC twin rotary inverter compressor system of two(8 to 12HP)/three(14 to 16HP) independent system in a condensing unit ,which can control capacity seamlessly, also enables rotation operation of the two/three in the condenser unit for higher reliability by reducing imbalance in operating hours and start-up times of the two/three.

It shall be equipped with vector controlled inverter unit for both/triple compressors together with electronic expansion valve in the refrigerant circuit to precisely control the refrigerant volume and maintain comfort level in accordance to the room load requirement.

And it also has ultra-precise 0.1 Hz control over compressors rotation speed. Infinity variable control adjusts compressor rotation speed in near-seamless 0.1 Hz steps. Responding precisely to the capacity needs of the moment, this fine control minimizes energy loss when changing frequencies, and also creates a comfortable environment subject to minimal temperature variations.

3.8.4 **CONDENSER COIL**

The condenser coil shall be constructed with copper tubes mechanically bonded to aluminum fins. The condenser shall have large face area to minimize noise give a high COP for heat transfer. The sub-cool heat exchanger is equipped with the main heat exchanger for higher COP .The condensing unit shall be chemically coated with fins.

3.8.5 **CONDENSER FAN AND MOTOR**

The Condenser fan shall be of multi-blade low noise level type and dynamically and statically balanced for minimum noise and vibration with recessed circular arc shape blade to reduce turbulence at blade end edge for higher fan efficiency.

The condenser fan shall be directly coupled and driven by drip proof permanently lubricated DC motor. The condenser fan and motor shall be able correspond to the heat load changes by stepping up or down according to the load requirements.

3.8.6 **REFRIGERANT CIRCUIT**

The refrigerant circuit shall include an accumulator, liquid tank, oil separator, oil tank, liquid, and gas shut off valves, solenoid valves and an electronic expansion valve. All necessary safety devices should provided to ensure the safety operation of the system.

3.8.7 **ACCUMULATOR**

The cylindrical accumulator shall be constructed from mild steel plates pressed into shape. The accumulator shall have sufficient capacity to prevent any liquid refrigerant from flowing back into the compressor suction.

3.8.9 **SAFETY DEVICES**

The following safety devices shall be part of the condensing unit:

- High pressure switch
- Fuses
- Crankcase heater
- Fusible plug
- Over current relay for the compressor
- Thermal protectors for compressor and fan motor
- Recycling guard timer
- Oil Recovery system
- Oil level sensor
- Over-current sensor
- Compressor suction and discharge temperature sensor
- Compressor suction and discharge pressure sensor

3.8.10 **PRESSURE TESTING**

Upon completion of installation, the entire refrigerant circuit shall be subject to a pressure test of 3.73MPa(38kg / cm²)for at least 24 hours without any drop in pressure. Nitrogen gas shall be used in pressure testing.

3.8.11 **OIL MANAGEMENT SYSTEM**

Unit shall be equipped with oil management system to ensure stable operation with long refrigerant tubing.

The system shall contain self oil balance circuit , oil supply control, inter-unit oil supply control with the aid of oil level detection.

The oil retrieval control through the indoor units is also conducted.

3.8.12 **FAN COIL UNITS**

Each fan coil unit shall be of 1-way air discharge cassette type, 2-way air discharge cassette type, 4-way air discharge cassette type, 4-way air discharge compact cassette type, concealed ducted standard type, concealed duct high static pressure type, concealed duct slim type, under ceiling type, high wall type, floor standing cabinet type, floor standing concealed type, floor standing tall type and fresh air intake indoor unit type indoor units.

Each fan coil unit shall be connectable with a self-diagnosis remote controller and having the features of setting of the room temperature (with digital indicator of room temperature), timer, air discharge direction (for cassette units, ceiling unit, high wall unit), auto and 3 fan speed selection self diagnosis circuit with malfunction code display.

The ceiling recessed type fan coil units must be equipped with condensate drain- pump.

3.8.13 **COOLING COIL**

The coil shall be constructed from strong clean copper tubes bonded to aluminum fins suitably spaced to ensure maximum heat transfer. The inlet of the coil shall be exceptional low to ensure quiet operation.

3.8.14 **ELECTRONIC REFRIGERANT CONTROL VALVE**

An electronic expansion valve shall be factory brazed to the inlet of the coil. It shall modulate the refrigerant volume continuously in respond to load variations of the room. Thus, maintain a precise constant temperature of ± 0.5 C.

3.8.15 **EVAPORATOR FAN**

The evaporator fan shall be of the multi-blade type with its performance designed to match the coil performance. The fan shall be statically and dynamically balanced to ensure low noise and vibration operations. It shall be driven by a permanently lubricated motor and shall operate on 220 -240 volts single phase 50 Hz.

3.8.16 **CONTROL**

The system shall be microprocessor controlled to achieve precise room temperature control and minimum power consumption. The controls system shall employ algorithm temperature control and shall have an accuracy of ± 0.5 C.

The control system should connected by using 2-core cable with non-polarity BUS transmission system (outdoor-outdoor, outdoor-indoor.)

In addition, the checking function for connection error of wiring must come standard with the system.

Micro-processor control shall be used to maintain a correct room temperature with minimum power consumption. Unit shall be equipped with automatic fan speed and its own 3 speed fan controller, thermostat, LCD indicators.

It also is equipped with a self- diagnosis circuit for easy and quick maintenance and service. It shall also be able to indicate malfunction code displays.

3.8.17 **CENTRAL REMOTE CONTROLLER SYSTEM**

A centralized control system shall consist of a Central Remote Controller and a Schedule Timer. They shall be provided to control all the functions of the indoor units either together as a central control system or individually as specified.

The function of each controller should be follows:

3.8.18 **CENTRAL REMOTE CONTROL**

It should be able to control up to 128 indoor units with two buses . It can separate into maximum 16 zones; moreover, each zone can be controlled individually.

It should be able to function as follows.

- a) Temperature setting for each Fan Coil Unit of group or zone
- b) Air Flow setting for each Fan Coil Unit of group or zone
- c) Fault indication of each Fan Coil Unit of group
- d) It should be able to ON / OF each individual or zone
- e) It should also have the function to ON or OFF the entire system
- f) Remote controller less system is available
- g) Alarm indicator and external operation output are available (no-voltage dry contact)
- h) Maximum wiring length of two kilometer.

3.8.19 **SCHEDULE TIMER**

The timer should be able to connected to each central remote controller or each remote controller. It should have the following functions as schedule timer mode :

- a) 6 programming per day
- b) Enabling 8 groups to be programmed
- c) A maximum of 64 indoor units can be controlled
- d) A maximum of 100 hours back-up power supply

3.8.20 **SOFT START**

All condensing units shall be soft-start at to ensure low starting current.

The rotary compressor shall be to start at the minimum load and increased to the required power (refrigerant volume) according to the actual load requirement, without large star-up current during switching into two compressor operation.

A recycling guard timer shall be provided to prevent the compressor to restart again immediately after it was stopped.

3.8.21 **AIR FILTER**

Resin net (washable) type air filter shall be provided for under ceiling type, hi-wall type and floor standing type fan coil units.

Long life type air filter shall be provided for cassette type fan coil units. The return air filter shall be of approved low velocity cleanable type with the material having the following characteristics:-

- a) Odorless
- b) Temperature resistant up to a continuous of 85 degree C
- c) Humidity resistant up to a continuous RH of 95 %

The filter shall be supported in a resin filter frame. The thickness of the filter shall be such that it possess as an efficiency rating of 15 % (AFI) as measured by the atmospheric dust spot test in accordance with JIS B-9908.

The air filter shall have a minimum effective life of 2500 hours.

3.8.22 **REFRIGERANT PIPING**

All refrigerant piping for the air conditioning system shall be constructed from hard drawn seamless copper refrigerant pipes with copper fittings and silver-soldered joints. The refrigerant piping arrangements shall be in accordance with good practice within the air conditioning industry, and are to include expansion valves, solenoid valves, shut off valves, strainers, charging connections, suction line insulation and all other items normally forming part of proper refrigerant circuits.

The air-conditioning contractor will entirely responsible for the correct refrigerant piping design and the proper interconnections of the complete refrigerant circuit.

The suction line pipe size and the liquid line pipe size shall be selected according to the manufacturer's specified outer diameter. All refrigerant pipes shall be properly supported and anchored to the building structure using steel hangers, anchors, brackets and supports which shall be fixed to the building structure by means of inserts or expansion shields of adequate size and number to support the load imposed thereon.

Additional charge of refrigerant for the piping way of the air conditioning system shall be furnished and installed by the air conditioning contractor on site.

3.8.23 **PIPE INSULATION**

- a. Refrigerant Pipe Insulation

The whole of the liquid and suction refrigerant lines including all fittings, valves etc. shall be insulated with foamed polyethylene of an adequate thickness.

- b. Drain Pipe Insulation

Drain pipes carrying condensate water shall be insulated with foamed polyethylene of an adequate thickness

- END OF SECTION 3 -

SECTION 4 - AUTOMATIC CONTROL SYSTEM

4.1 Scope

This section of the Specification covers the provision, commissioning and testing of automatic control systems for the Air-Conditioning and Ventilating Systems. All installation shall be carried out in accordance with *General Specifications for Air Conditioning Installation, December 1987* published by Department of Electrical Services. It also covers items of instrumentation used.

4.2 General

- a) The Contractor shall engineer, supply and install all automatic control systems inclusive of all labour, material and equipment in accordance with the Specification.
- b) All controls, except those supplied as 'Original Equipment' by the equipment manufacturer, shall be the standard product of one reputable control manufacturer.
- c) All controls shall be of the same manufacture. Where this is not practicable, proposed controls not of the same manufacture as the majority of controls shall be approved by the Engineer prior to installation. Any such alternative controls installed without prior approval of the Engineer may be rejected and required to be replaced without cost to the Employer.
- d) All automatic controls shall be installed, set and commissioned by personnel fully trained and experienced in this field and such personnel shall preferably be employees or representative of the control equipment manufacturer.
- e) The automatic control systems shall be complete, including all necessary thermostats, relays, manual switches, controllers, control valves, actuators, dampers, damper motor, auxiliary contacts, thermal overloads, piping, wiring and all auxiliary items necessary to perform the intended operation as specified irrespective of failure to mention in the Specifications or to show on the drawings each individual item.
- f) Submit shop drawings for examination showing schematic and wiring diagrams and components for all control systems.
- g) All electrical components of the automatic control system shall have the approval of all authorities, including DES, having jurisdiction over the works.
- h) All motors, controllers, relays and operating mechanism shall be so located as to be readily accessible for maintenance. Supply and install access doors for this purpose.
- i) Equipment will not be accepted without identifying name plate or stencil.
- j) The Contractor shall be responsible for the correct setting, calibration and adjustment to conform with the design conditions as specified. All calibrations for the controllers shall be carried out by the manufacturer's representative.
- k) All controls as manufactured by Honeywell, or approved equal shall be installed in strict accordance with the manufacturer's instructions and fully automatic in operation.
- l) The Contractor shall train the Employer's representatives in the proper operation and maintenance of the system. He shall furnish to the Employer's operating personnel 5 days of on-the-job training or longer period when necessary and turn over to the Employer two complete sets of written operating instructions, as-built drawings, specification data sheets and maintenance schedules. Furnish another set of the same to the Engineer.

4.3 **Coordination of Work**

Setting and commissioning of the Automatic System control shall be done in conjunction with testing and balancing of the Air-Conditioning and Ventilation System. Personnels engaged in these functions shall be required to coordinate their work. The Contractor shall be responsible for ensuring the coordination of these operations.

4.4 **Labels**

All controls shall be provided with ivorine labels engraved to indicate the function of the particular item. Labels shall be of minimum height ½ in. and shall be black with ¼ in. white lettering. The use of metal embossed tapes will NOT be permitted. Labels shall be fixed with approved steel escutcheon pins. Fixing by adhesives will NOT be accepted.

4.5 **Local Panels**

Provide local start-stop switches for all air-conditioning and ventilating equipment. Local panel shall be constructed of gal. steel of minimum thickness 14 BSWG. It shall be secured to walls, columns or floors with ample clearance at the rear for access to piping and wiring. Identify each piece of panel by name-plates, either plastic or metal and attach to the panel or integral with it. Cut lettering into the plate to a depth of not less than 1/64 inch and produce a contrasting colour. Painting of lettering directly on the surfaces of the plate or panel will not be permitted. Mount all control devices, relays and switches other than thermostats and motors on the control panel.

4.6 **Shop Drawings**

Include complete schematic control diagrams. Diagrams shall show a large scale outline of each air handling unit, chiller control circuit, cooling tower control circuit, pump control circuit and other auxiliary control circuit with control devices correctly located thereon and piping and wiring shown. Item numbers shall correspond with those shown on the drawings. Frame on set corrected control diagrams under glass and mount where directed.

4.11 **Automatic Controls**

4.11.1 **General**

The automatic control system shall be of electronic and/or microprocessor-based type, as per *General Specifications for Air Conditioning Installation, December 1987* published by Department of Electrical Services.

All controllers for modulating functions shall be of proportional integral (PI) action type unless specified otherwise.

4.11.2 **Room Temperature Controller (Room Thermostat)**

The room type temperature controller for air handling units shall be proportional integral (PI) type with a control output of 2-10 volts. Installation of the thermostat should be in accordance with *General Specifications for Air Conditioning Installation, December 1987* published by Department of Electrical Services.

4.11.3 **Temperature Sensors**

All temperature sensors used in conjunction with controllers shall be of Platinum RTD type with an internal resistance of 2,000 ohms.

Water temperature detector shall be of the Platinum RTD type and shall be complete with integral copper pocket for pipe mounting.

4.11.4 **Low Voltage System**

- a) All controllers and actuators shall be of the low voltage type and shall operate on 24 volts, 50 Hertz and single phase.
- b) The low voltage supply shall be limited to one transformer for a maximum of 3 motors of single transformer for each motor. The transformer shall be supplied by the controller's manufacturer.

4.11.5 **Electronic controllers (Single, Dual or 3 input)**

Controllers shall be of the electronic type; modular in form and module cassette system and shall be mounted in lockable casing with transparent cover controllers mounted in steel cubicles; suitable for standard dia-rail mounting; accept input signals of the thermistor type and shall have output of 2-10 volts; have built-in energy-saving designs; of P.I. type. Each controller shall have single or multiple outputs for sequencing of motors and shall be equipped with high and low limit travels, high and low limit temperature settings.

4.12 **Control Wiring**

Control wiring shall be run in galvanised steel conduit for thin-wall metal tube galvanised. Provide all wiring to perform the function specified. Power supply wiring for all electronic panels shall be not less than 0.0045 inch in diameter. They shall be run directly from the respective main air conditioning switch board or form an auxiliary distribution panel and the shielded cables shall be connected to the earth of the main building service panel. In no case the power supply neutral wire be used for earthing connection.

4.17 **Relays**

Relays shall be of open-contact type, mercury-tube type or electronic type and they shall be totally enclosed in steel cabinets with conduit connections. Their capabilities shall be as specified for thermostats.

4.18 **Contact**

Contact shall be of fine silver or other approved non-rusting metal and, if they carry the current of a running valve motor or a running damper motor, or if they start motor driven machines, they shall be snap acting which shall be accomplished by springs or magnets.

4.20 **Test Switch for Indicating Light**

Provide a push-to-make switch to test the condition of the bulbs of the indicating lights.

4.21 **Operation of Air Handling Systems in Fire Situation**

Under a fire alarm situation, various air handling systems shall be automatically cut off by the tripping function of the smoke detector installed in the return air duct or in the air handling unit room or in a place approved by the Fire Authority. Manual starting and stopping of all fans for the air conditioning and ventilation systems will be effected when required by the Fire Brigade.

Supply air fan(s) of the system(s) in which the smoke detectors have operated shall be stopped automatically upon receiving a fire alarm signal. The system(s) shall return to normal operation only when clearance and permission have been given by the Fire Brigade Officer from the Fire Authority Brunei Darussalam.

4.23 **Starting and Stopping**

4.23.1 **General**

All systems and equipment unless specified otherwise shall be started either manually or under a programme timer switch. In addition, each motor-driven item of equipment shall be provided with a key-operated rotary four-position control switch labelled "AUTO-OFF-MANUAL" mounted in the Electrical Switchboard, to permit manual or automatic start-stop operation.

4.23.2 **Sequence of Operation**

When automatic starting, all units of plants shall be switched to the "Auto" position to be energised in the following sequences:

1. Air Handling Unit
2. Air-cooled condenser fans then Compressors

4.23.3 **Sequence Timer Switch**

The sequence timer switch shall be programmed to operate the air-conditioning equipment in the required sequence.

The sequence timer switch shall be electronic type and shall have sufficient steps to energise various contactor coils of various equipment being controlled by the sequence timer switch. The control system shall be arranged so that on automatic shut-down, all items cease to function in the reverse cycle as that stated above in 4.23.2.

4.23.4 **Interlocking**

Fan coil units, chilled water pumps, condenser fans and refrigeration machines shall be electrically interlocked in the said sequence so that the refrigeration machine can only be started after the air handling units, chilled water pumps, condenser fans are in sequence.

- END OF SECTION 4 -

SECTION 5 - ELECTRICAL REQUIREMENTS

5.1 Scope

This section of the Specification sets out the Electrical Requirements for the proper functioning of the Air Conditioning and Ventilating systems, in accordance with with *General Specifications for Air Conditioning Installations, December 1987* from Department of Electrical Services, Negara Brunei Darussalam, except wher otherwise specified. The scope of work shall be include:

- (a) Provide a complete installation of all electrical, automatic control, power control and motor systems as specified or indicated in the drawings.
- (b) Unless otherwise specified, the installation of electrical systems shall be complete in details, including all material required to make a complete installation.
- (c) Compare the drawings and specifications, check all measurements and note the conditions under which the installation is to be made. Include all items of labour and materials shown or implied necessary to make this installation completely conform to the requirements irrespective of failure to mention in the specifications or shown on the drawings each individual item.

5.2 General

5.2.1 Materials

Provide evidence that the materials supplied and installed conform to the relevant British Standards and test methods prevailing throughout the industry and show that the materials have been tested in a recognized laboratory utilizing methods of test in accordance with the relevant British Standards and IEE regulations. All materials supplied shall have DES approval.

5.2.2 Drawings

5.3.1 General

The drawings indicate in diagrammatic form the layout of the electrical system. Actual locations, distances and levels shall be governed by field conditions. Include all items not specifically mentioned in the specifications or noted on the drawings but which are obviously necessary to make a complete working installation for all systems.

5.3.2 Shop Drawings

Submit shop drawings for all apparatus specified prior to installation. Shop drawings shall clearly indicate which item is being submitted. Shop drawings shall include:

- (a) Complete wiring diagrams of all equipment furnished under this division of the work.
- (b) Detailed dimensioned layouts of the panelboards, disconnect switches, motor starters, control centres and control devices.

All shop drawings and equipment shall be thoroughly checked before presenting them for review.

5.3.3 Record of Drawings

Maintain at the project site, during the entire time of the project, two complete sets of prints upon which are marked all as-built conditions of the electrical system. Those prints shall at all times be available for examination by the Engineer.

At the completion of the project, the Contractor shall provide 'as-built drawings' in accordance to the two marked sets of prints kept at the project site. Submit as many sets of the 'as-built' drawings as required by the Engineer together with the two marked sets of prints.

5.4 Switchboard

The switchboard shall be supplied and installed including all necessary outgoing connections. The switchboard shall be self-contained, extensible, floor-mounted, metalclad, flush-fronted, cubicle type suitable for operation at 415V/240V, 3-phase, 50 Hz with continuous rating as indicated in the drawings without exceeding the permissible temperatures of all the components in accordance with the relevant British Standards.

The protection of the busbar circuit and switching devices shall be of the Class 3C equipment of BS. 4070:1966.

All floor-mounting, free-standing switchboards (either Main Plant switchboards or AHU switchboard mounted on walls shall be of cubicle construction and suitable for the current ratings and rupturing capacities of their respective incoming supplies as stated on the relevant schematic diagrams.

Each switchboard shall consist of the required number of sheet steel enclosures for mounting all the items of electrical equipment and components as required. The structural work of the cubicle shall comprise welded m.s. angles with bolted frames provided at the rear to house and support busbars, cables boxes, cable glands, terminal blocks and other relevant items.

The cubicle shall be enclosed on the front, sides, rear and top with removable sheet steel panels of not less than 12 SWG thickness (in the case of small wall-mounted switchboards, the panels shall not be thinner than 14 SWG). The controlling ACB or isolator of each switchboard shall be mounted in its own separate cubicle which shall be completely isolated from the rest of the equipment and components and all incoming 'live' terminals of the controlling ACB or isolator shall be fully insulated by means of insulated paneling or other means in such a manner as to prevent accidental touch of the 'live' metal parts or conductors of the incoming supply cable from its point of entry to the switchboard to the incoming terminals of the controlling ACB or isolator.

Busbars and busbar connections to switching devices shall comprise high-conductivity, tinned copper bars of sufficient cross-sectional areas and rupturing capacities to cater for the voltage and current ratings indicated on the schematic diagrams. The busbars shall also be of sufficient capacities to limit temperature rise as required by BSS. 159:1957 and busbars markings, clearances between busbars, other current-carrying conductors and the structural framework of the switchboard shall be in accordance with the requirements of BSS. 158:1961. All 'Phase' and 'Neutral' busbars shall be of the same cross-sectional areas in each case, ('Neutral' busbars of half the cross-sectional areas of their respective 'Phase' busbars may be accepted only on condition that prior approval in writing has been obtained from the Supply Authority to the used of such 'Neutral' busbars and a copy of such letter is submitted to the Consulting Engineer for his reference). Busbar supports shall be of the heavy-duty type, fabricated from porcelain or other non-hygroscopic insulated material of adequate mechanical strength and shall be so spaced within the switchboard for busbars to be installed in parallel or edge-to-edge disposition.

PVC insulated cables of appropriate current ratings and voltage grades to suit the circuits concerned, shall be utilized for interconnecting switching devices and instruments within each switchboard. All such cables shall be neatly bound to frame supports by means of PVC binding strips or PVC insulated copper saddles and brass screws. Where it is necessary to use busbar interconnections in lieu of PVC cable interconnection, then clearance between such busbars and the framework of the switchboard shall be in accordance with the requirements of BSS. 158:1961. Termination of PVC interconnecting cables shall be by means of soldered-type or compression-type, copper lugs fitted to either end of each cable run and these, in turn, shall be fastened to the busbars and terminals of switching devices by means of suitable brass bolts, brass washers, steel spring washers and brass nuts with lock-nuts.

An earth-continuity busbar of tinned copper (not less than 25.6 mm x 3.2 mm cross-section) shall be provided internally throughout the full length of each switchboard. The switchboard's framework, main earthing lead, outgoing feeder and final sub-circuit earthing leads, shall be

securely bonded to this earthing busbar. It is to be noted that earth-continuity busbars of aluminium shall not be permitted for use in the installation.

Black, ivory labels with white or chrome-yellow lettering engraved thereon (PVC adhesive labels shall not be accepted) shall be placed immediately below or on panels of switching devices, stating the details of the circuits controlled by such devices. In addition, a main label with 25 mm high lettering engraved thereon and stating the designation of the switchboard, shall be fitted on the top of the front panel of the switchboard.

The switchboard and all the components shall be fully tropicalised and suitable for use in an ambient temperature of 90 °F under very humid, tropical conditions. An anti-condensation heating element of minimum 500W capacity with adjustable thermostat control shall be supplied and installed in each switchboard.

Each switchboard shall be treated internally and externally with two (2) coats of an approved-type, anti-corrosive paint and finished with two (2) coats of an approved-type enamel paint of dark battle-ship grey colour (matte finish). After the switchboard has been delivered to the site and installed in position with all incoming and outgoing cable termination completed, touch-up of all scratched or chipped portions of the paintwork that may have occurred due to mishandling during transportation of installation shall be carried out. All touched-up portions of paintwork shall be sprayed-on (brushing-in of paint for this purpose shall not be allowed) so as to present a clean surface, free from patches.

Prior to the delivery of each switchboard to the site, the switchboard shall be tested at the Manufacturer's Works, and the results of the test shall be submitted by the Manufacturer to the Engineer for his written approval of the acceptance of the switchboard for use in installation. The Contractor shall inform the Engineer shall witness the testing at his discretion. It is to be noted that only after the receipt of the Engineer's letter of approval as stated above, shall each switchboard be delivered to the site for installation.

5.5 **Push-Button Stations**

Wherever it is desired on the Drawings to provide push-button stations for the remote control of electric motors, such units as shown on the Drawings and described hereunder shall be supplied and installed adjacent to the motors or as near as practicable to the motor they control.

5.6 **"Stop" Push-Button Stations**

All such push-buttons station shall comprise machine-stamped or moulded, m.s. or cast-metal boxes fitted with cylindrical-type, push-button units with heavy-duty type, "normally-closed" contacts. Where such stations are installed within visible distance of the main starter panel from which they are connected, the push-button units shall be of the auto-latch-type which, when the buttons are depressed to trip the relevant motor starters, the buttons remain in the depressed position until manually released by turning their respective sleeves. Such push-button units shall be fitted with red colour, "mushroom" or "palm" type buttons, with the word: "STOP" either engraved thereon or with similar engraved labels fitted below the buttons. Where such stations are to be installed in different rooms from the rooms where the starter panels to which they are connected are installed, or if such stations are installed at considerable distance away from their respective starter panels within the same room then such stations shall have lockable-type, push-button units. Lockable type push-button units shall each be of the cylinder type which, when the cylinder is depressed to trip the motor starter, a key could be used to lock the cylinder in its depressed state, thereby permanently switching-off the supply to the motor until the cylinder is once again released by un-locking it with the key. The cylinders mechanism shall be so designed that key removal is possible at the cylinder's normal and depressed positions. The face of the cylinder unit shall be in red colour with words: "STOP" engraved thereon.

5.7 "Start" Push-Button Stations

"Start" push-button stations shall comprise machine-stamped or m.s. or cast-metal boxes fitted with green-coloured, moulded push-button units with heavy-duty type, "normally-open" spring-loaded contacts which close in circuit when the buttons are depressed and break the circuits upon released of the buttons. The words: "START" shall either be engraved on the buttons or similar, engraved labels shall be fitted directly below the buttons.

"Start/Stop" push-button stations shall be a combination of "START" and "STOP" push-button units as described above, encased in common machine-stamped or moulded, m.s. or cast-metal boxes.

Where push-button stations are located outdoors or in areas susceptible to weather conditions or the constant presence of moisture, such station shall be encased in weatherproof, m.s. machine-stamped or cast-metal castings and fitted with facilities for conduit or armoured cable entries, as the case may be.

All push-button stations located adjacent to motors or as near as practicable to motors, shall be installed on m.s. stands or framework. Such m.s. stands or framework shall be painted in the same manner as described of switchboards.

5.8 Air-Circuit Breakers (ACBS)

Air-circuit breakers (ACBs), where specified for use on switchboards, control boards and distribution boards, shall be TP, metalclad, manually-operate or electrically-operated with drawable types, suitable for flush-mounting in switchboard, control board or distribution board panels and shall generally conform to the following requirements and feature the following components installed with their units:-

(a) For ACBs not exceeding 600A current rating, the rupturing capacity of such ACBs shall be 26MVA at 415V, A.C., however, where the current ratings of ACBs exceed 600A, the rupturing capacity of all such units shall be 31 MVA at 415V, A.C.

(b) All ACBs shall be manufactured in accordance with BSS 4752:1971 and shall be of suitable voltage ratings to suit the voltages of the circuits they control.

(c) Each ACB shall be fitted with a shunt-trip coil and provided with a bolted-type solid Neutral link-installed in its own compartment, unless otherwise stated by the Engineer. The ACB shall be provided with current-transformer operated, magnetic over-current trips on all 3-poles (i.e. on all 3 'Phase' of the supply) and fitted with adjustable settings. The ACB must be provided with a high-set element.

(d) Every ACB shall be provided with interlocking facilities to prevent closing of the ACB in its withdrawn position. A mechanical 'ON/OFF' indicator shall ACBs built-up with the mechanism of the ACB operating handle and provision for padlocking the handle in the 'OFF' position shall also be made.

5.9 Isolators

Isolators where required for installation, shall be metalclad, SP&N, DP, TP or TPN types as indicated on the Schematic Diagrams. The units shall conform to the requirements of BS. 5419 where applicable. They shall be suitable for the voltages of the circuits which they control and fitted with contacts generally constructed in the same manner as for fuse gear units described below. Mechanical 'ON/OFF' indicators shall be fitted to the units for operation in ACBs with their respective operating handles. Operating handles of all isolator units shall be fitted with facilities for padlocking their handles in the 'OFF' position and the units shall be provided with inter-locking arrangements whereby their respective unit covers may not be opened when the switch handles are in the 'ON' position. Isolators which are built-in with switchboards and distribution boards shall be installed in their respective dustproof, metalclad casings. All

necessary m.s. brackets or stands for the installation of isolators adjacent to machine or motor control equipment shall be provided and painted with two (2) finishing coats of an anti-corrosive paint, followed by two (2) finishing coats of an approved-type paint to suit the colour/colours of their surroundings.

5.10 **Miniature Circuit Breaker**

The Contractor shall ensure that the miniature and moulded case circuit breakers are trip-free, quick-make, quick-break type. All breakers shall have inverse-time tripping with thermal magnetic trip elements. The rating of the m.c.b. shall be such as to carry full load with ambient temperature of 150 °C with a rated breaking capacity of 3 KA to conform to BS. 3871 Part 1.

All m.c.b.s. shall be limited to circuits controlling current of less than 100 Amp. and may be used in general for final Distribution Board Circuits.

5.11 **Moulded Case Circuit Breaker**

The moulded case circuit breaker for the main service switch feeder, main switchboard, sub-switchboard or in the individual enclosures shall consist of a moulded housing in which is combined a standard moulded case circuit breaker providing over load/short circuit protection within its interrupting capacity and ON-OFF switching function. The moulded case circuit breakers shall be ambient temperature compensating. The circuit breaker shall be provided with thermal magnetic trip and shall be manufactured to BS 3871.

5.12 **HRC Fuse-Links**

All fuse-ways of distribution fuse boards, cut-outs, switch-fuse and fuse-switch units installed shall be fitted with HRC fuse-links affording close excess-current protection which will enable them to operate within four (4) hours at 1.5 times the designed load currents for the circuits which they protect. Such HRC fuse-links shall be those complying with BSS 88:1975 and fitted with fuse-links marked to indicate a Class 'Q' fusing factor.

For motor starting or other transient duties, the fuse installed shall offer proper short circuit protection and at the same time will not rupture due to normal inrush currents associated with the particular installation. All fuse, fuse carriers and fuse links shall be correctly sized to requirements.

5.13 **Earth-Fault Relays**

Where earth-fault relays are to be provided for earth-fault protection of circuits and are to be used in conjunction with circuit breakers controlling the relevant circuits, such relays shall be of the unrestricted type (unless otherwise stated on the Schematic Diagrams) and operated through a set of four (4) current transformers per relay. The relay units shall be suitable for either flush-mountings or surface-mounting on switchboard panels and manufactured in accordance with BSS 142:1966. Each relay unit shall be fitted with a hand-reset type mechanical flag indicator and provided with adjustable settings having a range of 10% to 40%.

5.14 **Current Transformer (C/Ts)**

Ring-type, current transformers of appropriate ratios, burdens and classes shall be provided for the position of ammeters, power factor indicator, kilowatt-hour meters, earth-fault relays and magnetic overcurrent tripping devices built-in with circuit breakers. For operation of ammeters and power factor indicators, the C/Ts shall have a burden of 5 VA, unless when used in conjunction with kilowatt-hour meters when they shall be of 15 VA burden. All current transformers shall be correct dimensions for fixing in busbars and shall be manufactured to BSS 3938:1973.

5.15 **Measuring Instruments**

Wherever instruments for measuring or indication are required to be incorporated in switchboards, control boards or distribution boards, they shall be flush-mounted on the instrument panels fitted to their respective switchboards, control boards or distribution boards. For main switchboards, instruments shall be fitted with 150mm x 150mm dials, while instruments for sub-switchboards, control boards and distribution boards shall be provided with 100mm x 100mm dials. Measuring instruments shall be manufactured in accordance with the relevant BSS and shall generally comprise the following types.

5.16 **Voltmeters**

Every voltmeter shall be of the M.I.S.C type, of suitable voltage range and of a high degree of accuracy. The voltmeter shall be connected in circuit with a 7-position selector switch, and protective cut-outs fitted with 2A, HRC fuse-links, giving the following indications:-

- (a) Off
- (b) 3 phase-to-phase voltages
- (c) 3 phase-to-neutral voltages

5.17 **Ammeters**

Each ammeter shall be of the M.I.S.C. type, of suitable range to suit the current rating of the circuit it is meant to operate on, through current transformers. It shall have high degree of accuracy provided with three (3) current transformers (fitted to the busbars of the circuit whose current is to be measured by the ammeters) of ratio as stated on the relevant Schematic Diagram. The ammeter shall be connected in circuit with a 4-position selector switch giving the following indicators:-

- (a) Off
- (b) Red phase amps
- (c) Yellow phase amps
- (d) Blue phase amps

5.18 **Power Factor Indicators**

These shall be of appropriate range and type and shall be suitable for operation through current transformers.

5.19 **Indicator Lamps**

Where indicator lamps are to be utilised on switchboards and elsewhere, they shall be of installed in accordance with *with General Specifications for Air Conditioning Installation, December 1987*

5.20 **A.C. Contactors For L.V. Circuits**

Where contactors are to be utilised for controlling circuits connected to inductive or capacitive loads such as motors, capacitor units and small transformers, the contactors shall be of the heavy-duty type with a making and breaking category of A4. They shall be of current ratings as stated on the Schematic Diagrams, suitable for operation on the voltage ratings of the circuits they control and manufactured in accordance with BSS 775:Part 1:1969 A.C. operating coils of contactors shall be suitable for connection to the voltages and frequencies of the A.C. control circuit supplies which are connected to them. For D.C. voltages connected to them. For D.C. operating coils, these shall be suitable for operation on the D.C. voltages connected to them.

Where contactors are to be installed in switchboards, control boards, distribution boards and power factor correction boards, they shall be suitable for panel-mounting within their respective compartments. For external mounting, contactors shall be housed in dust-proof, pressed-steel casings, fitted with hinged, lockable doors and suitable for wall-mounting or for installation on

floor stands. Where contactors are exposed to weather conditions they shall be accommodated in cast metal alloy casings of weather-proof construction. All casings for contactor units shall have provisions for the entry and termination of incoming and outgoing cables to wiring conduits, as the case may be.

5.21 **Time Switches**

Time switches where used shall be of the synchronous motor wound, handset dial, single pole, plug-in type to provide facilities as required of time switch control of any selected service.

The clock shall be suitable for connection to a 230 Volt, 50 Hz. A.C. supply and shall be provided with a 9-hours spring reserve complete with stop/start device, high quality jewel escapement and fully temperature compensate balance, four-way terminal block separate clock and switching terminals, motor circuit single pole fuse and facility for internal manual operation independent of the clock. All components shall be approved by CEI, fully tropicalised and the time switches shall be of reputable manufacture.

5.22 **Electrical Motors**

All motors shall be in accordance with BSS. 2613, "The Electrical Performance of Rotating Electrical Machinery" and BS. 170, "Electrical Performance of Fractional Horsepower Electric Motors and Generators" and *General Specifications for Air Conditioning Installation, December 1987*, from DES

They shall be of vertical or horizontal spindle as appropriate, totally enclosed, fan cooled induction motors, suitable for continuous operations, with Class E insulation in accordance with BS. 2757, "Classification of Insulating Materials for Electrical Machinery and Apparatus on the Basis of Thermal Stability in Service".

Motor shall be capable of operating continuously at rated output at any frequency between 48 and 52 cycles per second and at any voltage within the range of normal voltage fluctuations. Motors shall be designed to operate for a period of not less than 5 minutes at a voltage of 25 per cent below nominal value and at normal frequency without injurious overheating. If required by the Engineer, demonstration that the motors comply with these requirements shall be conducted. The starting torque of motors shall be not less than twice the normal rate torque.

Motor bearings shall be of the roller type and the cage locating the rollers shall not be in contact with the races. All bearings shall be fitted with oil or grease lubricators. The shaft cap remote from the driving end shall be provided with a removable plug to enable the speed to be checked by a portable tachometer. Separate terminals are to be provided for internal and external connections.

The ends of the motor windings shall be brought out to terminal boxes and the arrangement shall be such as to permit the easy changing over of any two phase leads without disturbing the sealing compound when used at cable termination.

All terminals shall be of the stud type of adequate size for the particular duty, marked in accordance with BS. 822, "Terminal Markings for Electrical Machinery and Apparatus" and enclosed in a weatherproof box, which shall be securely fixed to the motor frame.

All terminal boxes shall be fitted with an approved sealing chamber conduit entry or adaptor plate as required together with the necessary fittings to suit the type of cable recommended. All motors shall be adequately earthed to meet the requirements of the Department of Electrical Services. A suitable earthing terminal shall be provided for the earth wire on the main body of each motor. All motors shall be equipped with heat sensing devices embedded in the windings, with connections brought out to a separate terminal box and arrangements made to trip the starter in the event of overheating.

The power factor of motors below 100 HP shall be less than 0.85 lagging under any conditions of load and for motors for 100 HP and above, the power factor shall not be less than 0.90 at 80% load. Tenderers shall include in his tender price the cost for a suitable sized capacitor to raise the inherent motor power factor to this figure.

The indicated horsepower of motors are those estimated to be required, and have been used to determine the electric feeder sizes. Should motors of greater horsepower be furnished, increase the sizes of electrical feeders and controllers correspondingly where the Engineer determines that motors of the indicated horsepower, capable of performing the functions shown, are available, such feeder and controller changes shall be made at no extra cost to the Employer.

5.23 **Motor Starters**

All starters shall, unless otherwise specified, be 3-phase, 415V 50 cycles per second manufactured to BS 387 and 775 each incorporating shrouded flush mounting start/stop push buttons, indirect type release, magnetic type overload protection complete with adjustable time delay hand reset overload trips, separate single phase protection relays, under-voltage release, 'on load' integral isolating switch mechanically interlocked with access door, HRC back-up fuses to BS. 88, auxiliary contact, red pilot lamp to indicate motor "running" and control circuit fuses.

Starters shall also be provided with a temperature sensitive device in order that the motor shall be isolated should an excessive temperature in the motor windings be detected by the embedded element. All starters should preferably be supplied by one manufacturer and shall be of robust construction, suitable for minimum maintenance.

Starters and components and related parts shall be properly designed and coordinated to suit the characteristics of the motor controlled and the equipment driven. Starters provided with automatic control shall be capable of as frequent operation as the control devices demand. The horsepower rating of each starter shall not be less than the rating of the motor it controls.

In accordance with the Department of Electrical Services :-

(i) A.C. Motors - single phase A.C. motors shall not exceed 1 HP, and if over 1/2 HP shall be fitted with a suitable starter designed to limit the starting current and including a no volt release.

(ii) Three phase A.C. motors up to and including 10 HP may be of the squirrel cage type. Up to 3 HP direct on line starting may be used, and above 3 HP a star Delta or auto transformer starter shall be provided, with a no volt release provided.

(iii) Three phase motors exceeding 10 HP shall be of the wound rotor type, and a suitable starter of the rotor resistance type shall be provided together with no volt release. Auto transformer type of starters may be used to limit the starting current to 1.6 times the normal free load current.

(iv) For three phase motors exceeding 25 HP the rotor starter shall also have a mechanical device to prevent the starting handle being moved quickly, and an interlock prevent starting up the motor unless all the rotor resistance is in circuit.

(a) **Star Delta Starters**

These shall be of the automatic type. The change-over from 'Star' to 'Delta' shall be through time delay switching device of the synchronous motor-driven type.

(b) **Auto-transformer Starters**

The general design and construction shall comply to relevant BS Standards. Transformer tapplings shall be provided from 50% to 100% at 10% intervals. The final tapping connection shall be so chose as to limit the starting current to not more than 1.6 times the Full Load current of the motor. The switching operation shall be automatic through timer device of the synchronous motor-driven type. Interlocking arrangements similar to those for Secondary Resistance Starters below shall be provided.

(c) **Secondary Resistance Starters**

These shall be of the automatic type. The secondary resistance shall be arranged in suitable steps/banks so as to limit the starting inrush current to not more than 1.5 times the full load current of the motor. The switching operation of the resistance banks shall be either through a timer device or be motor-driven. The stator contactor and the motor resistance starter shall be interlocked such that the stator contactor shall not close without all the secondary resistances in the circuit. The device shall also ensure that once the motor is stopped all the secondary resistances shall be brought into the circuit before the motor could be started again.

Different type of starters to suit the drives system may be used provided prior approval from DES for deviation from regulations has been obtained.

Contactors shall be of robust design and shall comply with BS 775. They shall operate without undue noise or vibration. Contactors shall be mounted in ventilated metal cubicles. Unless otherwise approved the metal surfaces of the cubicle wall adjacent to the contactor shall be protected by fireproof insulating material. The cubicles shall be complete with all locks, cable sealing boxes, busbars, internal wiring, terminal boards and accessories. All bare copper connections shall be taped an all secondary wiring so arranged and protected as to prevent its being damaged by arcing.

All motor contactor and their associated apparatus shall be capable of operating without overheating for a period of five minutes if the supply voltage falls to 75 percent of the normal value at normal periodicity. All motors shall be connected through suitable MCCB's, and switches in addition to the starters.

All starter cubicles shall be fitted with adjustable thermostatically controlled heaters to maintain the temperature within the cubicle above dewpoint. Heaters shall generally be located in the bottom of the cubicle with the thermostat at the top.

Unless otherwise shown, locate starters where motor and starter are fully visible and not more than fifty feet apart from each other. Provide a disconnecting device in the motor leads located so that it is visible and not more over fifty feet from the motor location wherever :-

(a) the motor is controlled only by a manual device at the starter location and is not visible or is more than fifty feet from the starter location.

(b) the motor is automatically controlled, or controlled from a point other than the starter location, and the manual control device is not visible or is more than fifty feet from the control locations.

Where interlocking or sequence starting of motors is indicated, the sequencing shall be done in such a manner that, when the disconnect switch of any starter in the sequence is open, no part of the starter beyond the live side of the switch will be left alive. Opening the disconnect switch shall break the control circuit. Furnish all equipment, such as relays or auxiliary contacts on disconnect switches, necessary to accomplish the foregoing. No unprotected cross-connection shall be made between the holding coil of one starter and the auxiliary contacts of another starter.

5.24 **Overload Relay**

All starters shall include a manual reset over-load cut-out of either the thermal or magnetic type which shall give perfect overload protection to all poles supplying the motor. These shall be adjustable and contain a built-in SPDT switch to be operated by the overload heaters. If such switch is not provided in the overload relay, then a separate relay performing the same function must be provided.

5.25 **Earthing**

The Contractor shall be responsible for the earth connection of metal parts of all switchgears, distribution boards, control boards, starter panels, metal conduits, motors and all other metalwork installed by him liable to become "live" in the event of the electrical installation becoming defective, shall be effectively bonded to earth by means of copper earth-continuity conductors of sized given in Table D.2M of the I.E.E. Regulations (15th edition), or as indicated on the drawings. Earth lead sizes shall also follow Table D.2M of the I.E.E. Regulations, or as indicated on the drawings.

Earth continuity conductors and earth leads shall be of high-conductivity copper (aluminium earth conductors shall not be permitted for use), continuous throughout their whole lengths and without joints, except by means of approved mechanical clamps. Where connections are made at switchgear and such items of electrical equipment, the conductors shall terminate in soldered or compression-type sockets. In the case of MICC/PVC cables, the copper outer sheaths of the cables may be utilised as earth continuity conductors, provided that at the termination of each cable-run the copper sheaths (or sheaths in the case of single-core, multiple runs of MICC/PVC cables) shall be effectively bonded to earth.

Every circuit off a switchboard, distribution board, control board, tap-off unit and splitter switchfuse unit shall be provided with its own earth-continuity conductor.

In hazardous locations, additional earth continuity conductor networks with their own earth electrode systems shall be provided for bonding metalwork to earth. Such networks, when required, shall be indicated on relevant layout drawings.

The electrical resistance of any earth-continuity conductor or earthing lead measured from its connection with the main earth electrode system of a building to any other position in the complete installation the building shall not exceed one (1) Ohm.

The main earthing leads of the installation shall be taken from the earth connection of each Main Switchboard or Sub-Switchboard or Motor Control Centre as directly as possible without looping into any accessory or equipment, to the earth electrodes. Such earthing lead shall be mechanically protected by means of conduit or similar means, which shall be surface-run on walls and buried in the ground at depth of not less than 460 mm below finished ground round level.

5.26 **Wiring and Cables**

5.26.1 **General**

All wiring to equipment and controls shall be in conduit complying to I.E.E. Regulations B 87 to B 100, or in cable trunking where applicable and no joints will be permitted. All conduits used for electrical wiring shall be painted orange for identification from other services. The installation of cabling shall comply in every respect to I.E.E. Regulations B 25 to B 31.

All cables shall be of size capable of carrying the maximum current without exceeding 1 Volt plus 2% of nominal voltage drop from consumer's terminals to any point in the installation under normal conditions of service in accordance with the 14th Edition of the I.E.E. Regulations for the Electrical Equipment of Buildings, and no cable smaller than 7/.029 inch shall be used for power Sub-Circuits.

In the main plant rooms, wiring to motors and equipment shall be done using MICC Cables. Cables shall be neatly run on cable trays in the space under the floor ducts if provided or

overhead exposed in the plantroom, wherever applicable. The bending radius of cables shall be not less than eight (8) times the overall diameter. The termination of cables shall be at the provided earth bar inside the switchboard and at a brass junction box near the motor or equipment terminal block.

The connection between the junction box and motor or equipment shall be made with PVC cables and PVC heavy duty flexible conduit, fitted with approved brass screw-type flexible conduit couplings. Cables from above 0.1 square inch shall be terminated with a lug type or grip cable sockets of approved manufacture.

The Contractor shall provide a steel sleeve where MICC cable passes through a concrete floor. This sleeve shall extend at least 9 inches above the floor to afford mechanical protection to the cable. After inserting the cables, the sleeve shall be effectively sealed with bitumen.

Cable trunking may be employed in lieu of conduit where multiple runs would otherwise occur. Trunking shall be manufactured from good quality hot dipped galvanized mild steel of not less than 18 s.w.g. for sizes up to 4" x 4", and not less than 16 s.w.g. for sizes up to 6" x 6" and not less than 14 s.w.g. for larger sizes.

Perforated hot dip galvanized mild steel cable trays shall be supplied and installed. Trays shall be 12" wide with an upturned flange both sided 3/4 inch deep and shall be complete with all necessary long radius bends and tees and fixing brackets fabricated from galvanized mild steel flats.

5.26.2 **PVC Cables**

PVC cables for sub-mains shall comprise high conductivity stranded copper conductors of the sizes shown on the drawings to BS 3360, PVC insulated to BS 2004 and 2746 as applicable. Cables drawn into non-metallic pipe conduits or fixed to cable trays shall be PVC sheathed.

Insulant colours shall be in accordance with Table B.4 of the 14th Edition of the I.E.E. Regulations for the Electrical Equipment of Buildings.

5.26.3 **PVC Armoured Cables**

PVC insulated steel wire armoured PVC sheathed cable shall be manufactured and tested to BS 3346:1961.

5.26.4 **Paper Insulated Cables**

Paper cables shall be manufactured and tested in accordance to BS 480 Part 1 : 1954 and shall be of the mass impregnated non-draining paper insulated type. Cables for 415V (M.V.) service shall be insulated for 1,100 Volts when operating on a system with an effectively earthed neutral.

Paper insulated cables are designed on the Specification Drawings and herein as : -

PLYSTS (MIND) - Paper insulated lead alloy, steel tape armoured and PVC served. (mineral impregnated non-draining)

PILCDSTAS (MIND) - Paper insulated lead covered double steel tape armoured and served. (mineral impregnated non-draining)

5.26.5 **MICC Cables (Mineral Insulated Copper Sheathed)**

Where specified, installation work shall be carried out with MICC cables. The size of the cables shall be suitable to ensure adequate current carrying capacity and that the voltage drop at the apparatus is not excessive. All work and material must be in accordance with the relevant British Standard Specification listed and the current rating shall be as listed by the I.E.E. All joints and termination of the conductors shall be securely attached by fittings of an approved type which

provide effective insulation and continuity of conductors and prevent the entry of moisture into the mineral insulation of the cable. The sealing compound shall be of the "Pyrotenax SILEPOS" type. The cable shall be supported by means of approved copper saddled "Multiway saddles" may be used.

- END OF SECTION 5 -

SECTION 6 - THERMAL AND ACOUSTIC INSULATION

6.1 Scope

This section of the Specification sets out the requirements for the materials, and performance of all operations necessary for the proper installation of all thermal and acoustic insulation for all pipework, ductwork and equipment as required for the proper operation of the air conditioning and mechanical ventilation systems.

6.2 General

All insulation material, vapour barrier and accessories such as adhesive shall be treated on total composite basis and materials offered must be of the type approved for use in air conditioning and mechanical ventilation installation for high rise buildings.

Unless otherwise specified, all thermal and acoustic insulation materials shall be resin bonded fibreglass with a factory applied fire retardant aluminium vapour barrier and of, such thickness, density and thermal conductivity performance as specified hereinafter.

The fibreglass insulation, vapour barrier and accessories, such as adhesives, mastic, cements etc. on a total composite basis shall be non-combustible and non-hygroscopic. These materials shall have a Class 'O' rating when tested for combustibility according to the procedures of BS 476, Part 6 & 6 or an approved equivalent standard on 25/50 fire hazard tests such as UL723, NFPA255 and ASTM E84.

The tenderers shall submit to the Engineer a list of materials intended to be used for this project and their test report together with the tender document. Successful Contractor shall submit to the Engineers relevant test reports, product catalogues, manufacturer's installation recommendation and samples of relevant size before proceeding the actual installation works. Materials installed at site without approval of the Engineers will not be accepted and all costs associated to the replacement will not be entertained.

6.3 Adhesives

Adhesives shall be waterproof compounds formulated for long life and suitable for the particular materials and service temperature specified.

Adhesives shall be tested in accordance with BS 476, Part 3 after uniform application to asbestos millboard to the thickness recommended by the manufacturer for the proposed application and shall meet the following requirements after the manufacturer's specified drying time.

Ignitability Index	0
Spread of Flame Index	0
Heat Evolved Index	0
Smoke Developed Index less than	2

Adhesives shall be applied strictly in accordance with the manufacturer's recommendations for the particular application.

6.4 Rectangular Air Ducts

6.4.1 General

All rectangular sheet metal supply air duct and only return air duct passing in non-return air space shall be insulated internally or externally as specified hereinafter. The air conditioning duct as indicated in the drawing shall be a composite fibreglass ductwork of approved standard as specified hereinafter.

6.4.2 Internal Insulation

Ducts shall be insulated internally for all supply air ducts in the shafts up the first take off or at locations where both thermal insulation and sound absorption are required as indicated in the drawings. All supply and return air ductwork for a minimum distance of thirty feet from an air handling unit shall be internally lined unless specified otherwise.

Material shall be **Barafire insulation** designed exclusively for duct lining work of 2 inch thick with density not less than 2 lb/cu.ft. and thermal conductivity factor shall not be exceeding 0.28 BTU/Hr/in/deg F/sq.ft. at 75 °F mean temperature. The internal insulation shall conform to the requirement of class 'O' BS 476 Part 5 & 6 and NFPA 90A and 90B when tested in accordance to UL 181 Class 1 standards for safety of airducts and shall be capable of withstanding air velocity of up to 4500 fpm without delamination or erosion. The facing of the duct liner shall be treated to prevent erosion and factory laminated.

Test reports must be submitted for examination before actual carrying out of work. The material shall comply to the following sound absorption coefficient:

Frequency (Hz)	125	250	500	1000	2000	4000
Sound absorption co-efficient	0.22	0.49	0.59	0.80	0.89	0.75

Sheathing shall be 26 SWG proprietary made perforated galvanised iron sheet of free area not less than 20 per cent and to the approval of the Engineer.

Perforated metal shall be fastened to the interior of the duct by pins or studs suitably glued to the duct and shall be retained by washers. Internally insulated ductwork shall be fabricated off-site, unless otherwise approved. Rust proof pins of studs shall be provided with at least 6-inch centres on the top surfaces, 9-inches centres on the vertical surfaces and 12-inch centres on the bottom, pins or studs in the longitudinal direction shall be staggered.

Exhaust air ducts at the suction and discharge ends shall be internally insulated to reduce discharge noise levels. Where the duct dimension exceed 18-inch at the longer side, 24 SWG galvanised cover angles shall be fitted.

Alternatively, stud welded rust proof pins of spot welded sheet metal split long pins may be used to hold the insulation in place.

All dimensions given on the drawings shall be cleared inside dimensions for airflow. Where internal insulation is installed, duct size shall be increased accordingly. Samples of lined-duct section must be submitted to the site engineer for approval before work can be carried out.

6.4.3 Thermal Insulation

All ductwork within the plant room, immediately below the roof and the vertical duct shaft shall be insulated with 2 inches thick fibre glass insulation of density not less than 2 lb/cu.ft. and thermal conductivity not more than 0.13 BTU/Hr/in/sq.ft./deg F. All ductwork exposed to the weather shall be insulated with 2 inches thick cork insulation and "hyrib" plaster finish.

All supply air duct and other ductwork where required shall generally be insulated with 1 inch thick fibreglass having a thermal conductivity value (k factor) of not more than 0.26 BTU/in/Hr/sq.ft./deg F at 75°F mean temperature not less than 1 lb/cu.ft. density. The vapour barrier shall consist of at

least one layer double sided aluminium foil/kraft laminate, with fibreglass yarn reinforcement. The insulation shall be carried over all flexible connections and points subject to condensation.

The surfaces of ducts and their insulation material shall be coated with an approved flame proof adhesive of 1/16 inch thick layer of flintcote before pressing together. The cork and fibreglass insulation shall be sealed with one layer of fire-resistant double sided fibreglass reinforced aluminium foil.

The aluminium foil shall overlap at all joints by a minimum of 3 inches and shall be securely cemented and taped with a 6 inch wide pressure sensitive aluminium adhesive to ensure a thoroughly effective vapour seal. The vapour permeability shall not exceed 0.02 perm.

Care shall be exercised to ensure that the vapour seal is completed. The vapour seal shall be extended over all flanges, at the hangers and the like so that it is continuous. An overlapped of 3 inches is required or a 6 inches wide strip vapour-sealer tape could be cemented over such joint.

Ducts shall be well insulated to ensure a rectangular and neat appearance. Where ductwork exceed 12 inch the insulation shall be held securely with pins or studs suitably glued to the duct and retained by washers. The pins or studs shall be provided at 6 inch centres, except for insulation to top of horizontal duct runs. Additional patches shall be neatly glued over any damaged section of the vapour seal and over holes for supports. The ends of joints in the insulation shall be coated with adhesive and stuck together to ensure that the insulation is continuous. Thermal insulation shall not be required for supply air ductwork internally lined with 2 inch thick insulation located in the return air stream.

6.5 Flexible Ductwork

The insulation shall be protected with a tough seamless fire-retardant aluminised vinyl vapour barrier jacket.

The insulation shall be made of long, fine, glass fibre, bonded with thermosetting resin. The density of the insulation shall be at least 1 lb/cu.ft. and the thickness shall not be less than 1 inch having a thermal conductivity K of not greater than 0.24 Btu/Hr/in/deg F/sq.ft. at 75 °F mean temperature.

6.6 Cleaning of Ducts

All ducts shall be thoroughly cleaned on installation so that when the plant is placed in operation, dirt and dust will not be discharged from the diffusers and registers. Care must be taken that no discolouring of the ceiling takes place due to the neglect of this requirement.

6.7 Insulation of Refrigerant Piping

Refrigerant piping system shall be insulated with closed cell Rubber insulated selected as per manufacturer's recommendation.

6.8 Condensate Drains

Condensate drain pipe shall be insulated with closed cell Rubber insulation selected as per manufacturer's recommendation.

6.11 Sealing of Joints

All segments of pipe insulation shall be firmly butted against the preceding sections and the joint shall be sealed with a butt strip. The butt strip shall be applied with aluminium pressure sensitive adhesive tape with a minimum width of 3 inch. Joint of aluminium foil vapour barrier shall be overlapped 4 inch minimum and sealed with an approved brand of vapour seal adhesive.

6.12 Installation Details

6.12.1 General

All insulating material, shall be fitted tightly to the surface which it is applied, and edges or ends of preformed sections shall butt up firmly close to one another over the whole surface to be insulated. Insulation at bends, tees and fittings shall be cut or shaped on site where necessary.

Before application of the insulation all surfaces shall be cleaned to remove any scale, rust, grease or dirt. Provide adhesive to pipe surface before application of the insulation.

Pipe insulation shall be continuous through wall, floor and ceiling openings. Where an adhesive is utilized the insulation shall be firmly held in place until the adhesive has set.

- END OF SECTION 6 -

SECTION 7 - NOISE CONTROL AND VIBRATION ELIMINATION

7.1 Scope

This section of the Specification sets out the requirements for the materials, and performance of all operations necessary for the proper installation of all noise control and vibration elimination for all pipework, ductwork and equipment as required for the proper operation of the air conditioning and mechanical ventilation system.

7.2 General

All machinery or equipment, interconnected piping, ductwork or conduits shall be provided with adequate vibration isolating devices for the avoidance of excessive noise or vibration in the building. Isolators shall, as far as possible, prevent the transmission of vibration noise (including hum) and 'feelable' vibration to any part of the building.

All isolators shall be designed to suit the vibration frequency to be absorbed and the load imposed. Isolator units shall have adequate area and load ratings to obtain proper resiliency under load and impact without permitting excessive movement when starting.

Where equipment is belt driven and motor is not mounted on equipment, the motor and driven equipment shall be mounted on unitized support and the entire supported on subject isolators. The unitized support shall be provided with adjustable slide rails sizes for the motor.

Prior to the installation of any equipment, the following items shall be submitted for certification by the Engineer:-

- a) Catalogues : Cuts and data sheet on specific vibration isolators to be utilized showing compliance with the specifications.
- b) List showing items of equipment, piping, etc., to be isolated, the isolator type and model number selected, isolator loading and deflection, and reference to specific drawing showing frame construction where applicable.
- c) Drawings showing equipment frame construction for each machine including dimensions, structural member sizes, support point locations, etc.
- d) Written approval of the frame design to be used, obtained from the equipment manufacturer.
- e) Drawings showing methods for suspension, support, restraint, guides, etc. for piping and ductwork, etc.
- f) Drawings showing methods for isolation of pipes, etc. piercing slabs, beams, etc.
- g) Linear load versus deflection curves of selected isolators.

7.3 General Requirements of Isolators

Vibration isolators proposed for use in the works shall have the following general properties:-

- a) To have either known undeflected heights or other markings so that, after adjustment, when carrying their load, the deflection under load can be verified, thus determining that the load is within the proper range of the device and that the correct degree of vibration isolation is being provided according to the design.
- b) All isolators to operate in the linear portion of their load versus deflection curves to be furnished by manufacturer and must be linear over a deflection range 50 percent above the design deflection.
- c) Ratio of lateral of vertical stiffness of isolator types shall be not less than 1.0 or greater than 2.0.

- d) Wave motion through the isolator shall be reduced to the following extent: Isolation above the resonant frequency shall follow the theoretical prediction based upon undamped single degree of freedom system with minimum isolation of 50 decibels above 150 Hertz.
- e) Vibration isolator spring diameter shall not be less than their deflected height. Select spring with a 50 percent overload safety factor.
- f) Unless otherwise indicated all equipment mounted on vibration bases shall have a minimum operating clearance of one inch (25 mm) between structural steel base and floor or support base beneath. Check clearance space to ensure that no scrap of material has been left to possibly short circuit isolation base.
- g) Where necessary due to height limitations, provide structural steel bases with height saving brackets, and minimum of four points of support. Isolators shall have a method of levelling and where spring isolators are used, shall have gussets on both sides of the isolator.
- h) Design isolators for positive anchorage against up-lift and turning.
- i) Provide and install under this Section of the Specification structural steel required to properly support equipment.
- j) For steel spring isolators, springs shall be designed so that the ratio of horizontal to vertical spring constant is between 0.9 and 1.3. The natural frequency of the isolator must be 1/6 to 1/10 of the driving frequency that is to be controlled. Isolators to have minimum additional travel to solid equal to 50 percent of rated deflection. Floor mounted isolators to be equipped with built-in levelling bolts complete with sound isolation pads. Static deflection as specified herein.

In the event that the isolators do not meet the specified requirements or the equipment fails to meet specified requirements, revisions/modifications shall be made as required with no additional cost.

7.4 **Bases**

Rotating and reciprocating machinery shall be mounted on rigid steel or concrete bases. Steel bases shall be constructed of WF beams of a depth equal to at least 1/10th of the longest dimension at the base. Concrete bases shall be of reinforced concrete of a depth equal to at least 1/12th of the longest dimension of the base but not less than six inches. Machinery with self-contained legs or bases which are at least as rigid as the bases described do not require additional bases.

Poured concrete foundations shall have 3000 psi compressive strength at 28 days case. Provide wood float finish with chamfered corners. Both shall have bottom plates and pipes sleeves securely embedded in the concrete. Bottom plates shall be welded to bolts to prevent bolts from turning. Grout under the entire machine bedplate or frame bearing surface. After grout has set, remove all wedges, shims and jack bolts and fill the space with grout. Mounted electric motors on the same foundations as the driven machine.

7.5 **Springs**

Free-standing, with the ratio of horizontal spring constant to vertical spring constant at least 1.0. Steel spring diameter shall be at least 0.8 times the spring operating height. The difference between spring operating height and solid spring height shall be at least 0.5 times the static deflection.

7.6 **Levelling**

Provide steel spring anti-vibration mountings with levelling bolts and mount on rubber pads at least 1/4 inch thick or rubber shearflex.

7.7 Mountings

Equip bases with mounting brackets and steel spring type anti-vibration mountings which satisfy the following requirements with provisions for reactive forces. Steel spring static deflections shall be greater than the minimum deflections shown below:-

Lowest Rotational Speed RPM	Min. Static Deflection Inches
Less than 300	10
300 - 399	6
400 - 499	3.5
500 - 599	2.5
600 - 699	1.5
700 - 799	1.25
800 - 899	1.0
Greater than 900	0.8

7.8 Variable Loads

For machinery with operating weight greater than installed weight and machinery subject to varying loads, steel spring anti-vibration mountings shall be equipped with limit stops to prevent over-extension of springs when operating forces or weight are removed. Limit stops shall not interfere with normal operation of the anti-vibration mounting in any way.

7.9 Suspension

Where machinery is to be suspended from the structure, each hanger shall be equipped with a double deflecting steel spring and rubber-in-shear anti-vibration hanger. The steel spring for each such hanger shall satisfy the requirements herein specified. The rubber-in-shear mounting for each such hanger shall provide a static deflection at least equivalent to the static deflection for a 1/4 inch rubber pad as specified. Anti-vibration mounting shall be equipped with adequate levelling mechanisms which do not interfere with proper hanger operation.

7.10 Service Connections

In order that the anti-vibration mountings not be bypassed, all service connections to machinery on anti-vibration mountings through ductwork, piping or conduit shall be equipped with flexible connectors.

7.11 Vibration Control for Electrical Conduit

Isolate electrical conduit from all rotating or reciprocating machinery with 360° loops of flexible conduit. The diameter of the loops shall be at least ten times the diameter of the conduit.

7.12 Vibration Control for Ductwork

All supply and return ductwork connections to rotating or reciprocating machinery shall be through flexible connectors as hereinbefore specified. Connector size and ductwork support shall be selected to prevent either contact between the collars on either side of the connector or tautness of the flexible material in the connector under operating conditions.

7.13 **Vibration Control for Piping**

Isolate all piping from rotating and reciprocating machinery and from the building structure. Piping connections to rotating or reciprocating machinery shall be through flexible rubber hoses, flexible metal hoses or metal expansion joints. Rubber hoses shall be used for flexible connectors except where operating conditions prohibit their use. Whenever rubber hoses cannot be used, flexible metal hoses or metal expansion joints shall be used. The lengths of flexible metal hoses or metal expansion joints shall be at least six times the nominal pipe diameter but not be longer than 36 inches. Valves shall be located so that the rubber hose, metal hose or metal expansion joint is between the valve and the machinery to which the hose or joint is connected unless otherwise specified. Wherever possible, rubber or metal hoses shall be installed horizontally and parallel to the shafts of any rotating or reciprocating machinery to which they are connected. Flexible connectors shall be rated and suitable for the working pressure of system.

7.14 **Installation of Anti-Vibration Isolators**

All isolators shall be installed accordance with manufacturer's printed installation directions. In supporting any component or piping, the Contractor shall observe the following:-

- (a) Coordinate work with other trades to avoid short circulating of vibration isolators.
- (b) Bring to the attention of the Engineer or his Representative prior to installation, any conflict with other trades that would result in solid (hard) contact to equipment or piping, etc., due to inadequate space, etc. Cost of corrective work necessitated by conflicts after installation shall be at the Contractor's expense.
- (c) Obtain inspection and certification by the Engineer or his Representative for all concealed work prior to enclosure.
- (d) The Contractor is to notify the Engineer or his Representative prior to the installation of vibration isolation devices so that he may review the Contractor's technique for proper installation of the vibration isolators.

The installation or use of vibration isolators must not cause any change or position of equipment or piping which would result in stresses in piping connections or misalignment of shafts or bearings. In order to meet this objective, equipment and piping shall be maintained in a rigid position during installation. The load shall not be transferred to the isolator until the installation is complete and under full operation load.

For isolating pipework, the first three pipe hangers at all insulated water line equipment connections shall contain combination spring and neoprene hangers with positioning plates. One inch minimum static deflection for lines 3" and smaller, and 2" (5mm) for lines over 3" (7.6 mm) in size shall be used. Uninsulated water lines shall be provided with metalclad hairfelt specifically manufactured for isolating pipe from hanger at all hangers. For isolating equipment, suspend each unit on a minimum of our combination spring and neoprene hangers with positioning plates.

Internally isolated equipment (Air-Handling Units and Air Conditioning Units Wether Internally Isolated Fan and Motor Assemblies) shall be mounted on rigid baseplate with spring isolators as specified. Static deflection shall be minimum of 2" (50 mm) for fans operating at 500 rpm and below and 1½" (38 mm) for fans operating at 501 rpm and above.

- END OF SECTION 7 -

SECTION 8 - TESTING, BALANCING AND COMMISSIONING

8.1 Scope

This section of the Specification sets out the requirements for testing, balancing and commissioning of all equipment installed by the Air-Conditioning Contractor.

8.2 General

All instruments and appliances required for testing, except those specifically mentioned herein as being provided, shall be furnished by the Contractor for the duration of the tests.

The gauges, thermometers and other instruments specified as a permanent part of the installation may be used for testing purposes. Test instruments shall be checked for accuracy by an approved laboratory and test certificates shall be submitted to the Engineer prior to site testing.

Proper facilities and appliances for testing of materials, equipment and work supplied shall be provided during normal working hours as may be necessary to satisfy the Engineer that the installation meets the requirements of this Specification.

In general, all field testing of equipment shall be conducted in accordance with the best and latest relevant standard. During the testing period, each trade shall have his supervising foreman and mechanic available to aid in testing and to perform any adjustments as directed. All adjustments and testing shall be carried out under the direction of either a competent registered Professional Engineer or Qualified Technician or other approved personnel, who must be a permanent full-time employee of the Contractor.

Results of all tests shall be tabulated in an appropriate form. The format of the forms shall be submitted to the Engineer for approval prior to testing. The capacity of each equipment shall be checked and recorded under design conditions. Where required, the Contractor shall provide equipment performance data to permit interpolation of test results for non-design conditions.

Prior to carrying out any test, fourteen (14) days' notice in writing shall be given to the Engineer informing him of the nature of such test and the proposed time, date and location of such test. A copy of test results shall be forwarded to the Engineer. No equipment shall be transported until approval of the test results has been given by the Engineer.

All expenses incurred by the Engineer during the test which require his presence shall be borne by the Air-Conditioning Contractor. The tender sum shall include such expenses and other expenses incurred on testing.

8.3 Testing Equipment and Accessories

The Contractor shall supply all necessary balancing, testing, calibrating instruments and labour required and these shall be available on site continuously during the testing period.

The Contractor shall provide the following instruments for testing, balancing and commissioning.

- (a) Inclined manometer calibrated in no less than 0.005 inch divisions.
- (b) Combination inclined and vertical manometer (0 to 10 inch).
- (c) Pitot Tubes.
- (d) Electronic stroboscopic Tachometer with direct digital readout.
- (e) Clamp on ampere meter with voltage scales.
- (f) Deflecting vane anemometer.
- (g) Rotating vane anemometer.
- (h) Thermal type (hot wire) anemometer.
- (i) Hook gauge.
- (j) Dial, glass stem and electronic digital thermometers.

- (k) Sling psychrometer.

All instruments shall be calibrated and have suitable scales such that the measure variable is within 1/2 to 3/4 of the full scale reading.

All separable sockets, tappings and tees for testing, shall be furnished and installed as required and instruments calibrated before tests are conducted.

8.4 **Lubrication and Setting in Operation**

Before testing or preparing any item of plant, ensure that such item of plant is fully charged with the correct grade of oil, grease or other lubricant as the case may be, all in accordance with the manufacturer's recommendations. All such initial charges of lubricant shall be supplied by the Contractor.

Make all necessary adjustments and set in operation all equipment described in this Specification.

The complete installation shall be handed over in complete and proper working order to the satisfaction of the Engineer.

8.5 **Commissioning of Refrigerating System**

8.5.1 **Code**

Commissioning of Refrigerating System shall be carried out in accordance with Chartered Institution of Building Services Code Series R 'Commissioning of Refrigerating System' Code Series C 'Commissioning of Control System' and Code Series W 'Commissioning of Water Distribution'.

8.5.2 **Scope of Work**

The Contractor shall carry out the following work strictly in accordance with the codes specified in Section 8.6.1 herein and all settings shall conform to the equipment manufacturers' recommendations.

- (a) Pressure and Leak Testing of Refrigeration System.
- (b) Evacuation and Dehydration of Refrigeration System.
- (c) Charging.
- (d) Lubrication.
- (e) Testing of all safety and interlocking devices.
- (f) Setting to work and adjusting of Reciprocating Compressor or Centrifugal Compressor.

The Contractor shall submit detailed procedures to carry out the above work to the Engineer for approval.

8.6 **Commissioning of Air Distribution Systems**

8.6.1 **Code**

The commissioning of air distribution system shall comply with the Chartered Institution of Building Services Code Series A 'The Commissioning of Air Distribution System, High and Low Velocity'.

8.6.2 **Instruments**

The types of instruments to be used for the measurement of air quantities and pressures are set out below. All instruments shall be in good condition and where applicable shall be covered by recent calibration certified from an independent certified Testing Laboratory.

- (a) A deflecting vane anemometer for measuring air velocity.
- (b) A rotating Vanes Anemometer, four (4) inches diameter with in built one minute timer if an approved make.
- (c) A pitot-static tube of stainless steel construction and rubber sensing hose for sensing duct pressure.
- (d) U-tube, slope Gauge or Magnehelic Gauge for indicating pressure.
- (e) Electronic digital thermometer for measuring temperature at various duct and room locations.
- (f) A tachometer for measuring fan Rpm.
- (g) Volt-Amp meter for measuring fan motor Voltage and current.
- (h) A good quality direct reading velometer of an approved make capable of direct velocity reading with the range of 100-4000 fpm.

Instruments shall be used in accordance with the Manufacturer's instructions. If possible, the same instrument shall be used to make similar measurements for the entire job. If more than one instrument is used for similar measurements, variation between instruments' calibration should be less than 10 per cent.

8.6.3 Initial Running of Electrically Driven Fan Set

(a) Limiting the Load

Wherever possible the first start of any motor shall be on light load. With centrifugal fan sets this will normally be achieved by limiting the mass flow by operation of the main damper; a knowledge of the fan characteristic is required so that excessive suction or delivery pressures are not applied to the ductwork system.

(b) Initial Start

On activating the motor starter, check;

- 1) direction of rotation of motor shaft;
- 2) motor, drive and fan free from vibration or undue noise;
- 3) motor starting current for sequence timing adjustment;
- 4) motor running current on all phases;
- 5) no sparking at commutator or slip rings;
- 6) no overheating of motor (see BS587 and BS170);
- 7) no seepage of lubricant from housing;
- 8) no overheating of bearings;
- 9) oil rings running freely;
- 10) on multi-speed motors check reduced speed rev/s and motor running currents.

(c) Initial Run

A light load run shall be sustained until the commissioning engineer is satisfied from the checks listed in 8.6.3 (a) above and from motor insulation test readings that further load may be applied. Repetitive starting of the motor should be avoided to prevent over-stressing of fuses, switchgear and motor.

(d) Start at Normal Load

Subsequent to the satisfactory conclusion of the initial light load run, the machine shall be stopped and restarted at normal starting load, and the checks listed in 8.4.3 (b) repeated. Again avoid repetitive starting.

(e) Running in Period

After a short run at normal load (a few minutes' run will normally suffice) flexible connections to terminal units etc., shall be restored to position. Subsequently a running in period shall be sustained until the commissioning engineer is satisfied that the fan set is a reliable continuous running machine that can safely be placed under the normal operation and maintenance regime. The regulation of the air distribution system shall be delayed until the running in period (which may last some days) is completed satisfactorily. During the running-in period the dynamic balance of the fan and motor shall be investigated and corrected if necessary.

8.6.4 Preliminary Steps

Before beginning to balance the system, eliminate every possible air flow restriction. Open oil air valves, fire dampers, and volume controls in both the supply and return ducts. Adjust outside air dampers for minimum and maximum position and adjust return air dampers for maximum air flow. Set adjustable pattern ceiling diffusers for horizontal air discharge patterns, wherever possible.

8.6.5 Fan Performance

Before any system can be balanced properly the fan must provide enough static pressure for the system, and the air volume handled by the fan must be adequate for the system. Therefore, measure and compare with Specifications:

The following shall be measured by the Contractor and the result shall be tabulated with design data and submitted to the Engineer for acceptance.

- (a) System static pressure
- (b) Fan Rpm, voltage at fan motor and current drawn
- (c) Total air volume

Prior to taking any measurement, the Contractor shall submit his procedure for measurement to the Engineer for approval.

8.6.6 Balancing Test Points

Balancing points shall be provided in ducts in sufficient number to facilitate the proper testing and commissioning of the air distribution system. All balancing points shall be located in readily accessible positions as shown on the drawings.

Balancing points shall consist of a set of one inch diameter holes drilled in the duct and sealed by plates of the same thickness as the duct. Plates shall be attached by two self tapping screws and the covers made air tight by using neoprene gaskets. The numbers and positions of test holes in rectangular ductwork shall be as given on the drawings.

8.6.7 Outside Air Quantities

Outside air quantities coincided with the correct total air flows shall be very carefully measured for each system by the methods specified. This shall be carried out with the outside air cooling coils in operation. If the initial balancing takes place prior to the commissioning of the refrigeration systems then the air quantities shall be initially set at 15% above the specified figures, and later retested and adjusted as necessary with the coils operating at full load. The damper quadrants shall be carefully locked in position by an approved method and the settings shall be clearly and neatly marked in red paint.

8.6.8 Branch Duct Air Quantities

Air flows in all main branch ducts and zone where test points have been specified shall be ascertained by means of a Pitot tube or an approved Velometer. At each test point the number of measurements shall equal the square of the number of the test openings provided e.g. with three (3) holes, a total of nine (9) readings shall be taken and average.

8.6.9 Return Air Quantities

Return air quantities from the various floors or zones as applicable shall be measured with the aid of a Rotary Vane Anemometer traversing the face of the return air grilles, held approximately one

inch away from the face of the grille. The method shall be otherwise be the as the described in Clause 8.6.8.

8.6.10 **Balancing of Air Flow**

Balancing of air flow shall be carried out in accordance with the Chartered Institution of Building Services Code Series A Clause 2.7. Balancing shall be done by working back to the fan from the remote branches by setting the correct proportional air flow at each junction of the system in turn (without regard for absolute valves of air flow). This done, the absolute valves of air flow throughout the system shall then be brought to their design valves simply by adjusting the main damper only (next to the fan) until the design total rate of air flow is established at the fan.

8.6.11 **Test Data**

The number of readings per measurement shall not be less than five and average valves shall be tabulated before submitting to the Engineer. All apparatus connections, unit casing, ductwork, inspection doors and the like shall be checked for air leakage. Special attention shall be given to sealing around filters.

When checking air quantities at fans, due allowance shall be made for duct leakage and dust loading of filters corresponding to 50% design dust holding capacity. Total air quantities shall be obtained by the adjustment of fan speed or fan pitch angle. Branch duct air quantities shall be adjusted by means of volume or splitter damper. Volume control dampers at outlets may be used to balance air quantities only if the final adjustments do not produce objectionable draughts or noise levels in excess of the specified limits.

The positions of all volume control and splitter type dampers shall be checked to ensure that minimum resistance has been imposed on the system. Inlet dampers on fans, if provided, shall only be used for final fine adjustment of total air quantity. Filter manometer assemblies shall be inspected for correct operation. The work to be carried out in adjusting and balancing the air handling systems shall comprise the followings:-

1. Check and adjust fan speed to design requirements.
2. Check and record motor full load amperes.
3. Make pitot tube traverse of main supply and obtain design air flow in c.f.m. at fan.
4. Test and record system static pressures in inch W.G. at suction and discharge.
5. Test and adjust system for design recirculated air in c.f.m. to within $\pm 10\%$.
6. Test and adjust system for design outside air in c.f.m. to within $\pm 5\%$.
7. Test and record cooling cycle entering air temperatures (Dry bulb and Wet bulb $^{\circ}\text{F}$).
8. Test and record cooling cycle leaving air temperatures (Dry bulb and Wet bulb $^{\circ}\text{F}$).
9. Adjust all main supply and return air ducts to design air flow rate in c.f.m. to within $\pm 10\%$.
10. Adjust all zone supply and return air ducts to design air flow rate in c.f.m. to within $\pm 10\%$.
11. Test and adjust each diffuser, grille and register to within $\pm 10\%$ of design air flow requirements.
12. Identify each diffuser, grille and register as to location and areas.
13. Identify and list size, type and manufacturer of diffusers, grilles, registers and all testing equipment. Use manufacturer's or approved ratings on all equipment to make required calculations.
14. In readings and tests of diffusers, grilles and registers, include f.p.m. velocity and test f.p.m. velocity and required c.f.m. after adjustments in accordance with Clause 8.4.12.
15. In co-operation with control manufacturer's representative, set adjustments of automatically operated dampers.
16. Adjust all diffusers, grilles and registers to minimise draughts in all areas.

On completion of the above tests and air balance report shall be compiled incorporating the test results and submitted to the Engineer for acceptance.

8.6.12 **Air Diffusers**

After the fan is checked, the total air volume is measured, and the main and branch ducts are balanced, air flow at each diffuser shall be adjusted and measured. The average velocity or air through a diffuser shall be measured around and cross the diffuser. Not less than five readings shall be taken. The air flow volume delivered through the diffuser shall be the product of average velocity and flow factor. The flow factors shall be provided by the Manufacturer based upon laboratory measurements made with specific instruments in controlled conditions. Tabulated data shall be submitted to the Engineer for acceptance.

8.9 **General Performance Tests**

8.9.1 **General**

When all equipment specified herein has been correctly installed and the balancing of air and water systems completed and approved, the Contractor shall carry out general performance tests to satisfy the Engineer that all equipment as installed operates as required by the specification.

These performance tests shall be of not less than three weeks duration. The Contractor shall be responsible for the operation of all plant and equipment installed by him until the general and specific performance test have been completed to the satisfaction of the Engineer.

8.9.3 **Air Handling Plant**

All fans shall be checked for correct operation, excessive noise and vibration and correct starting without belt slippage. All fire dampers shall be tested for correct operation.

8.9.4 **Electrical Equipment**

The operation of all motors, starters, electrical interlocks, relays, switchgear, meters and the like shall be demonstrated under full working conditions. Each set of thermal overloads shall be adjusted for the actual load of each motor on a day of maximum temperature. The overloads shall be demonstrated to function by trial setting below normal trip conditions.

- All alarm and safety devices shall be checked and tested.
- Motor indicators shall be set to the normal current in the respective motors.
- All motor currents and power consumption shall be recorded and scheduled.
- Phase readings shall be tabulated against the name plate rating of the respective motor.

8.9.5 **Miscellaneous Equipment**

All the other items of plant installed shall be tested for satisfactory operation and compliance with the specification.

8.9.6 **Noise Level Tests**

Noise level tests, complete with octave band analyses, shall be made in all areas including the roof and where directed around the site boundary. With all plant operating the noise levels in the various areas and at site boundaries shall not exceed the noise levels in the various areas and at site boundaries shall not exceed the noise levels specified herein.

Three (3) sets of the recorded results shall be forwarded to the Engineer.

- END OF SECTION 8 -

SECTION 10 - DUCTWORK AND AIR DISTRIBUTION

10.1 Scope

This section of the Specification sets out the requirements for the types, quality of materials and standards of construction which shall be adopted in the fabrication, supply and installation of the ductwork and associated accessories and fittings.

10.2 General

For the purposes of this Specification, the following definitions shall be adopted:

- (a) "Medium Pressure High Velocity Ductwork" shall mean all supply air ductwork of static pressures in duct exceeding 2 inch w.g. but not more than 6 inch in w.g.
- (b) "Low Pressure Ductwork" shall mean all supply air ductwork of static pressures in duct more than 2 inch static and velocities not more than 2,000 fpm.

All ductwork shall be constructed from hot-dip galvanised sheet steel.

10.3 Dimensions

All ductwork dimensions shown on the drawings are the MINIMUM internal dimensions of the air passage, e.g. inside of insulation or acoustic lining where fitted. Where air quantities delivered by the equipment installed by the Contractor are more than the design quantities, the Contractor shall modify the duct dimensions to maintain the design air velocities of the duct and such modifications shall comply with the specification described hereinafter.

Where the Contractor desires to change the size of a duct from the dimensions shown on the drawings, to obtain more economical sheet cutting or to avoid an obstruction, he may do so providing that:-

- (a) The ductwork designed by him has not less than a capacity and the total frictional resistance not greater than that of the ductwork specified.
- (b) The Contractor accepts the responsibility of ensuring that the duct size when varied will not obstruct the building structure or any other services to be installed.
- (c) The change is approved by the Engineer.

10.4 Materials

10.4.1 Sheet Metal

This Specification is based on the use of galvanised sheet steel for rigid duct. Duct gauges specified refer to the thickness of the ungalvanised sheet, in terms of Birmingham Standard Wire Gauge.

Ductwork shall be manufactured from galvanised sheet steel to BS 2989, "Hot-Dip Zinc Coated Steel Sheet and Coil". The zinc coating mass designation shall equal to Class 2A. The sheet metal shall be new, clean and lock-forming quality (LFQ) suitable for use in lock-forming machines without cracking of the sheet or otherwise damaging the protective galvanised coating. Sheets which split or crack, or on which the galvanising flakes when rolled for jointing, shall be rejected. The Engineer shall be at liberty to request Test Samples in accordance with this Standard.

Where specifically approved or instructed by the Engineer, ductwork material other than galvanised sheet metal, such as aluminium or aluminium alloy, stainless steel, asbestos, plastics and fibre glass ducts may be used where required to meet the requirements of particular applications.

10.4.2 **Rolled Steel Angles**

Rolled steel angle shall be of mild steel to BS 5535, "Specification for Right Angle and Box Angle Plates".

10.4.3 **Rivets**

Rivets shall be galvanised tinsmith's rivets or expanding solid end type rivets of 5% magnesium aluminium alloy. Rivets fixing sheet metal shall be 1/8 inch diameter and rivets fixing rolled steel angles to sheet metal shall be 3/16 inch diameter.

10.4.4 **Self-Tapping Screws**

Self-tapping screws shall be of bright zinc plated steel and shall only be used where specified.

10.4.5 **Bolts**

Bolts, nuts and washers shall be of bright zinc plated steel to BS 916 and BS 1083.

10.4.6 **Duct Hardware**

Duct fittings, e.g. bearing housings, damper quadrants, etc. shall be made from any of the following materials:-

- (a) Mild steel galvanised or electro zinc plated
- (b) Bronze - good quality cast or rolled
- (c) Aluminium alloy die castings
- (d) Zinc alloy die castings

10.5 **Corrosion Protection of Angle Flanges, Stiffening and Hangers**

Prior to painting the ferrous metal, surfaces shall be thoroughly cleaned of rust, loose scale dirt, oil or grease and other foreign matter by wire-brushing or with ICI Deoxidizing 125. After cleaning, brush one coat of Grey Green Chromate Metal primer F500-388 or equivalent allowing overnight drying. After this first coat has dried, apply one coat of Dulux undercoat A522-line or equivalent, allowing overnight drying. After this second coat, apply 2 coats of Dulux Glass Finish or equivalent to appropriate shade. Allow 16 hours drying time between coats.

10.6 **Erection of Exposed Ductwork**

Where two or more ducts are installed adjacent to each other and are in view, angle flanges and stiffeners shall be in line to present a neat appearance, where space limitation prevents the lining up of angle flanges and stiffeners, they shall be nested together.

10.7 **Duct Constructions**

10.7.1 **General**

The Tenderer's attention is called to the positioning of the ductwork and associated fittings and plant in areas where space is limited.

Necessary additional cost should be included for prefabricating, and insulating sections of the ductwork in lengths suitable for installation as shown.

No further allowances will be made at any later date for negotiation of additional space than that generally shown on the accompanying drawing.

All ductwork shall be constructed of galvanised sheet steel.

Unless otherwise approved, all ductwork and fittings shall be constructed strictly to the dimensions indicated and in accordance with practice recommended in the current editions of the Sheet Metal and Air Conditioning Contractors National Association Incorporated (USA) and DW/142 of Heating and Ventilating Contractor's Association whichever is applicable.

Full size standard galvanised sheet steel shall be used, and any patches, made on second-hand sheets will be rejected.

10.7.2 Workmanship

Unless specified otherwise, ductwork shall be rectangular type. Any ductwork and fittings considered unsatisfactory by the Engineer shall be removed from the site by the Contractor within 3 days.

The Contractor is required at the discretion of the Engineer to carry out leakage test for the first 50 ft. of ductwork before fabricating and installing any more ducts. This will ensure a check of workmanship and quality to make the joint air-tight promptly and economically. All tests shall be carried out under the supervision and to the satisfaction of the Engineer.

All high velocity ductwork whether low pressure or medium pressure shall be tested for leakage under the supervision and to the satisfaction of the Engineer. Testing procedures shall be in accordance with duct leakage testing procedures as described in the latest edition of the and DW/142 of HVCA and/or in "Section 8 - Testing, Balancing and Commissioning" herein.

At the discretion of the Engineer, the Air-Conditioning Contractor shall provide a sample of the following duct fittings and insulation used in ductwork for the Engineer's approval:-

- (a) All typical joints
- (b) High velocity main duct take-off
- (c) High velocity branch duct take-off
- (d) Low velocity main duct take-off
- (e) Flanged joints for high velocity duct
- (f) 90 °F bend with double thickness turning vanes
- (g) High velocity duct with acoustic and thermal insulation
- (h) Low velocity duct with acoustic and thermal insulation
- (i) Exposed to weather duct
- (j) Acoustic flexible ducting
- (k) Flexible duct connection
 - Single take-off
 - Double take-off
- (l) Splitter dampers
- (m) Grilles, diffusers and registers
- (n) Volume dampers
- (o) Linear diffuser complete with plenum box
- (p) Fire damper
- (q) Variable air volume box

Ductwork shall not commence until the samples have been approved. The samples shall be retained by the Engineer and shall be considered to be the standard of workmanship for the project.

10.7.3 Duct Length

There is no restriction on the length of duct sections between joints assembled in the field. The factor that will usually determine length module will be:-

- (a) Available shops manufacturing facilities
- (b) Handling
- (c) Transportation and storage to and on the site

(d) Physical limitations created by the ductwork layout or building construction methods.

Duct shall be machine-bent and shall be free of waves and buckles.

10.7.4 **Stiffeners**

Ductwork shall be cross-braked or provided with steel angle bracing for additional stiffness to prevent sagging and drumming of ductwork.

Where transverse reinforcing is required on all four sides, it must be tied together at each corner by welding. Where transverse reinforcing is required on only two side, it must be tied together with either tie rods or angles at the ends.

The transverse reinforcing size is determined by the dimension of the side to which the angle is applied. The rods where used shall be 1/4" minimum diameter. Where two tie rods are required, installation shall be 1/3 point across the duct.

Angles shall be cut from rolled steel angle sections or folded steel plate and drilled for rivets in accordance with a detail shown on the drawing. Dimensions of rolled steel angles shall be as referred to in Clause 10.4.2.

Where transverse joints are of a type incorporating reinforcing angles, then the transverse stiffeners angles may be omitted where a transverse joint of one of these type occur.

10.8 **Joint Sealants**

10.8.1 **General**

All joints in the medium velocity ductwork shall be made air-tight with the aid of a sealant. The sealant shall be such that it remains in place during the assembly and after completion of the joint. When cured, the sealant shall retain its adhesive and elastic properties, and be resistant to air entrained water an oil.

The sealants shall conform to the following index ratings for early fire hazard as specified in BS 4106 Parts 5, 6 and 7:-

Ignition Index	0
Spread of Flame Index	0
Heat Evolved	0
Smoke Development Index	0

10.8.2 **Liquid Sealants**

Liquid sealants shall be used for sleeve and slip type joints where a sealant is required to fill the small space between the overlap. Liquid sealant shall not be used except on flexible ductwork.

Liquid sealants are not acceptable for sealing airtight joints unless the sealant is held in the joint by lapping metal surfaces. Application of sealant is by brush, chulking gun or pressure extruding equipment. Where metal clearance exceed approximately 0.04 inch, several applications may be necessary to fill the void caused by shrinkage and run out of the sealant.

10.8.3 **High Viscosity Sealants**

High viscosity sealant shall be used as a filler or in grooves or where the sealant is held in the joint by surfaces in compression.

The sealant shall be applied by pressure gun to the inside of the assembled joint, such that the internal air pressure tends to force the sealing into the joints.

10.8.4 Adhesive Tapes

Adhesive tapes shall not be used for sealing of duct joints unless specifically approved.

10.8.5 Gaskets

Long life materials such as rubber, extruded forms of soft neoprene used in certain wall sealants shall be used in flanged joints. Extruded sealants shall have cloth filler so that they will not be forced completely out of the joint by air pressure. For ease of application, gaskets should have adhesive backing or otherwise be tacky enough to adhere to the metal while assembling the joint.

10.9 Joints

The acceptable types of joints are specified in DW/142 of HVCA or smacker whichever is applicable.

Sheet metal joints shall be roll-formed in a correctly set and adjusted machine to form a tight fitting joint.

No free or cut edges of ductwork shall appear within ducts, and where seams or joints protrude into air stream, they shall be arranged in the direction of air flow.

No ductwork joints, bends or other fittings will be permitted within the thickness of the wall, floor or ceiling structure.

Angle flanges shall be fabricated from rolled steel angles referred to in Clause 10.4 and shall be coated for corrosion protection in accordance with Clause 10.5 and be of the sizes in the following table:-

Longest Duct Side	Angle Size (inch)
Up to 24 inches	1 1/4 x 1 1/4 x 1/8
25 inch to 48 inch	1 1/4 x 1 1/4 x 1/8
49 inch to 60 inch	1 1/2 x 1 1/2 x 3/16
61 inch to 100 inch	2 x 2 x 3/16
Above 100 inches	2 1/2 x 2 1/2 x 1/4

Holes in flanges angle shall be drilled or punched in a jig or a template. Bolt holes shall have a clearance of 3/32 inch diameter over bolts and may be slotted. Bolts shall be 1/4 inch diameter for used with 1 inch and 1 1/4 inch angles and 3/8 inch diameter for use with 1 1/2 inch and 2 inch angles. Rivets shall be 3/16 inch diameter.

Angles shall be welded into frames prior to attachment to duct. Attachment of angle frames to duct shall be by riveting or spot welding. Spot welding where permitted shall be subjected to the conditions specified in Clause 10.8. The weld spots on the inside of the duct shall be painted for anti-corrosion.

The double thickness of longitudinal joints shall be cut away either before rolling the joints, or after the flange is assembled to the duct, but before knocking down. The ends of the ducts shall be knocked down to a minimum of 3/8 inch across flange faces, and the corners sealed by welding or blazing as illustrated.

Flanged sections shall be bolted together with gasket between the faces to give an air-tight joint and after bolting up, the distance between flange faces shall not exceed 3/16 inch. The gasket shall be full-faced type, carefully mitred and joined at the corners to ensure a continuous air-tight seal.

Flanges may be outside or inside of ducts if specifically called for on the drawings or in the Specification. The flange angles shall be covered with a sheet metal fairing, riveted to the duct. The fairing shall be of the same material thickness as the duct.

Sealant shall be applied between the duct and the flange all round to ensure a continuous air-tight seal.

10.10 **Tapers and Offsets**

Tapers and offers in ductwork shall be carried out in accordance with the appropriate Mechanical Details.

Changes in section of ductwork are to be effected by tapering the ducts with a slope not greater than 1:4 but preferably 1:10 slope or less.

10.11 **Obstructions to Ducts, Streamlines and Restrictions**

10.11.1 **Streamlines**

Where it is impossible to offset a duct around an obstruction such as a pipe or small beam or around a small building column, the obstruction may be encompassed with a two piece streamliner. Such a proposal can only be carried out with the approval of the Engineers.

The area of duct at the obstruction shall be not less than 80% of the area of duct before the obstruction. The tapers on the converging and diverging sections shall comply with Clause 10.11. The streamliner around the obstruction shall be rounded on air entering side and be tapered to a 60° point on the air leaving side.

Cross joints shall be as specified in the Tender Specifications for straight ducts except those adjacent to the obstruction where slip joints or flanges (if the duct depth allows for access to the bolts) shall be used.

10.11.2 **Obstruction in Contact with Airstream**

An obstruction may pass through a duct provided that it does not decrease the duct area by more than 20%. Where the obstruction is of circular cross-section up to and including 3 inches outside diameter, the decrease of duct area due to the obstruction may exceed 20%.

Notwithstanding the above, such passing of obstruction through any ducts can only be carried out with the approval of the Engineers. A slotted hole shall be cut in one section of the ductwork to permit installation of the ductwork around the obstruction. The slotted hole shall be patched as shown before the flange is riveted in place. The obstruction shall be sealed to the ductwork with rubber grommets.

10.11.3 **Restrictions**

Where one side of a duct or a corner of a duct is obstructed by part of a structure or building and space is restricted, the duct may be locally reduced to clear the obstruction, provided that the reduction of duct does not exceed 20% of the initial area of the duct.

The tapers on the duct diverging and converging sections shall comply with Clause 10.11. In arranging a local reduction, the effect of the building obstruction shall be borne in mind when selecting types and locations of field assembled cross joints so that the joint can be satisfactorily assembled without clashing with the obstruction.

Where a duct passing through a beam opening is restricted, the duct may be transformed to the equivalent size of the straight duct to suit such opening.

10.12 **Bends**

The method of construction of bends is illustrated in the Mechanical Details. Construction shall in all respects be as detailed for ductwork in the preceding Clauses.

The type of bend to be used may depend on the duct location and on other site restrictions. The particular type which shall be used in each location shall be as shown on the drawings, unless specifically approved by the Engineer.

10.13 **Tees, Branch Connection and End Closures**

Typical details of approved fittings are shown on the Mechanical Details. Types of fittings to be used shall be as shown on the duct layout drawings.

With these fittings, the longitudinal seams may be Acme Grooved Seam or continuously welded. The branch is continuously welded into the side or the main run.

During fabrication, care should be taken to eliminate projection of metal edges into the air stream. If the zinc coating is burnt off the steel during welding, the joint shall be painted inside and outside with zinc chromate rust inhibitor to prevent corrosion.

10.14 **Access Doors and Test Openings**

Access doors and openings shall be provided at all positions of dampers, turning vane coils, thermostats and other apparatus requiring service and inspection in the duct system. Doors shall be minimum 15 inch x 18 inch (380mm x 460mm) unless otherwise required by the actual conditions. Where size of duct will not accommodate this size, doors shall be made as large as practicable.

Doors shall be of rigid construction with provision for air-tight felt or sponge rubber or neoprene gaskets and galvanised hinges, bronze pins, brass fasteners and other necessary hardware and accessories. All doors shall be furnished with suitable sash locks and latches. Doors shall be hinged to swing so that fan pressure or suction holds the door closed.

Where ductwork exceeds 48 inches (1.2m) in any one dimension, access manways at not less than 40 ft. (12m) intervals shall be provided in all duct runs and on both sides of turning vanes. Access manways shall be not less than 20 inch by 42 inch (500mm by 1,000mm).

Where directed by the Engineer or where necessary for use for taking air measurements, such as at the discharge of air handling units or at each individual zone of the ductwork system, test openings shall be provided. Openings shall be formed with suitable screwed caps and extension plugs for insertion or pitot tubes. All test openings shall be insulated to approval.

Access doors shall be so constructed that no part of the access door shall project into the airstream and the cover when shut shall be flush with the inside surface of the duct. The edges of the door shall be turned back to make a rounded edge or alternatively a piece of pressed galvanised steel shall be fitted to obtain a similar result.

Access door shall be made from 18 ga. galvanised steel sheet. Door shall be attached to the duct with suitable sash locks, latches and hinges. Where the duct is insulated, the door shall be insulated to the same thickness and to the same requirements as the duct. Where insulation is inside the duct, the surface of the door or cover insulation shall be flush with that of the duct. The edges of the insulation shall be covered with G.I. channel or 'Z' sections. Doors and levers shall be sealed air-tight to the duct with rubber or neoprene gasket which shall be securely fixed to either the door cover or the level or the duct.

10.15 Splitter Dampers

10.15.1 Adjustable Turning Vanes

This may be used as a damper for a wall supply register or as a turning vane.

Construction on this type of turning vane is shown on the drawings. Blades shall be constructed from 20 ga. galvanised steel sheet, pivoted at each end on steel rods supported by steel sheet side plates and tie bars.

A means for adjusting the setting of the blades shall be provided. Access for this adjustment shall be either through an air outlet, where this is close enough to the adjusting device, or through a handhole located in the duct for this purpose. The frame of the turning vane shall be fixed into the duct by riveting.

10.15.2 Single Blade Splitter Dampers

Splitter damper shall be of sufficient length to close off either branch duct. The blade shall not be less than the width of the branch duct and not less than 12 inches. Splitters shall not be used where their length will exceed 24 inches.

To blade shall be pivoted on cadmium or zinc plated steel butt hinges of not less than 2 inches. The hinges shall be attached to the blade and duct with three 3/8 inch diameter rivets per hinge leaf. Blades up to 18 inch wide shall be constructed of 18 ga. galvanised steel sheets turned down 1 inch at the sides and turned back 1/2 inch at the leading edge.

Blades exceeding 18 inches wide shall be constructed of 20 ga. galvanised sheet in a double streamline section and pivoted on a hinge rod of not less than 1/2 inch diameter. The hinge rod shall be cadmium plated steel and shall be supported at each end by bearings as shown. The double streamline blade shall be securely fixed to the hinge rod by spot welding, riveting or screwing.

10.15.3 Linkage

Splitter damper quadrant up to 20 inches shall be operated by 3/8 inch rod and for larger damper by 1/2 inch rod.

10.16 Hangers for Ducts

10.16.1 General

All ductwork shall be supported rigidly and at a center to prevent sagging and vibration on hangers, supports and cantilever brackets. However, they shall be arranged to allow for expansion due to thermal stresses without distortion to the ductworks. Unless otherwise specified, hangers for vertical and horizontal ducts shall comply with the details, material sizes and spacing shown on the drawings and as specified herein.

Supports for rectangular ducts shall generally be trapeze type hangers comprising angle bearers (supporting shelf) of galvanised steel hung from mild steel rods or galvanised steel angle hangers. These shall be of size and spacing as indicated below:-

Hanger	Sizes of Rectangular Duct		
Longest Dimension of Duct	Size of Hanger Rods	Size of Trapeze Angles and Bearers	Maximum Spacing
Up to 18"	¼"	1" x 1" x c"	10'
19" to 30"	¼"	1" x 1" x c"	10'
31" to 42"	d"	1½" x 1½" x c"	10'
43" to 60"	d"	1 ½" x 1½" x c"	10'
61" to 84"	d"	2" x 2" x c"	8'
85" to 96"	½"	2" x 2" x 3/16"	8'
Over 96"	½"	2" x 2" x ½"	4'

NOTE: Where two ducts are hung one beneath the other, then the drop rod sizes and the top duct support angle size shall be given by the sum of their longest sides.

The attachment of the angle bearers to the hangers shall preferably be by bolts, push nuts or fixture clips to enable ease of adjustment.

Where horizontal ducts are to be supported on walls, band iron strap type hangers shall be used. These are recommended for small size ducts having widths less than the height of the duct. The band shall be anchored into the wall at the top and bottom using approved type anchors or fasteners. For horizontal ducts where the widths are greater than the height, neat shelf type bracket angle irons shall be used.

Supports for round ducts shall be band iron strap type hangers with sizes and spacing as indicated below:-

Hanger Sizes for Round Duct				
Duct Diameter	Size of Hanger Rods	Size of Band and Straps	Maximum Spacing	Number of Hangers
Up to 18"	-	1" x 16 SWG	10'	1
19" - 36"	-	1" x 12 SWG	10'	1
37" - 50"	-	2" x 16 SWG	10'	1
51" - 84"	d"	2" x 16 SWG	10'	2

Notwithstanding the schedule of hanger type and size given hereabove, the Contractor shall be deemed to be responsible for ensuring that all items used for the duct supports are adequate for the duty, load and conditions imposed.

Unless approved otherwise duct hangers shall not be used to hang piping, ceilings or other loads. Where it is necessary to hang items other than ductwork from duct hangers, the maximum stress in

hanger rods, straps and bolts shall not exceed 6000 psi. Hangers shall be fabricated from strips of galvanised sheet, rolled steel angles and rolled steel flat round bars as shown in this Specification.

All rolled steel angles and rolled steel flat used for hangers shall be coated for protection against corrosion in accordance with Clause 10.5. The Air-Conditioning Contractor shall with other trades ensure that hangers are not in the way of pipes, conduit, etc. running above ducts. All hangers, straps, bands and angles used for supporting ductwork shall generally be suitably treated against corrosion by galvanising or painting with aluminium paints.

All ducts shall be suitably supported at appropriate intervals to comply with the requirements of the SMACNA Standards.

10.16.2 Fixing of Hangers

All fastening and anchoring of supports to structural slabs, ceiling beams, walls and decking shall be by approved means. Unless specifically approved by the Engineer, only approved type concrete anchors and inserts, expansion bolts, ramsets, c-clamps, beam clamps, etc shall be used. Suitable receiving holes shall be cut by approved rotary percussion electric drills to give true and accurate drilling.

Explosive power fasteners, wooden plugs and straight nails shall not be used.

The following fixing methods are approved for attaching hangers to structure except where otherwise specified in the Specification:-

- (a) The steel or timber structures - Mild steel bolts of the size listed.
- (b) The masonry structures - Expanding type plugs used with steel bolts of threaded drop rods of the sizes listed. Plugs used shall be approved by the Engineer. Bolts or nuts cast into concrete structures are acceptable provided that they are fitted with steel washer to adequately distribute the load into the concrete.

Prior to the installation of any supports, the Contractor shall submit detailed layout drawings indicating location of all supports, the loads imposed on each fastener or anchor, typical details for hangers and anchorages, details of special anchorages and suspensions. These shall be required to be approved by the Engineer before actual installation.

10.17 Flexible Ducting

10.17.1 General

Flexible ducts are used to connect terminal devices such as mixing boxes and diffusers to medium or low velocity ducts. Although flexible ducts are capable of following an indirect route, the runs shall be as short and straight as possible in order to minimise pressure losses and noise generation. The duct shall be stretched to smooth out internal corrugations and long radius bends shall be used where possible.

Flexible ducting shall be to the sizes and installed in the locations shown on the drawings. Flexible ducting shall be manufactured from corrugated roll strip of grade 3003 aluminium, constructed with a four-ply lock seam to form a continuous flexible spiral duct.

10.17.2 Insulated Ducting

All flexible supply air ducting shall be insulated. Insulation shall consist of fibre-glass blanket 1 inch thick enclosed in a continuous insulation sleeve.

10.17.3 Uninsulated Ducting

Unless shown on the drawings, all exhaust and return air ducting shall be of the insulated type.

10.17.4 **Joining of Flexible Ducting**

When flexible ducting is used to connect the sheet metal duct to the supply air boots, sufficient clearances shall be allowed between the light fittings and flexible ducting.

Joining of flexible ducting either to other flexible ducting or to rigid ducting and fittings shall be carried out to details shown on the drawings.

10.18 **Flexible Connections**

Flexible connections shall be air-tight and resistant to fire, water and mildew and shall be made with tight weave asbestos factory-attached to a galvanised steel strip.

Flexible connections shall be fitted to isolate fans and/or air handling unit casing from ductwork. The connections shall be of at least 6 inch width and shall be arranged to permit to renewal of the connection without disturbing the ductwork or the plant. The metal parts of connected equipment shall be separated by not less than four inches and installed with sufficient slack to compensate for free movement of fans or spring vibration isolators.

Flexible connections in supply air ducts surrounded by unconditioned air shall be insulated by 1/2 inch thick steel of closed cell flexible insulation securely glued and clamped to the outside of the flexible connection. Flexible connections shall be of 20 oz (.6 Kg) woven asbestos, glass cloth, canvas or other approved non-combustible material.

10.19 **Flashing**

All ducts passing through the roof shall be flashed by the Contractor in a manner shown in the drawings. However, this shall not include any upstands or kerbing around the roof openings which will be provided by others.

10.20 **Cleaning of Ductwork and Protection during Construction**

All ducts shall be thoroughly cleaned inside to the satisfaction of the Engineer, before starting the fans. Covers shall be provided during installation to prevent building material or rubbish entering the ducts and fans.

10.21 **Duct Sleeves and Prepared Openings**

Where ducts pass through walls or partitioning, floors, ceilings and roofs, suitable galvanised sheet steel sleeves of a gauge not less than the duct concerned shall be located into place by the Contractor in liaison with the Main Contractor.

Sleeves shall be used for round ducts 15 inch (380 mm) diameter or less. For all other ducts (rectangular or round ducts above 15 inch (280 mm) diameter), prepared openings shall be used. All sleeves and prepared openings shall be constructed with one inch (25 mm) of clearance between duct and the opening or, for insulated ductwork, between the insulation and the opening.

Unless approved by the Engineer, the free space between the sleeve or opening and the duct or duct insulation shall be caulked tight using felt gasket, asbestos rope or sealing compound and a neat sheet metal collar or angle flange arranged to cover the free space. The closure collar shall fit snugly around the duct or insulation and the edges ground smooth to preclude tearing or puncturing the insulation vapour barrier.

For ducts piercing through roofs, curb-type flashing shall be provided to prevent entry of rain and moisture. The sleeves shall be of lengths to suit the finished wall thickness and in the case of plastered and/or rendered walls shall not protrude more than 1/8 inch over the finished wall surface. In the case of insulated ductwork, the sleeves shall be oversized to allow the insulation and vapour sealing to be continuous through them.

10.22 Penetrations

Penetrations through ductwork and conditioner casings are to be avoided if possible or else installed behind bulk-heads formed to seal pipework and electrical services from the air stream.

Where these penetrations are unavoidable, the pipe shall be sealed to the duct wall in such a manner that an air-tight seal is achieved, while permitting movement of the pipe relative to the duct or housing. An approved method of sealing of pipework through a conditioner housing is shown on the drawings.

10.23 Alternative

The tenderers are at liberty to offer other methods of construction but details of which must be submitted at the time of tendering as an alternative to the basic tender.

10.24 Shut Off and Volume Control Dampers

10.24.1 General

The following clauses set out the requirements for control volume dampers other than splitter dampers specified in Clause 10.16 or proprietary damper supplied with air outlets.

These requirements apply to single blade dampers which may be used in ducts up to 8 inches width and to multi-blade damper which shall be used in all other cases. Sample dampers shall be submitted for approval to their manufacturer.

10.24.2 Single-Blade Dampers

Single-blade dampers in low velocity duct up to 26 inch x 8 inch may be installed in the duct without separate frames or flanges provided such dampers are only required for throttling and not for tight shut-off.

10.24.3 Multi-Blade Dampers

All multi-blade dampers shall be of the opposed blade type. The damper blades shall swing open in opposite directions so that the air stream is not deviated to one side. The damper shall be the product of an approved manufacturer.

10.24.4 Modulating Dampers

Modulating dampers shall be of the opposed blade type. The damper shall have face dimensions which comply with the sizes shown on the drawing, where the dampers are smaller than the duct size, blanking plates shall be provided unless convergent and divergent duct sections are shown on the drawings.

Dampers used for outdoor intakes, for mixing air and on hot air plenum shall have neoprene edges cemented and rivetted in place at the time of fabrication.

10.24.5 Manually Operated Dampers

Manually operated dampers shall be full duct size unless otherwise shown on the drawings. The damper shall be operated by lock-type quadrant operator.

10.24.6 Damper Frames

Frames shall be constructed of 10 BG. galvanised steel sheet folded to channel section not less than 6 inches wide. Frame shall be welded at the corners and painted. Damper frames shall be drilled to provided bolt hole for connections of the damper to the duct angle flanged cross joints.

Mullions shall be constructed of 16 BG. galvanised steel sheet folded to channel sections and rivetted into box section.

10.24.7 Damper Blades

Damper shall be of single blade type or of multi-louvre type with elliptic or flat steel blades mounted horizontally in a welded steel frame.

Rectangular damper, 12 inches long or more as measured in the direction perpendicular to its axis, shall be louvred with blades not over 10 inches wide and not exceeding 48 inches between supports Round dampers shall be of single blade type.

Blades shall be fabricated from 16 BG. galvanised sheet and shall interlock with adjacent blades as shown in the drawings. Neoprene, rubber or felt sealing strips shall be bonded to the tips of the blades to prevent air leakage. Damper leakage shall not exceed 5% of the maximum design air quantities for the particular damper.

10.24.8 Bearing and Spindles

Bearings shall be of ball bearing type or of self-oiling sintered bronze. The housing of the bearing shall be rivetted or where approved, spot welded to the damper side frames.

Spindles shall be of 5/8 inch diameter and shall be securely fixed to the centrefold of the blades. Spindles may be of the stub type or may run the full length of the blades. Spindles shall be cadmium or brass-plated.

10.24.9 Linkages

Dampers shall be linked with the bars and links arranged to give rotating action. The bars and links shall be fabricated from brass or bright steel flat or round bar which shall be adjustable in length. It should be able to withstand, without appreciable deflection, a compressive load equal to twice the maximum operating force of the damper motor. The rod shall be jig drilled. Drilling shall be carried out before plating.

Damper rods shall be brought through the sides of the duct with set screws and bushing.

Where two sets of dampers are operated from one motor, the linkage shall be such as to allow either damper to be adjusted as to position and/or amount of movement without affecting the adjustment of the other.

The linkage used with manually operated dampers shall incorporate a means for positioning, locking and indicating the positions of the dampers. For dampers over two (2) blades wide, linkage shall be of an approved proprietary type ensuring positive control and alignment of the damper blades. Joints in the linkage shall be made with steel or brass pins and clevises or with ball and socket joints capable of withstanding without suffering damage the service they are intended for.

10.24.10 Mounting and Linking of Damper Motors

Damper motors shall be rigidly mounted on robust fabricated mild steel bar or brackets supported from the duct or building structure so as to prevent any movement of the motor relative to the damper.

Motor to damper linkage shall be of proprietary type incorporating cadmium plated m.s. rods and ball-swivel joints. Where the length of the rods and/or the force exerted by the motor in the opinion of the Engineer could cause buckling of the rod, tubular linkage made of 1/2 inch galvanised m.s. pipe with solid bronze rods welded at both ends shall be used.

10.24.11 Access to Dampers

Dampers shall have accessible operating mechanism and where operating devices occur in finished portion of the buildings, such operating devices shall be chromium-plated with all exposed edges rounded.

10.24.12 **Finishing**

All steel part of the damper shall be finished with two coats of black enamel.

10.24.13 **Outside Air Dampers**

Special gate type outside air damper shall be provided. The damper shall be arranged and constructed as shown on the drawings, and their function shall be to admit outside air.

10.25 **Fire and Smoke Dampers**

10.25.1 **General**

Automatic type fire and smoke dampers shall be supplied and installed at all locations as shown in the drawings and/or all the following positions:-

Fire Dampers Penetrations through fire-rated walls, partitions, floors (except when enclosed in fire rated shafts), fire stops and ceilings. Unducted return, exhaust or transfer air openings in the above-mentioned closures. In addition, fire and smoke dampers shall be provided in all areas as required by the local Fire Authority, irrespective of whether it is shown in the drawings or not.

10.25.2 **Construction**

All dampers shall comply in all respects with the requirements of the Fire Authority and shall be of the following minimum standard of construction:-

- (a) The damper shall be of galvanised or stainless steel or other moisture resistant non-corroding material constructed to a minimum thickness of not less than 12 SWG or equivalent. Attachment of the damper to ductwork shall be in such manner that any deformation or collapse of the ductwork under fire conditions will not dislodge the damper or affect its operation or performance.
- (b) The damper blades shall be single or multiple blade steel curtain type or minimum thickness of not less than 14 SWG arranged to swing freely and automatically (by weighted device or constant tension springs) into place when released. Internal small angle iron guide-stops shall be fitted to ensure an efficient seal when the damper blades are in a closed position. The air leakage rate through the dampers when closed shall not exceed 2% at a pressure differential of 5 in. wg.
- (c) Fire dampers shall be fusible-link actuated. Fusible link shall be arranged to break at a maximum temperature of 155 °F (68 °C) and be connected and anchored to welded internal lugs by means of non-corrodible multicore wire. The position of the fusible links when assembled shall be chosen so that they may be easily inspected and adjusted through access panels cut in the ductwork. In all cases, the position of the ductwork access panels shall coincide with the removable portions of the false ceilings wherever they occur, and shall be clearly marked.

Access openings shall be covered with a 1/16 inch (15 mm) thick galvanised steel plate with self-tapping screws at 6 inch centres and sealed with mastic. Insulation and vapour seal over the opening shall be continuous.

The fusible link and smoke release connection shall be electrically interlocked with the motor circuits of the air supply system. This shall serve to stop the fan motors when the fire or smoke damper is closed.

- (d) The damper shall lock shut positively and shall be opened manually. The damper in the open or shut position shall be indicated by means of an external indicator.

- (e) The dampers shall have rating curves showing resistances to air flow of not to exceed 0.06 in. wg. static pressure at 1500 cfm per sq.ft. for low pressure applications, and 0.25 in.wg. at 3500 cfm per sq.ft. for medium and high pressure applications.

10.25.3 **Installation**

The space between the frames and the brickwall shall be packed with commercial-grade twisted asbestos ropes or approved fire seal before installation.

Arrangements of typical fire dampers are shown on the drawings.

10.25.4 **Access to Fire Dampers**

Opening as specified by Engineer shall be provided in the ducts were required to provide access to fire dampers to permit their resetting and replacement of fusible links.

The access panel shall coincide with the removal portions of the false ceiling where they occur.

- END OF SECTION 10 -

SECTION 12 - PIPEWORK

12.1 Scope

This section of the Specification sets out the requirements for the design, and standards of workmanship which shall be adopted in the supply, fabrication and installation of black and galvanized steel piping (other than refrigerant piping) and also of valves and fittings contained therein. It also includes the requirements for testing and insulation of piping.

12.2 Standards and Codes

This Specification is basically in accordance with BS 806, "Ferrous piping systems for and in connection with land boilers". However, when more detailed design, connection and testing information is required than provided in this Section of the Specification, the detailed provisions of these codes shall apply.

Where this Specification requires materials, construction, tests or performance to comply with any Standard or Code, that Standard or Code shall, unless specified otherwise, be that which is current at the closing date for tenders. If subsequent to the award of the contract any such Standard or Code is amended, the Engineer may direct that the Contractor comply with such amendment.

The installation of pipework shall conform to:-

BS 10:1962	Flanges and bolting for pipes, valves and fittings
BS 21:1973	Pipe threads for tubes and fittings where pressure-tight joints are made on the threads
BS 3974	Pipe supports
BS 1710	Identification of pipelines
CP 2010	Pipelines
BS 3601	Steel pipes and tubes for pressure purposes :carbon steel with specified room temperature properties

12.3 Responsibility for Piping Design and Approval of Drawings

Unless otherwise specified in the Specification, the Contractor shall be responsible for the design and construction of the piping system so that it will meet the capacity requirements of the Specification and the requirements of this Section. He shall prepare installation drawings showing full details of the piping arrangement, pipe sizes, pipe supports, connections to equipment and all other details to indicate how equipment and piping will be installed. These drawings shall be submitted to the Engineer for approval at least four weeks prior to the date it is intended to commence fabrication or installation.

12.4 Piping Materials

It shall be the successful Tenderer's responsibility to ensure that piping materials and wall thickness comply with the relevant Standard Codes or Statutory Authorities requirements.

However, the pipe schedule in Clause 12.5 lists the minimum standard which shall be acceptable. Should the successful tenderer wish to use alternative materials, substantive calculations shall be submitted and written approval shall be obtained from the Engineer prior to installation. Any variations to the schedule shall be as specified in the Specification.

12.5 Pipe Schedules

Piping of the following types and materials shall be used for the various services, in accordance with *General Specifications for Air Conditioning Installations, December 1987* from Department of Electrical Services.

12.6 Arrangement and Layout Piping

The drawings indicate the desired and approximate positions and arrangement of all piping.

In Contractor's installation drawings which will be subject to the Engineer's approval all pipework shall be arranged so as not to interfere with the removal of equipment or devices and to ensure clear access to doors, windows, manholes and other access openings. Pipework shall be arranged to allow easy removal of tube bundles and coils.

12.7 Preventing Transmission of Vibration

Where the piping has insufficient flexibility to prevent transmission of vibration through it to the building structure, or where specifically required by the Specification, flexible connections shall be provided at connections to rotating and vibrating machinery.

Where flexible pipe connections are used, they shall be selected to accommodate the axial and lateral dynamic deflections of the isolated equipment. Flexible connectors shall have a minimum length equal to six (6) times the nominal pipe diameter and a maximum length of 3 ft. Flexible connections shall be installed so that their axes are parallel to the axis of rotation of the equipment to which they are connected, and adequate pipe anchorage shall be provided to prevent stressing of the pipework or connected equipment by the longitudinal forces resulting from the flexible connection.

The installation recommendations of the manufacturer of the flexible connections shall be strictly observed. Approval to use flexible connections shall be obtained from the Engineer prior to the installation of these devices.

12.8 Pump Connections

Special care and precautions shall be taken in arranging and installing pipework connected to the suction and delivery side of pumps. Particular attention shall be given to the following:-

(a) Piping Sizing

Full line size pipework shall be taken right to the pump, with correctly proportioned tapered reduction pieces, if required, immediately at the suction and discharge connections. Any valves and fittings, in such piping shall be full line size.

(b) Piping Arrangement

A straight pipe of a length equal to at least four (4) pipe diameters shall be provided on the pump inlet. Where the pump is flexibly mounted but no flexible piping connections have been specified, the piping shall be arranged so as to ensure sufficient flexibility to allow for the slight movement of the pump on its mountings.

(c) Piping Supports

The piping adjacent to the pumps shall be positively and strongly supported so that the completed weight of the piping is taken by the supports and/or hangers and not by the pump. Unless specified otherwise, all piping attached to vibration isolated pumps shall be supported via approved flexible hangers or anti-vibration mounts, for a length equal to approximately 100 pipe diameters, or a minimum of 15 ft.

(d) Recommendations of Pump Makers

Any special recommendations or instructions of the pump maker concerning the piping connections to any particular pump shall be fully observed.

12.9 Pipe Supports

Pipe supports shall permit appropriate movement for expansion and contraction in the desired direction and prevent transmission of vibration. All pipe supports shall be installed in conjunction with *General Specifications for Air Conditioning Installations, December 1987* from Department of Electrical Services.

Vibration isolation supports shall consist of neoprene in shear and helical spring assemblies. Materials, design and dimensions of supports shall conform to the recommendations of BS 3974 "Pipe Supports".

12.10 Anchors

Anchors shall be provided where shown on the drawings to provide reactions for expansion devices and flexible type connections and to prevent excessive expansion or contraction forces in pipework from being transmitted to equipment. On steel pipes, anchors may be either welded or clamped securely to the bare pipe.

12.11 Grading

Piping shall be installed true to alignment and grade. Crooked or sagging pipes which will trap liquid or air are not acceptable.

Clips, hangers and supports shall be fabricated from mild steel hot dip galvanised after manufacture and shall be of proprietary manufacture and in quantity production and to the approval of the Engineer. Where the successful Tenderer wishes to use supports of his own manufacture, he shall submit drawings of samples to the Engineer for approval. Supports which have not been approved prior to installation may be rejected.

Where pipes run together in parallel, their supports shall be grouped. Fastening of supports to the building or structure shall be by means approved by the Engineer prior to any fixing being made. Wooden plugs and explosive powered fasteners are not acceptable. Steelwork shall not be drilled or welded to unless approval has been given by the Engineer. On cold insulated pipes, an insulation ferrule shall be placed between the pipe and the pipe support. The ferrule shall consist of a lightweight rigid cellular inorganic glass insulated block, having an average ultimate compressive strength of not less than 80 psi.

The ferrule shall have the same wall thickness as the adjacent pipe insulation and be of a length sufficient to ensure that the support does not contact the pipe insulation due to movement of the pipe. The ferrule shall be coated internally with an anti-abrasion compound compatible with the material of the ferrule, and held in place using reinforced aluminium foil such as Sisalation 450 or equivalent applied with a longitudinal lap using a non-flammable (dry state) adhesive.

The butt joints between, and continuity of vapour barrier over, the ferrule and insulation shall be as set out under 'Insulation of Piping'. Reducing fittings shall be of the eccentric type and installed to prevent liquid or air trapping at the fitting. Unless shown otherwise, all pipework shall be run truly horizontally with the exception of drain lines which shall have a minimum downward grade of 1:50.

Where piping has to clear an obstruction, piping carrying liquids shall pass under the obstruction and piping carrying air and vapours shall pass over the obstruction. In these cases grading, drains and vents shall be arranged to ensure that the piping can be drained and vented.

12.12 Drains

Sufficient drains shall be provided to allow the whole or any part of the system to be drained of fluid. Valved drains shall be provided at all low points on the piping systems. Refer to *General*

Specifications for Air Conditioning Installations, December 1987 from Department of Electrical Services for correct installation.

12.13 Automatic Vents

Refer to *General Specifications for Air Conditioning Installations, December 1987* from Department of Electrical Services for correct installation.

12.14 Storage & Cleaning

Where ferrous piping is stored in the open on site, it shall be supplied with an oiled or varnished finish prior to delivery to site. Open ends of pipe shall be plugged or kept closed.

Before erection, ferrous pipe shall be thoroughly cleaned of loose scale and dirt by blowing through with compressed air or by pulling a brush through the pipe. Any rusting on the exterior or ferrous piping shall be wire brushed clean and painted prior to erection with a rust inhibitor as detailed under Clause 12.56 "Corrosion Protection - Surface Preparation and Coatings".

After installation and before hydrostatic testing, all piping shall be thoroughly cleaned out by washing through with water until all foreign matter is removed, or if practicable, blown through with steam. Temporary filters shall be installed in inlet pipes to equipment at the commencement of commissioning and shall be removed just prior to handing over. Final cleaning shall be carried out in the presence, and to the satisfaction of the Engineer.

12.15 Cutting and Preparation

After cutting the pipes, all burrs shall be removed from both the inside and outside edges of the cut face.

12.16 Protection of Open Pipework

During the course of installation, any open ends of pipework left at the end of each day or each phase of work shall be sealed off by using caps or plugs to prevent the entry of foreign bodies, or refuse. Wooden plugs, rags or papers shall not be used to seal open ends.

12.17 Earthing

No piping shall be used for electrical earthing.

12.18 Drip Trays

Drip trays shall be installed under all cold exposed fittings, coils or pumps on which condensation may occur. The fixing, insulating and provisions for draining drip trays shall be as shown on the drawings.

12.19 Sleeves

Where pipes pass through walls, floors or ceilings, the holes and sleeves shall be positioned as shown on the drawings. Sleeves shall be formed from the same material as that of the pipe, but shall be not less than 16 ga. for steel pipe, and shall be of such a size as to ensure a clearance of not less than 5/8 in. in diameter.

Where pipes pass through a fire-rated wall, the annular space between the sleeve and the pipe shall be packed with asbestos fibre rope and tamped into the space. Sleeves set into "wet" floors, such as ceramic tiled or "grano" floors suitable for washing or hosing down, shall be of galvanized steel pipe and shall project 2 in. above finished floor level.

12.20 **Pipe Joints**

Where possible, long pipe lengths and permanent type joints, e.g. welded joints, brazed joints, screwed socket joints (as applicable) shall be used. The number of demountable joints, e.g. flanges, unions, compression joints (as applicable), shall be kept to a minimum. Joints in pipework shall be built with reference to *General Specifications for Air Conditioning Installations, December 1987* from Department of Electrical Services for correct installation.

12.21 **Locations and Use of Demountable Joints**

Demountable joints are joints which allow sections of piping to be disconnected from each other or from fittings or equipment. They include flanges, unions and compression fittings, but not screwed sockets. Demountable joints shall not be buried directly in the ground, but may be located in pits.

Demountable joints shall be provided as follows:-

- (a) Where pipework may have to be dismantled for maintenance purposes.
- (b) Where called for on the drawings.
- (c) At all connections of piping to plant (pumps, condensers, etc.)

The following demountable joints shall be used:-

- (a) All pipes over 2 in. diameter shall be provided with flanges.
- (b) Steel pipes up to and including 2 in. diameter may be provided with screws, unions or with flanges.

12.22 **Removal of Screwed Valves**

Where screwed valves are allowed, union or flanged joint shall be provided adjacent to the valve to allow disconnection of the item of equipment it serves or the valve itself without having to dismantle an extensive amount of pipework.

12.23 **Connection to Plant**

Connections to items of plant shall be provided with isolating valves and designed to permit dismantling of the plant item without disturbing other pipes, and to permit removal of the plant without removing the piping or draining the system.

12.24 **Approved Types of Joints**

Joints in pipes shall be of the types as allowed in *General Specifications for Air Conditioning Installations, December 1987* from Department of Electrical Services for correct installation.

12.25 **Pipe Fittings**

Tees and similar fittings, except where specified otherwise, are to be in accordance with *General Specifications for Air Conditioning Installations, December 1987* from Department of Electrical Services for correct installation.

12.26 **Bends**

12.26.1 **General**

The following requirements for bends in systems are based on consideration of piping system flexibility, stresses, matching of system component diameters and wall thickness, on frictional resistance to flow.

12.26.2 **High Temperature Range Systems**

For all piping systems joined by either welding, brazing or screwing, the use of bends formed from straight steel pipe, identical to the adjoining piping in the system is preferred. Bends shall have radii not less than those specified in BS 806, "Ferrous piping system for an in connection with land boilers" for bends made from steel pipe.

12.26.3 **Welded Steel Bends and Elbows**

For welded steel pipeline construction where it is not practicable to use pipe bends complying with the requirements of BS 806, butt welding long radius elbows may be used. Long radius elbows manufactured in either "Standard Strength" or "Extra Strong" thickness, in accordance with the requirements of BS 1640 Part 1, "Steel Butt Welding Pipe Fittings for the Petroleum Industry" are acceptable.

In order to obtain the correct matching between butt welding fittings and mating pipework, consideration shall be given to the following requirements before final selection of piping is made:

- (a) The use of "Standard Strength" butt welding elbows with "Medium Grade" steel pipe to BS 3602, "Steel pipe and tube for pressure purpose : Carbon steel with specified room temperature properties" shall be restricted to pipe sizes up to and including 2 inch. Above 2 inch "Standard Strength" butt welding elbows shall only be used with welded and seamless steel pipe to BS 1600, "Dimension of steel pipe for the Petroleum Industry", "Standard Strength" quality.
- (b) "Extra Strong" butt welding steel elbows shall only be used with welded and seamless steel piping to BS 1600, "Extra Strong" quality.

12.26.4 **Screwed Steel Elbows and Bends**

Where on pipelines up to 3/4 inch diameter it is not practicable to use screwed pipe bends complying with the requirements of BS 806, then steel elbows or bends up to and including 6" diameter made in accordance with BS 1740, may be used.

12.27 **Procedures for Metal Arc and Gas Welding**

Welding shall be in accordance with BS 2633, BS 2971, BS 1821 and BS 2640.

12.28 **Testing of Piping**

12.28.1 **Material Tests**

All piping and fittings used shall have been tested in accordance with the requirements of the relevant British Standard Specification and/or the requirements of any local Statutory Authority for the material concerned.

12.28.2 **Pressure Tests**

All piping shall be pressure tested during installation with water under a pressure of not less than 150 psi and not less than twice the working pressure.

Pressure testing shall be done before piping is insulated, painted or otherwise covered over.

The Engineer shall be notified in writing at least 48 hours before the test, of the date on which the test will take place. The test shall be witnessed by the Engineer. Testing shall not be accepted unless witnessed as specified.

Unless otherwise specified, testing shall be as follows:-

- (a) Close only those valves necessary or fit blank flanges necessary to hold the test media in the section or piping under test. Remove or isolate any fittings, controls or instruments not designed to withstand the test pressure.
- (b) Charge the system, to the test pressure specified, and maintain this pressure for sufficient time to allow all piping, joints and fittings to be inspected for leaks.
- (c) If any leaks are found, they shall be repaired and the pipework then retested as described above.

12.28.3 **Thermal Movement Tests**

After installation and pressure tests, pipework which operates at a temperature above or below normal ambient temperature shall be cycled between ambient and operating temperature at least three times, or until the Engineer is satisfied that the provisions made to cater for expansion and contraction function properly and that the piping remains tight, sound and true to line and will not damage itself or the insulation or cause damage to connected equipment or to the building structure.

The cycle time shall be of sufficient duration to ensure that each system reaches its normal operating temperature and pressure and remains at these conditions for at least one hour.

12.29 **Identification of Piping**

All pipework shall be identified in accordance with BS 1710, "Identification of Pipelines".

12.30 **Method to Identification**

Unless specified otherwise in the Specification, all piping except those built into walls or buried in the ground shall be painted throughout and the finished background colour shall be that described in BS 1710.

Piping shall then be further identified by markers applied at not more than 25 ft intervals on straight runs, both sides of any wall, floor or any other partition through which the pipe passes, adjacent to valve, branch line or control points, and any outlet. Rising pipes shall be marked at each accessible level, concealed pipes shall be marked where access panels occur.

Where a pipe is insulated, the background colour and identification markers shall be applied over the finished insulation.

12.31 **Marker Design**

All markers shall consist of a flexible glossy white pigmented film with the under side completely pre-coated with an aggressive pressure sensitive adhesive. The adhesive shall be protected by a

treated paper liner which shall be removable without soaking in water or other solvent and shall be scored to facilitate removal.

The adhesive shall be such as to bond in a manner not permitting the removal of the marker, in one piece, from a clean aluminium surface without the aid of physical tool. The adhesive shall be such as to provide adequate adhesion to sand cast or moderately rough, cleaned pipeline surface.

The markers shall retain adhesion and performance within the temperature range -50 °F to +212 °F. Marker to be installed where temperature is in excess of 212 °F, shall be of a type submitted to the Engineer for approval prior to being used. The design of the pipe marker shall incorporate a ground colour block not less than 15 inch in length. The ground colour shall be surrounded by a white border and at both ends, external to the ground colour block, directional chevrons shall be incorporated.

These shall be of a plain colour against a white background. The arms of the chevron shall be of uniform width throughout their length. The design around the ground colour may be retained intact to preserve the aesthetic balance of the marker.

12.32 **Direction of Flow Chevrons**

The Contractors shall in all cases of applying markers to pipelines determine the flow direction in the pipe, shear off the unwanted chevron and apply the marker with the correct flow direction indicated.

12.33 **Flow and Return Indicators**

The Contractor on all visible piping shall apply flow and return indicators, determining which are the flow and return pipes. Flow and return indicators shall consist of the letters "P" and "R" respectively, printed black on white materials, similar to that of the colour markers and shall be applied over the unwanted chevron of the colour marker.

12.34 **Supplementary Safety Signals**

Supplementary safety signals shall be over a length of not less than 3 inch and applied over the markers on all pipes carrying dangerous materials, fire fighting materials and potable water, the colour of the safety signal being governed by the nature of the pipeline contents.

12.35 **Lettering**

A description of the fluid carried shall be provided on the marker and shall be in accordance to BS 1710. On pipes smaller than 1/2 inch lettering may be applied to tags or plates, provided that these are securely attached to the pipe, Lettering on tags or plates shall be a minimum of 3/16 inch.

Pipes 1/2" - 1"	-	e" high letters on marker
Pipes 1 1/4" - 3"	-	1" high letters on marker
Pipes 4" and above	-	1 1/2" high letters on marker

12.36 **Application Instructions**

Comprehensive printed instructions shall be provided with each packet of markers. The instructions shall give full details of application techniques including pre-coating of surface where necessary and edge sealing. See the drawings for typical marker arrangements.

12.37 **Table of Colouring and Lettering Details**

Service	Base	Main	Lettering
Chilled water supply flow pipes	Green	Island 119	CHWS
Chilled water return pipes	Green	Tropicana 2026	CHWR
Refrigerant pipes	Brown	Brown	REFRIGERANT
Condensate pipes	Black	Black	CONDENSATE

* Colour references are base on ICI Dulux Colour Card.

Pipe identification shall conform to BS 1710, "Identification of Pipelines".

The Air-Conditioning Contractor shall submit samples of the paints for approval and no painting shall commence before approval is obtained from the Engineer. The final choice of the colours shall be determined by the Engineer.

Paint numbers quoted in the table in Clause 12.52 are from BS 381C "Colours for Specified Purposes" and colours shall comply with this Standard.

12.38 **Valves**

Supply and install valves where shown on the drawings and as described in *General Specifications for Air Conditioning Installations, December 1987* from Department of Electrical Services for correct installation.

12.39 **Corrosion Protection - Surface Preparation and Coatings**

Provide corrosion protection to all ungalvanised metal surfaces with appropriate coatings to the Engineer's approval, corrosion protection shall comply with BS 5493:1977 'Protective Coating of iron and steel structure against corrosion'.

Before application of any coating, the surface shall be dry and free from mill-scales, rust, dirt, grease and other chemical contaminants. All mill-scale and rust shall be removed by powered wire-brushing, discing, mechanical abrading etc. The mill-scale free surface shall then be treated with ICI Deoxidine 125 to remove rust. Two coats of ICI F 540-150 Dulux Quick Drying Red Lead primer shall be applied.

The welded part of any galvanised surface shall be made good by first removing all scale and heat-damaged coatings by local blast-cleaning and then applying zinc-rich paints to reinstate the original dry-film thickness. Surface preparation and coatings shall be in accordance with BS 5493:1977 and the Manufacturer's recommendations.

- END OF SECTION 12 -

SECTION 14 - SERVICE AND MAINTENANCE

14.1 Scope

This section of the Specification covers the provision of all materials, appliances, labour and necessary incidentals for the service and maintenance of the Air Conditioning and Ventilation Systems and the Ancillary Equipment for the Mechanical and Electrical Services within the Defect Liability Period under this Contract.

14.2 Workmanship and Materials

The work described in this section shall be performed by workmen skilled in the service, maintenance and repair of central air conditioning plant of all types and shall be executed in accordance with the best practice in the industry.

All materials supplied in connection with works under this section shall be new and unused and shall generally be of the best quality as regards manufacture and performance.

14.3 Instruction of Personnel

The Contractor shall provide an operator skilled in all aspects of the operation of the mechanical services installed (including refrigeration machines, pumps, air handling plant and instrumentation) within the Defect Liability Period from the date of practical completion of the installation to competently and thoroughly instruct the operating personnel in all aspects of operation, maintenance and trouble-shooting techniques associated with the installation.

This operator shall be required to work 40 man-hours per week, not necessarily during normal office hours. Reimbursement rates of properly authorised hours in excess of this figure will be subject to agreement between the Contractor and the Employer.

If so desired more than one operator may be supplied, each skilled in a certain aspect of the installation. In such circumstances, all aspects of expertise shall be represented on the site for the full period of instruction.

Persons so described above shall be acceptable to the Engineer. If a person is at any time deemed unsuitable by the Engineer, then he or she shall be replaced with a person acceptable to the Engineer.

14.4 Description of Work

The Contractor shall be required to carry out but not limited to the works described below:-

- (a) All machinery and equipment comprising the complete Air Conditioning System and Ancillary Equipment under this Contract shall be serviced and maintained strictly in accordance with the Service and Maintenance Schedule as set out below and/or in accordance with the manufacturers' recommendations.
- (b) The Contractor shall advise the Employer of any defects in any part of the complete air conditioning plant and ancillary equipment observed during the routine inspection and service, and shall repair such defects if required to do so by the Employer.
- (c) The Contractor shall provide emergency repair services during normal office hours and also during overtime hours if required to do so by the Employer without incurring additional expenses on the part of the Employer.
- (d) The Contractor shall keep a log book in the main plant to check the performance of the air conditioning system and the ancillary equipment.

14.5 Servicing and Maintenance Schedule

The Contractor shall inspect and service all machinery and equipment comprising the complete Air-Conditioning Plant and Ancillary Equipment under this Contract at least once a month, except where otherwise directed by the Employer and/or the Engineer.

At each such monthly inspection and service of the complete Air-Conditioning Plant and Ancillary Equipment, the Contractor shall carry out the periodic servicing and maintenance routines in strict accordance with the manufacturer's recommendations and the work detailed below:-

- i) Inspect all refrigerant compressors and refrigeration system and
 - (a) Check the whole refrigeration circuit for leaks with a standard halide gas leak detector and rectify as necessary.
 - (b) Check all refrigerant and oil levels and charge correct amount and proper type of refrigerant and lubrication oil into system as necessary.
 - (c) Inspect V-belts and pulleys for signs of abnormal wear or pulley misalignment. Adjust or replace worn-out parts as necessary and maintain proper belt tension by necessary adjustments.
 - (d) Check for oil leaks around packing and tighten packing glands sufficiently to prevent leakage only.
 - (e) Check the operation of all safety devices such as relief valves and clean, adjust and lubricate as necessary.
 - (f) Check the operation of all refrigerant controls such as that of expansion valves, pressure switches, thermostatic gas-filled bulbs and clean, adjust and lubricate as necessary.
 - (g) Check the suction and discharge pressure of all refrigerant compressors and if abnormal, trace the faults and rectify as necessary. Test cutting in and out points by proper adjustment of pressure control switches.
 - (h) Check all bolts and nuts for tightness and tighten as necessary especially foundation bolts for compressors.
 - (i) Check condition of vibration isolators of compressors and if faulty, rectify or replace as necessary.
 - (j) Check strainers installed on refrigerant lines and clean if necessary.
 - (k) Check for knocks, abnormal noise levels and excessive vibration in compressors and rectify as necessary.
 - (l) Purge system of air and non-condensable gases by following manufacturer's instructions.
- ii) Inspect all air handling and fan coil units, and
 - (a) Check all air filters and clean or replace as necessary.
 - (b) Check all cooling coils seals, fittings, connections and pipelines for leaks and rectify as necessary.
 - (c) Purge air and non-condensable gases from all cooling coils by adhering to manufacturer's instructions.

- (d) Check all fan bearings and lubricate with oil or grease as necessary.
 - (e) Inspect belts and pulleys for wear and check tension of belting and adjust as necessary.
 - (f) Check the operation of automatic water regulating valves and clean, adjust and lubricate as necessary.
 - (g) Check the operation of all automatic multi-blade face and bypass dampers and clean, adjust and lubricate as necessary.
 - (h) Clean all the condensate pans, trays and drains and also operation of drain pipes especially the traps. Rectify any leakage or corrosion as necessary.
 - (i) Clean cooling coils to remove accumulated dirt and other foreign matter by washing with caustic soda solution and rinsing thoroughly with clean water.
 - (j) Check condition of electric reheat coils, remove scale and products of oxidation from surface and replace damaged insulators as necessary.
 - (k) Check surfaces of casing for signs of corrosion and retreat or repaint as necessary.
 - (l) Check insulation and vapour barrier on casing and repair or replace as necessary.
- iii) Inspect all electric motors, and
- (a) Check all motor bearings and lubricate with oil or grease as necessary.
 - (b) Check carbon brushes and slip rings for wear and clean or replace as necessary. Also check contact pressure of carbon brushes and adjust compression springs as necessary.
 - (c) Check commutator for presence of so-called commutator and polish with fine sand paper as necessary.
 - (d) Clean dust and dirt from all current carrying parts and from insulation.
 - (e) Clean all cooling air passages and external fins and retreat or repaint motor casing as necessary.
 - (f) Check starter contact are free from arcing during starting cycle and rectify as necessary.
 - (g) Check all safety devices, such as overcurrent protection devices fitted and clean, adjust and lubricate as necessary.
- iv) Inspect all air distribution equipment, and
- (a) Clean and repaint all grilles, registers and diffusers as necessary.
 - (b) Clean or replace air filters on fresh air inlet grilles.
 - (c) Check and repair insulation on ducts and rectify leakage on joints as necessary.
 - (d) Check operation of all dampers and clean, adjust and lubricate as necessary.

- (e) Check operation of fire dampers and lubricate all moving parts. For installation with a number of such dampers, carry out a random check on the proper operation of the fusible links especially its rated fusing temperature. Also check on condition of insulation around framework and sealing capability of damper blades and rectify as necessary.
- (f) Readjust all control dampers on diffusers and splitter dampers as necessary to obtain the proper amount of airflow desired.
- v) Inspect all condensers, and
 - (a) Check coils, connections, fittings and pipelines for leakage and rectify as necessary.
 - (b) Check casing for signs of corrosion and rectify as necessary.
 - (c) Purge air and non-condensable gases from coils by following manufacturer's recommendations.
 - (d) For air-cooled ones, clean cooling fins of dust and dirt by compressed air.
 - (e) Check condition and operation of safety devices such as relief valves and clean, adjust and lubricate as necessary.
 - (f) For air-cooled ones, check and lubricate fan and motor bearings with oil or grease as necessary, check condition of vibration isolators and rectify if necessary, check and adjust belt tension as necessary.
 - (g) For shell and tube condensers, clean water side tubes by mechanical or chemical means to remove scale, check condition and operation of all regulating valves.
- vi) Inspect and check the routine operation of all electrical starters, electrical control gears and ancillary electrical apparatus, and
 - (a) Clean, adjust and lubricate all bearings, pivots and other moving parts as necessary.
 - (b) Clean or renew electric contactors as necessary.
 - (c) Renew electric fuses as necessary.
 - (d) Clean dust and dirt from current-carrying parts and from insulation as necessary.
 - (e) Check contact points of contactors and relays for wear or pitting and for arcing during operation and rectify or renew as necessary.
- vii) Inspect and check the routine operation of all automatic temperature control gears and relays, and
 - (a) Clean, adjust and lubricate all bearings, pivots and other moving parts as necessary.
 - (b) Clean or renew electric contactors as necessary.
 - (c) Renew electric fuses as necessary.
- viii) Check the performance of the complete Air-Conditioning Plant and Ancillary Equipment and perform the necessary adjustments such as that for the air volume control dampers.

- ix) Inspect and check all insulation and vapour barrier on chilled water pipes, allied fittings such as valves, refrigerant lines and chilled water expansion tanks for signs of damage or wear and rectify as necessary.
- x) Check operation and condition of all valves in system and inspect corresponding flanged, welded, soldered or screwed connections for leakage and rectify as necessary. For leaky valves, tighten packing gland or nut or replace packing or stem as necessary. Examine valve seats and if pitted, grind with fine abrasive to alleviate leakage.
- xi) Check operation of air handling unit cut-out relay by activation of smoke detector(s) in plantroom and rectify if necessary.
- xii) Inspect and check all other equipment under this Contract, whether or not these are specifically mentioned in this Schedule.
- xiii) Instruct the operators responsible for the operation of the plant and equipment on correct method of operating the plant and equipment, and on the maintenance points to be watched.
- xiv) Report in writing to the Employer any defect(s) observed in any part of parts of the complete Air-Conditioning Plant and Ancillary Equipment. The report shall state the cause(s) of the defect(s) observed, and shall include an estimate of the cost of repairs required.
- xv) Inspect all water pumps, and
 - (a) Check all seals, glands, fittings, connections and pipelines for leaks and rectify as necessary.
 - (b) Repack and adjust packing glands as necessary. Allow for a small amount of drip to prevent excessive friction.
 - (c) Check all pump bearings and bushings and lubricate with the correct amount of lubricating oil or grease as necessary.
 - (d) Check alignment between pump and driver and condition of all elastomer couplings between them and rectify or replace as necessary.
 - (e) Check tension of all belt drives and adjust as necessary.
 - (f) Inspect pulleys for worn or damage grooves and belts for abnormal wear and rectify as necessary.
 - (g) Check condition of contact faces of mechanical seals and rectify as necessary.
 - (h) Check casing and baseplate for signs of corrosion and rectify as necessary.
 - (i) Check condition and operation of associated fittings such as gate valves, check valves, globe valves, vibration isolators and strainers and rectify or replace as necessary. Clean all strainers as necessary.
 - (j) Check all bolts and nuts for tightness and tighten as necessary especially the foundation bolts.
 - (k) During normal operation of pumps, check for abnormal sounds or vibration, suction and discharge pressure and bearing temperatures and rectify as necessary.
- xvi) Inspect, check, repair as necessary all automatic control including DDC control related instrument and sensors as per Section 3.

- xvii) Inspect all chilled water storage and expansion tanks and drains, clean and flush out the tanks as necessary and retreat or repaint all areas showing signs of corrosion and similarly to maintain all other services water tanks.

- xviii) Half Yearly Tasks
 - (a) Check all direct-expansion refrigeration systems for operating pressures, temperatures, undue vibration, refrigerant leaks, also cleanliness of condenser fans.
 - (b) Arrange for a specialist inspection and check-up of the automatic control.
 - (c) Arrange for a specialist service to check chiller sets for correct operation. Check operating temperatures and pressures, operating and safety controls. Top up refrigerant and/or oil changes as required.

- xix) Yearly Tasks

As half-yearly, and in addition:-

 - (a) Inspect and repack with grease fan and motor bearings.
 - (b) Inspect, clean, tighten, adjust and otherwise rectify any faults in the electrical switchboards and installation.
 - (c) Clean condenser water tubes in chiller sets.
 - (d) Thoroughly inspect, flush out and clean cooling towers, including fans and drives. Remove any rust and make good corrosion protection as required.
 - (e) Dismantle pumps, clean out internally and externally, grease bearings and repack glands. De-rust and make good anti-corrosive coatings.
 - (f) Dismantle and clean all water strainers.

14.6 Consumable Materials

The Contractor shall supply the following consumable materials as and when required.

- i) All oils and greases required for lubrication of compressors, bearings, pivots and other moving parts.
- ii) All refrigerant required to replace refrigerant losses in the refrigerant systems and for testing purposes.
- iii) All consumable filter elements.
- iv) All carbon brushes and slip rings required to replace worn ones in electric motors.
- v) All electric contact points required to replace worn electric contact points in switch gears, motor starter gears, electric control gears and electric relays.
- vi) All electric fuses required to replace blown fuses. All materials for patch-up jobs such a primer and gloss finish paint, insulation, vapour barrier and gland packing.
- vii) All materials for replacing or worn-out ones such as bearings, bushings, belts, pulleys and fusible links.

- viii) All incidental consumable such as adhesives, screws and allied fixing materials, sandpaper, abrasive, chemicals for cleaning purposes, solvents, solder, welding and brazing rods and so on. These shall be of the best quality suitable to the job envisaged.
- ix) All cotton waste, soap detergent and other cleaning materials required for cleaning purposes.

The cost of these consumable materials shall not be charged for separately by the Contractor, but shall be included in the fixed monthly rate quoted by the Contractor for the service and maintenance of the complete Air-Conditioning Plant and Ancillary Equipment.

All replacement materials or items shall be new and of the same quality and type as the original ones. Approval shall be sought from the Engineer if alternatives are to be used. If such prior approval is not obtained, the material or item shall be rejected and the Contractor shall replace it to the satisfaction of the Engineer with no extra cost incurred on the Employer.

14.7 Service and Maintenance Record

The Contractor shall provide a service and maintenance record book for the complete Air-Conditioning Plant and Ancillary Equipment being serviced and maintained by him. This record book shall be kept in the plantroom of the Air-Conditioning Plant and Ancillary Equipment being serviced and maintained and brief details of all service, maintenance and repairs carried out on the complete Air-Conditioning Plant and Ancillary Equipment shall be entered by the Contractor into this book for checking purposes. The address and telephone number of the Contractor's service office shall also be entered into this record book to facilitate emergency service calls.

The Contractor shall also keep an accurate detailed record in duplicate of all service, maintenance and repair work carried out by him on the complete Air-Conditioning Plant and Ancillary Equipment. This record shall be in the form of a Maintenance/Repair Sheet and shall be countersigned by the Employer each time the Air-Conditioning Plant and Ancillary Equipment is attended to by the Contractor.

- END OF SECTION 14 -

SECTION 16 - VENTILATING FAN

16.1 Scope

This section of the Specification sets out the requirements for the design, materials and the standard of performance which shall be adopted in the manufacture and installation of ventilating fans.

16.2 General

The Contractor shall engineer, supply and install all fans and ventilators where shown on accompanying drawings for the proper and efficient ventilation of the building. Fans and ventilators shall be of the type and arrangement suitable for achieving the requirements of the ventilating system design.

16.3 Capacity

All fans and ventilators shall be of size and capacity not less than the minimum required for the design when operating under the specified conditions.

All fans shall be tested in accordance with AMCA Standard 210, 'Test Code for Air Moving Devices' and BS 848.

16.4 Fan Types

(a) Propeller Fans

Propeller type fans shall generally be used for the movement of relatively large volumes of air at low static pressures or at free-delivery conditions. The fan shall consist of a multi-blade impeller arranged for ring or diaphragm-mounting and connected to a direct driving electric motor. Impeller and mounting frames shall be manufactured from heavy gauge metal or other approved type materials designed for industrial or commercial uses and capable of continuous operation under the conditions encountered. Fans shall be carefully selected to suit the capacity and service required and shall be protected with due respect to corrosion, inflammability or other hazardous application. Fans shall be designed for balanced and vibration-free operation with a minimum noise level and power consumption. Unless specifically approved by the Engineer, fan speeds shall not exceed 1450 rpm. Fans shall be generally ring or diaphragm-mounted to suit the particular installation. Where required, all fan ancillaries such as external grilles, wire guards, cowls, bell mouth entry or automatic louvre shutters shall be provided. The sound levels of fan shall not exceed NC 45 and shall be tested to BS 848 Part 2, 'Fan Noise Testing'.

(b) Aerofoil Axial Flow Fans

Aerofoil axial type fans shall generally be applied to the supply and extraction of air against system static pressure due to ductwork, filters, grilles, dampers and other losses.

Unless otherwise required, aerofoil axial fans shall be of tube axial arrangement with the impellers mounted within a casing of heavy gauge hot-dipped galvanized steel. Impellers shall be manufactured of die-cast aluminium alloy or other approval suitable material to suit the conditions of operation. Impellers shall be of adjustable pitch and capable of producing the flow and pressure required.

Fans shall be designed for balanced and vibration-free operation with a minimum of noise level and power consumption. Unless specifically approved by the Engineer, fan speeds shall not exceed 1450 rpm. The noise levels of fan shall not exceed NC 45 and shall be tested in accordance with BS 848 Part 2. The fan and casing shall be carefully selected to suit the service conditions encountered and shall be protected with due respect to corrosion, inflammability or other hazardous applications.

Connection of the fan casing of air ductwork shall be by means of flexible connections. Where required, all ancillaries such as wire guards, cowls, bell mouth entry, volume dampers or automatic louvre shutters shall also be provided.

(c) Air Curtain

Air curtains shall be provided wherever necessary for isolating cooling, heating or air movement between different compartments. The design of the unit shall ensure high efficiency in heating/cooling retention and to provide for efficient dust-proofing, deodorizing and insect-proofing effect.

The unit shall be suitable of either inside, outside, ceiling-mounted or concealed installation. Fans shall be of large size, double suction centrifugal type. The size and capacity shall be selected to suit the service required, and shall be capable of continuous operation under the conditions encountered. The air curtain casing shall be of elegant design and finish, with air deflection vanes designed for easy adjustment. Filters shall be provided at the inlet side for the removal of dust particles and these shall be of the replaceable type.

Operation of the fan shall include for a 3-speed changeover switch for remote control for "High", "Medium" and "Low" air discharge requirements.

16.5 Fan Motors and Drives

Fans may generally be direct motor driven or connected to the motor by means of a V-belt drive. Motors shall be of the constant speed, squirrel cage induction, totally enclosed type. Fan motors shall be rated for continuous operation in ambient temperatures of up to at least 40 °C and shall be of sufficient size to efficiently fulfill the fan brake horsepower requirements, including for drive losses.

The motor shall comply with all the regulations of the local authorities and manufactured and rated to BS 2613. Class of insulation shall normally be Class E unless otherwise specified for application in high ambient temperatures. The motor shall generally be designed for weatherproof operation and protected to IP 44 Classification. Where applications under corrosive, inflammable or other hazardous conditions are encountered, motors shall be accordingly protected.

Motors shall be suitable for either 240V, single phase or 415V, 3 phase operation on a 50 Hz AC supply. The motor starter shall be of direct-on-line, star-delta or auto-transformer type to suit the situation in full compliance of the electricity regulations.

Where V-belt drives are used, the drives shall be designed for not less than 150% of the connected driving horsepower. Two belt drives shall be rated at 100% for each belt. Drives shall be adjustable variable-pitch type for units rated up to and including 25 HP. Adjustment shall allow for not less than 20% speed variation of the fan. Fan motors larger than 25 HP, final adjustment of fan speed shall be made during testing and balancing by changing the sheaves as required. Belt drive motors shall be provided with adjustable rails or bases and the drive provided with removable drive guard and screen.

Motors shall be fitted with suitable ball and/or roller bearings. Bearing tolerances and cage design shall be selected to ensure that specified noise levels can be achieved when the fan is in operation. The bearing shall be grease-lubricated and sealed for life.

16.6 Volume Dampers for Fans

Where required for air volume modulation, dampers provided shall be of the butterfly or airstream operated depending on the requirements of the situation. The dampers shall consist of two or more semi-circular vanes pivoted within the damper casing and carried by permanently lubricated bearings. The casing and vanes shall be hot-dip galvanized.

Where hand operated dampers are furnished, the volume modulation shall be by a screw and link mechanism with a hand-wheel control on the outside of the casing. For automatic volume modulation, the dampers shall be motorised with the actuator motor unit and limit switches carefully selected to suit the torque and system characteristics required.

The volume damper shall hold the vanes firmly against air pressure of up to 20 in wg.

16.7 Anti-Vibration Mountings

The installation of all fans shall be complete with all necessary anti-vibration mountings to effectively damper any transmission of fan noise and vibration.

16.8 Acoustic Performance

Each fan and motor shall be selected to ensure that the maximum allowable sound power level stated in the Specification is not exceeded at any specified operating condition.

The Tenderer shall supply with his tender the overall sound power level for each fan and motor operating at the design conditions as per specifications. An octave band analysis of the fan and motor sound power levels for the octave bands 125 Hz to 4,000 Hz shall be supplied. Fans found exceeding the maximum allowable noise levels as specified in Section 7 shall be replaced at no extra cost to the Employer. Sound power levels measurement shall be in accordance with BS 848 Part 2, 'Fan Noise Testing'.

- END OF SECTION 16 -

SECTION 17 - CENTRAL STATION AIR HANDLING UNIT

17.1 Scope

This section of the Specification sets out the requirements for the central handling equipment to be used in conjunction with the air distribution system.

17.2 General

The Contractor shall engineer, supply and install where indicated on the drawings, central station air handling units of the single-zone draw through or multizone blow through with configuration as required for the design. The installation of the unit shall be in accordance with *General Specifications for Air Conditioning Installation, December 1987* published by Department of Electrical Services. The air handling unit shall be tested and constructed in accordance with ARI standard 430.

17.3 Size and Capacity

The unit shall be of the type and size suitable for ensuring a performance and capacity not less than the minimum required for the design when operating under the specified conditions.

17.4 Unit Casing

The casing of the air handling unit shall be of double skinned type and sectionalized construction in accordance with *General Specifications for Air Conditioning Installation, December 1987* published by Department of Electrical Services. All connections of the air handling unit to air ductwork shall be by means of flexible connections on site. Flexible connections shall be of neoprene coated fabric.

(a) Fan Section & Coil Section

The fan section shall house the centrifugal fans and shall be furnished with visual inspection openings. The coil section shall be manufactured same as fan section. Coils shall be mounted on slide tracks. Coil section with cooling coils shall slope towards centre with drain connections on both side. The drain pan shall be adequately insulated to prevent condensation.

(b) Return Air Bypass Damper Section

The bypass damper section shall be supplied in accordance with *General Specifications for Air Conditioning Installation, December 1987* published by Department of Electrical Services.

(c) Return Air and Fresh Air Mixing Box Section

The mixing box section shall be a separate section bolted to the before filter section. Mixing damper blades shall be paralleled acting type, positioned to blend and thoroughly mix the fresh air and return air streams. Damper blade shafts shall be square cross-section, positively locked into V-shape blade channels to prevent blade slippage. Damper bearings shall be nylon in bronze bushings.

(d) Air Filter Section

The flat and V air-filter section shall be manufactured of 16 gauge minimum galvanized steel sheets, securely bolted and braced, and with 18 gauge minimum galvanized steel top and bottom panels. Hinged and latched doors shall be provided on both sides.

17.5 Fans and Motors

Fans shall be of the double-width, double inlet air foil backward curved blade type suitable for the size and characteristics of the system and capable of maintaining the required air flow rate against the total system resistance of ductwork, filters coils, dampers and other losses. Installation shall be in line with *General Specifications for Air Conditioning Installation, December 1987* published by Department of Electrical Services.

17.6 Cooling Coils

The chilled water coils provided for the unit shall be of the extended-fin type selected to suit the capacity and conditions required, to the standards set out in *General Specifications for Air Conditioning Installation, December 1987* published by Department of Electrical Services. The ratings of the coil shall be certified in accordance to ARI Standard 410.

17.7 Filters

Filters to be furnished for use with the air handling unit shall be in accordance with *General Specifications for Air Conditioning Installation, December 1987* published by Department of Electrical Services.

17.8 Condensate Drain Pipe

Provide all insulated condensate pipes from drip condensate drain pan to the floor waste provided by others. Provide U-trap to prevent blow-in.

17.9 Operating Controls

The air handling unit shall be furnished with all the operating and safety controls necessary for the safe and proper functioning of the system. Controls and controllers shall be of the electronic type of approved make and design.

Each air handling unit shall be provided with both local and remote "ON-OFF" switches to be located as specified. When the blower fan in the air handling unit is started, its control system shall be energised. Suitable interlocks shall be incorporated for operating the unit in conjunction with the rest of the air conditioning system. To maintain the discharge air at the pre-determined dew point temperature, an insertion type thermostat shall be provided to modulate the two-way valve in the chilled water line. A return air thermostat shall modulate the face and bypass damper to maintain the room temperature required for constant volume system. Suitable humidistats shall also be installed at appropriate locations to control the plant and maintain the specified conditions.

17.10 Installation

The air handling unit shall be designed for either horizontal, vertical or suspended mounting in accordance with the requirements of the situation. All mounting channels, foundation blocks, holding bolts, vibration isolators or hangers shall be furnished as required to ensure safe and quiet operation. The unit shall be installed with ample allowance for maintenance and service access.

- END OF SECTION 17 -

FIRE PROTECTION SERVICES
(SPECIFICATIONS)

SPECIFICATION FOR FIRE PROTECTION SERVICES

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
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SECTION 4	Hose Reel System Installation	FHR/1 – FHR/2
SECTION 5	Pump Installation	FP/1 – FP/2
SECTION 6	Valves & Accessories	FV/1 – FV/2
SECTION 7	Pipework & Fittings	FPW/1 – FPW/4
SECTION 8	Control Panels	(Refer to Elect'l Specs)
SECTION 9	Material Identification	FMI/1 – FMI/2
SECTION 10	Testing & Commissioning of Fire Fighting Systems	FT&C/1 – FT&C/3

SECTION 1 - BASE SPECIFICATION

All equipment and materials to be supplied and installed under this sub-contract shall be of first grade design and manufacture and shall comply with latest British Standard.

Uniformity of equipment shall be complying throughout the installation.

Where manufacturers are nominated in the Specification or in the following schedule they are intended to define acceptable standards of equipment. Tenderers may submit alternate equipment which are at least equal in every respect to the nominated items.

Steel piping	Maruichi/Nippon Steel/ Kawasaki/Sumitomo
Ductile Iron Pipe	Stanton/Kubota/Von ROL/Pont A Maussom
Copper Pipes	Crane enfield/Yorkshire
Pumps	Worthington/Grundfos/Ajax/Regent
Motors	ABB/Crompton/TECO/GEC
Control Panels	PKS/Power Teck/CE
Valves	Toyo/Hattersley/Pegler/Kitazawa/Bestobell
Vibration Isolators	Kinetic/Mason/Nap
Sprinklers and Sprinkler Accessories	Spraysafe/Viking/Grinell/Angus
Hose Reels	Hart/Sri/Chubb
Dry Riser Landing Valve	Hart/Sri/Chubb
Hydrants, Breeching Inlets	Hart/Sri/Chubb
Dry Riser Hose	Hart/Sri/Chubb
Flow Switches	Saginomaya/Honeywell/Johnson
Pressure Switches	Saginomaya/Honeywell/Johnson
Extinguishers	Killfire/Angus/Chubb
Fire Blanket	Angus/Chubb

SECTION 2 - PORTABLE FIRE EXTINGUISHERS AND FIRE BLANKET

Portable fire extinguisher and fire blanket to the approval of Local Fire Services Department shall be supplied and installed by this Sub-Contractor. The number and types of extinguishers and fire blanket are as shown on the drawings. The extinguishers and fire blanket shall be hung or hook or securely placed on brackets fastened to wall, partition or column in a suitable conspicuous and accessible position. Cost of the brackets shall be included in the tender price. All extinguishers should be installed at height of 1m from the floor level to the handle, unless otherwise indicated.

ABC DRY POWDER FIRE EXTINGUISHER

The dry powder shall be a safe and versatile extinguishing medium ideally suited for high risk environments. The dry powder medium shall be non-conductor of electricity. The headcap shall be corrosive resistant and shall ensure ultimate fluidisation of the powder prior to commencement of discharge. The powder extinguishers shall be designed and constructed in accordance with BS5423.

CO₂ EXTINGUISHERS

This shall be an efficient fire extinguishing medium. It shall smother flames and reduce the oxygen content of air around the fire, thus ensuring extinction. It shall be non-conductive and effective against fires in electrical plant. The extinguisher casing shall be of aluminium alloy with a swivel horn applicator. The CO₂ extinguisher shall be designed and constructed in accordance with BS5423.

Water CO₂ EXTINGUISHERS

This shall have a long life operating efficiency. A special protective coating to prevent corrosion to the containers made of polyethylene base coating shall be applied. The extinguisher bodies shall be prefabricated from steel sheets which are preformed and welded together. The neck rims shall be machined copper plated steel components welded into position on the tops of the extinguisher bodies. Caps shall be of Lexan and hoses shall be of pvc with moulded polycarbonate nozzle.

FIRE BLANKETS

Fire blankets shall be in accordance with BS6575 and shall be made of woven glass fibre giving them a rough surface providing stability. They shall be designed to enable simple storage of the blanket, the container shall be non-corrosive, rigid self-extinguishing white plastic. Instruction on usage should be provided on the cover.

SECTION 3 - FIRE HYDRANTS

The works shall consist of the complete supply and installation of external fire hydrants as per drawings.

HYDRANTS

Hydrants shall be of underground or pillar type as shown in the drawings.

Underground hydrants shall comply with BS750 and shall be fitted with a 65mm "V" thread outlet. Hydrants shall also be equipped with a captive internal valve. Hydrants shall be installed with their outlets not lower than 300mm from the surface. A drain off pipe shall be provided within the hydrant chamber to ensure that the valve chamber is free of water.

Pillar hydrants shall be constructed from cast iron and have a nominal bore of 100mm. Pillar hydrants shall be fitted with 2 numbers 65mm dia oblique type brass/bronze landing valve with a female instantaneous coupling. Valve outlets shall be fitted with a plastic cap and the hydrant shall be finished in signal red. Landing valve shall be manufactured to comply with BS5041 Part 2.

MARKER POSTS

Precast reinforced concrete marker posts with an indicator plate shall be supplied and installed at all sluice valve, air valves, washout and underground hydrant positions and at 150m intervals and changes of directions, on all main supply pipelines. Indicator plates shall be of aluminium alloy construction in accordance with BS3251. Hydrant markers shall be painted in yellow colour while markers for water services shall be painted in a blue colour, with markings as detailed in the drawings.

THRUST AND ANCHOR BLOCKS

Thrust and anchor blocks shall be provided at all bends, tapers, tees and other points where horizontal thrust will occur and also where pipelines are laid on steep grades (1:10 and above). The bearing faces of thrust blocks shall be cast against the bearing side of the excavation.

The dimensions of thrust and anchor blocks are shown on the Drawings.

SECTION 4 - HOSEREEL SYSTEM INSTALLATION

This section of the specification shall cover the supply, installation, testing and commissioning of the hydraulic hosereel pump, along with all accessories like hose, reel, pipework, valves etc. as shown on drawings. The system shall be in accordance with the requirements of BS 5306 Part 1.

WATER TANK/ HOSEREEL PUMP SYSTEM

Water tank (if required/specified in Bill of Quantities) shall be of sectionalised construction and made of Stainless Steel. The hosereel pump shall be vertical in-line type. The hosereel pump system shall comprise of one duty and one standby pump for transfer of water from a suction tank directly to the fittings. A hydro-pneumatic tank shall be provided to store water under pressure to increase the duration between pump starts. Level control shall be by extra low voltage no float level sensing electrodes and controllers.

A set of low level sensing electrodes shall be installed at the suction tank and shall cut out the pump if the water level falls below the preset low level. A low level indicating light shall be provided at the control panel and audio alarm shall be provided outside the plant room to indicate low level of water in tanks. The pump should only restart after the water in the suction tank has reached a preset start level. A high level sensor shall also be provided to announce a high level alarm. The pump operation shall be controlled by means of 2 pressure switches. Activation of pressure switch no. 1 shall activate pump no. 1, while activation of pressure switch no. 2 shall activate pump no. 2. Deactivation of pressure switch no. 1 should cut out both the duty and standby pump. A time delay switch shall be provided to prevent the starting surge from cutting out the pump. The time delay shall be adjustable from 10 to 60 seconds.

In the event of overload tripping of the duty pump the standby pump shall be brought into operation automatically. The overload failure shall be annunciated audibly and visually at the control panel and by means of a red strobe light fitted outside the pump room. Means shall be provided in the control panel to silence the audible alarm manually. The pump control system shall also alternate the operation of the pumps by ratchet relay to even out the wear and tear.

HYDROPNEUMATIC TANK

Pre-pressurised, sealed air charged, diaphragm type tanks shall be of capacities as shown in the drawings. The tank shall be constructed from steel plate built to ASME standards for Unfired Pressure Vessel and finished smooth internally and externally to prevent rough spots and sharp edges from damaging the liner. All metal surfaces shall be protected with enamel finish or equivalent to prevent corrosion. The pressure tank shall be suitable for a minimum working pressure of 150 psi or 1½ times maximum working pressure whichever is greater. All tanks shall be ASME certified models and shall be factory tested for leaks. A tamper proof air valve shall be provided for adjusting the air pressure in the tank. The cost of this valve to be included in the cost of the tank.

The water reservoir shall be of non-metallic construction. The diaphragm shall be of heavy duty butyl with seamless constructions for uniform strength. The diaphragm shall match the shell design to prevent bubbles or corner which trap water and sediment. All materials in contact with the water shall be of non-toxic corrosion resistant construction. The pre-charge pressure shall be adjustable and a charging port with non-return device shall be provided. All hydro-pneumatic tanks are to be factory fitted with a 100mm dia pressure gauge to indicate the air pressure in the tank.

VALVES AND GAUGES/ HOSE/ REEL

A 25mm diameter isolating brass stop valve shall be provided on the feed pipe to each hosereel. The hose shall be made of continuous non-kinking reinforced rubber hose complying to BS3169, type 'A' fitted with a shut-off-type nozzle by means of steel cadmium plated hose clips. The nozzle shall be made of corrosion resisting metal material. It shall be adjustable for jet and spray pattern with complete shut-off. The nozzle shall be in compliance with BS 336. The length of hose shall be 30m and 25mm bore with 6.5mm discharge nozzle. The hose shall be suitable for operation at a maximum working pressure of 1600kpa.

The discharge nozzle and isolating gate valve shall be easily accessible; in no case shall be more than 900mm above the finished floor level. Reel shall be of double swivel type unless otherwise indicated on the drawings. Drum shall

be constructed of 1.6mm thick pressed steel free from denting and twisting, and finished in red epoxy polyester paint. The hub and shaft shall be of brass, fitted with a device to prevent overrun of the hose, having glandless centre seal. In case of fixed type reels, a swivel hose guide with swing-arms of nylon rollers or similar material shall be provided adjacent to enable the hose to be pulled in any direction as required. Every reel shall be marked with the following information in a prominent position:

- a. Manufacturer's name and trade mark.
- b. Instruction for operation and use should include the following:-
 - i. Turn on stop valve to release nozzle
 - ii. Run-out hose
 - iii. Turn on water at nozzle
 - iv. The year of manufacturer
 - v. The test pressure of hose in kpa

The whole assembly of hose and reel shall be in compliance with BS(EN) 671. The hosereel shall achieve a throw of 6M at 0.4l/s with a input pressure of 150kpa. Where reel cabinets are specified they shall be of steel construction (1.6mm) with a wire-glass front labelled "Fire hosereel" in letters 50mm high in English. The door shall be fitted with a spring lock.

PUMP SWITCHBOARD

The hosereel pump control panel shall be of IP54 construction and shall have the following features and controls.

1. On-off isolators and residual current device (RCD) breaker.
2. Separate power and control MCB for each pumpset.
3. Up to 8kw direct on-line starter
8 - 25kw star-delta starter
4. Labelling: "Hosereel Pumps", "Pump no. 1", "Pump no. 2" etc.
5. Auto/off/manual selector switch for duty and standby pump.
6. Phase indicator lights (red, yellow, blue).
7. Pump run (green) and fail (red) indicators.
8. Audible and visual warning for pump fail and high water level (amber) and low water level (red).
9. Alarm mute and reset button.
10. Voltmeter and ammeter c/w a selector switch
11. Overload trip device with single phasing protection capability.
12. Manual start and stop push buttons.
13. Ratchet relay for alternating operation.
14. All rating of contactors, relays, etc. must be at least 130% higher than the max. full load conditions.
15. One hour run meter for each pump
16. Alarm bell and red strobe light at the entrance to the pump room.
17. Volt free contacts for pump status/trip/power failure remote indication.

NOTICES

Operating instructions shall be affixed to the wall in prominent position adjacent to the reel.

IMPORTANT TURN ON VALVE BELOW BEFORE RUNNING OUT HOSE

Hosereel located in the recesses or cabinets/risers shall bear the words "Fire Hose Reel" on the door in red letters at least 50mm high on a white background. All notices shall be prominently displayed and they shall not be unreasonably affected by weathering or by corrosion caused by any processes in the vicinity.

SECTION 5 - PUMP INSTALLATION

This section of the specification shall cover the supply, installation, testing and commissioning of the fire pumps along with all accessories as shown on drawings or elsewhere in the specification. Pumps shall be new and shall be of the type and performance as shown in the drawing or as specified in the bill of quantities. Pumps shall be UL, FM or LPC approved and shall be factory tested before shipment. Pumps shall comply with the requirements of BS 5306 Part 2, BS 599 and BS 5316. Pumps curves with the operating point marked-on, shall be submitted for approval before the pumps are ordered.

All pumps assemblies shall be factory aligned complete units comprising of pump and motor, coupled together on a common base plate.

CONSTRUCTION

The pumps shall be of centrifugal constant speed, single or multi-stage, and shall be driven by a electric motor operating at a speed of 2900 rpm. The pump shall be selected for a operating flow and pressure as shown on the drawing. The pump efficiency should not be less than 70% at the design point. Pumps shall be selected with a steep curve to enable proper setting of the pressure switches.

Casing/ Impeller/ Shaft

The casing shall be constructed of high grade close grained cast iron with integral connections. A tapped drain shall be provided at the lowest point, while a air release point provided at the highest point. The pump casing shall be of adequate strength to withstand the pressure in the system or a minimum of 150 psi whichever is greater. The impeller shall be of high grade bronze, gunmetal or stainless steel, statically and dynamically balanced at the factory.

The impeller shall be firmly secured to the shaft by a key and by external shaft nuts. The shaft shall be constructed of high tensile steel or stainless steel. The diameter of the shaft shall be sized to withstand all induced stresses. The shaft shall be protected by renewable bronze or stainless steel sleeves.

Bearings/ Seal/ Motor

The bearings unless sealed in bearing housing and protected from moisture and dust, shall be of sealed and lubricated for life type ball or roller bearings. Bearings shall be designed and sized for an operating life of 50,000 hours. All seals shall be of the mechanical seal type and should be of tungsten carbide faces.

The motor shall be of totally enclosed, IP55 construction, fan cooled, squirrel cage type suitable for 415V/3 ph/50Hz, 2900 rpm operation. The motor shall be selected at 125% of the pump overload rating. The motor shall be suitable for continuous operation, 20 starts per hour for motor less than 25kw and 10 starts per hour per larger motors and Class H insulation with Class B temperature rise. Where the coupling between the motor and the pump is exposed it shall be protected by a sheet metal guard.

Mounting/ Accessories

Pumps shall be mounted on a fabricated steel base which shall be heavily reinforced and braced to ensure correct alignment. The base plate shall be mounted on a concrete plinth of minimum 150mm height using neoprene in shear or spring, vibration isolation mounts as shown in the drawings. Neoprene in shear mounts shall be used for situations where the plinth is located on the ground and spring vibration isolation mounts shall be used where the pump is installed on a suspended slab. The number and type of vibration isolators selected shall be such that a uniform deflection is obtained under all operating conditions. Inertia blocks shall be incorporated into the base plate to reduce the amplitude of vibration where shown in the drawing.

The pump shall be fitted with flexible connections, gate valves, check valve, strainers, reducers, air valves, closed head relief valve, pressure gauges at inlet and outlet etc.

INSTALLATION

Fit pumps and appurtenances to the space provided and make readily serviceable. Provide steel framework, inertia

blocks, hangers, anchor bolts and vibration isolators for pumps. Provide flanges and flexible pipe connectors to the suction and discharge connections of pumps. Provide supports to both sides of the flexible connection to prevent undue strain on pumps. Such support shall be mounted so as not to transmit vibration to the building. Each pump shall be fitted with an air cocks, drain plugs and a pressure gauge on both side of the pump. Supply and advise the location of holding bolts and fixing for incorporation in the concrete work.

All pumps shall be properly labelled. All pumps shall bear the manufacturers nameplate giving the manufacturer's name, pump serial number, model number and date of manufacture including listed recognised institution approval plate. Any damage to finishes which have occurred during transit, storage, installation or otherwise shall be made good in the manner recommended by the manufacturer and to the satisfaction of the Architect. All pumps shall be factory painted in accordance with the manufacturer's recommendations. The colour of the pumps shall be signal red.

TYPE HORIZONTAL SPLIT CASING PUMP

The horizontal split casing pump shall be of single stage, single volute centrifugal type. The casing shall be horizontally split. A flexible self-aligning centre dropout spacer type coupling, capable of absorbing torsional vibration shall be employed between the pump and the motor. A metal self supporting easily removable guard shall be provided around the coupling.

TYPE HORIZONTAL END SUCTION PUMP

The horizontal end suction pump shall be of single stage, single volute, centrifugal type, with a back pull out construction. A flexible self aligning centre dropout spacer type coupling, capable of absorbing torsional vibration shall be employed between the pump and the motor. A metal self supporting easily removable guard shall be provided around the coupling.

TYPE VERTICAL MULTISTAGE PUMP

Multistage pumps shall be of centrifugal type and arranged with the shaft vertically installed. The motor shall be supported on the pump casing and directly coupled to the pump shaft. A safety mesh screen cover shall be provided around the coupling.

SECTION 6 - VALVES AND ACCESSORIES

This section covers the supply, installation, testing and commissioning of all valves and accessories. Valves and accessories shall be supplied and installed as shown on the drawings. All valves shall be constructed and applied in accordance with the relevant British Standards and shall be fitted in accessible positions for operation and repair. All stop valves shall be right handed and shall have indication whether the valve is open or shut. The controlling wheel must have markings of the direction on how the wheel is to be turned to close the valve. Valves shall generally be arranged to close on clockwise rotation of the handwheel.

The connection between each valve and the adjacent equipment shall be made with a union for sizes up to 50mm or a flange (BS 4504), for ease of dismantling. Before installation, all valves shall be blown to remove any foreign matter that might have lodged in them. Valves spindles shall be adequately lubricated with graphite and all glands shall be freshly packed before installation. The size of the valves shall be of the same diameter as the pipe for which they are to be fitted except for pressure reducing and control valve which shall be designed for the duty concerned. All valves shall be suitable for the working and test pressure of the system in which they are installed and shall be of approved manufacture as per basic equipment standards and shall be of the same manufacture. Valves shall of minimum rating PN 10.

All valves shall be padlocked in their operating position using a 6mm thick canvas strap. The padlocks shall work on a master key system. Micro switches shall be provided on all sprinkler system subsidiary valves. The micro switch shall operate when the valve is 50% closed. The operation of the micro switch shall be monitored by the fire alarm system. Each valve shall be provided with a brass identification plate which indicates the valve number, area served, and usage. Each valve shall also have on it a identification of the make, model and service pressure rating. Valves larger than 65mm shall be fitted with a indicator plate to clearly indicate if the valve is in the open or close position.

STOP/ GATE/ SLUICE VALVES

All fittings shall be provided with a screwdown brass or chromed stop valve complying with BS1010 alternatively if specified a quarter turn ball valve shall be used. Ball valve shall comply with BS5154. Gate valves less than 50mm dia shall comply to BS5154 and shall be constructed from copper alloy. Valves less than 50mm dia may be with threaded ends while larger valve shall use flanges to BS4504. Valves larger than 65mm diameter shall be of double flanged cast iron body construction to BS5150 with non rising stem and solid gun metal wedge. Valves handles shall be of similar materials as the valve body and should be easily removable with a tool to prevent unauthorised use. Gate valves shall also comply with BS5151 while globe valves shall comply with BS5152.

Sluice valves shall be clockwise closing, cast iron construction, non rising spindle, solid wedge type gate, BS10 flanged valve, complying with the requirements of BS5163. The valves shall be supplied with iron caps and operating keys. The wedge and face shall be of gunmetal construction while the spindle shall be of high tensile bronze construction. Valves shall be coated in accordance with BS4147.

BUTTERFLY/ CHECK VALVES

Butterfly valves shall comply with BS5155. The valves shall be of cast steel body and shall be double flanged wafer type designed to give a tight shut off with renewable nitrile rubber sealing rings and nylon coated bronze discs with stainless steel shaft. Valves up to 150mm dia shall be fitted with a 10 position locked lever handle, while larger valves shall be provided with a worm gear type handwheel with position indicators and limit stops. Check valves of 50mm diameter and below shall be with threaded ends and of copper alloy construction and shall comply with BS5154. Check valves shall be spring assisted non slam type. Check valves larger than 50mm diameter shall be of cast iron construction, double flanged or wafer type complying to BS 5153. Check valves shall be non slam, centre guided, spring assisted, disc type.

PRESSURE RELIEF/ AIR VALVES

Pressure relief valves shall be of fully spring loaded type in accordance with BS 1271, and shall be installed in locations as shown in the drawings. Air valves shall be 25mm single and 50mm double orifice valves incorporating a screw on isolating valve. Body of air valve shall be cast iron to BS 1452. Floating ball and valve shall be stainless steel to BS 970 : Part 4 Grade 303 S21 and float shall be stainless steel to BS 1449 : Part 2 Grade 316. Air valves shall be coated in accordance to BS 4147 : 1980 Type 1. The discharge of the air valves shall be piped to the nearest drain.

BALL FLOAT VALVE/ STRAINERS

Ball valve of 25mm diameter and below shall be of copper alloy construction equilibrium diaphragm type complying with BS1212 Part 2 and have copper floats to BS1968. Valves larger than 25mm dia shall be of cast iron construction and with piston type valve complying to BS1212 Part 1 and have copper float complying with BS1968. A silencing pipe shall be fitted at the discharge of all float valves. Strainers of 50mm diameter and below shall be with threaded ends and of copper alloy construction while larger strainers up to 300mm dia shall be of double flanged cast iron construction. Strainers shall be of the "Y" pattern. Strainer cages shall be of 22 swg 18/8 stainless

steel and have 0.8mm perforations, the free area of which shall be not less than 5 times the cross sectional area of the pipe and shall be easily removal for maintenance. Valves larger than 150mm shall incorporate basket type strainers and shall incorporate a drain cock.

PRESSURE REGULATING VALVES

Pressure regulating valves shall be provided at the incoming supply line and elsewhere as shown on the drawings and shall comply with BS6494. The pressure reducing mechanism should be able to regulate the pressure within the set limit irrespective of flow rate or incoming water pressure fluctuations. Manual adjustment of the setting should be possible and a inlet and outlet pressure gauge should be provided to facilitate setting.

HYDRANTS/MARKER POSTS

Hydrants shall be of underground or pillar type as shown in the drawings. Underground hydrants shall comply with BS750 and shall be fitted with a 65mm "V" thread outlet. Hydrants shall also be equipped with a captive internal valve. Hydrants shall be installed with their outlets not lower than 300mm from the surface. A drain off pipe shall be provided within the hydrant chamber to ensure that the valve chamber is free of water. Pillar hydrants shall be constructed from cast iron with a nominal bore of 100mm and shall be fitted with 2 numbers 65mm dia oblique type brass/bronze landing valve with a female instantaneous coupling. Valve outlets shall be fitted with a plastic cap and the hydrant shall be finished in signal red. Landing valve shall be manufactured to comply with BS5041 Part2.

Precast reinforced concrete marker posts with an indicator plate shall be supplied and installed at all sluice valve, air valves, washout and underground hydrant positions and at 150m intervals and changes of directions, on all main supply pipelines. Indicator plates shall be of aluminium alloy construction in accordance with BS3251. Hydrant markers shall be painted in yellow colour while markers for water services shall be painted in a blue colour, with markings as detailed in the drawings.

FLEXIBLE COUPLING

Piping connections to all pumps and all equipment shall be by means of wire and fabric reinforced moulded high pressure convoluted rubber connectors. The fittings shall have integral rubber flanges, and be bolted onto the pipe lines using flanges for 50mm diameter and larger. Smaller coupling shall utilise a screw connection.

PRESSURE SWITCHES/ FLOW SWITCH/ PRESSURE GAUGES

Pressure switches shall be of the diaphragm, bellow or bourdon tube type, micro switch activated using a normally open and normally closed contact with adjustable cut-in and cut-out setting. Maximum cut out setting should not exceed 20% of the operating cut out setting and the minimum differential between the two settings shall not exceed 5% of the cut out setting. Contacts shall be rated for the required duty.

Flow switches shall be of paddle type suitable for the specified flow. Flow switches shall be fitted with a electronic relay to prevent false actuation by water surges. The flow switch shall be of non corrosive construction and the parts exposed to water shall be of stainless steel. The paddle should be able to be trimmed to suit the pipe size and flow. Flow switches shall be located on a straight length of pipe and at least 5 pipe diameter away from elbows and fittings. Flow switches should operate on the activation of one sprinkler or hose reel or landing valve. Flow switches shall be equipped with one number of normally closed and one number normally open contact suitable rated for the required duty.

WATER LEVEL SENSORS/ WATER LEVEL INDICATORS

Water level sensors shall be of the non float type using low voltage stainless steel electrodes and relays, or ultrasonic type which do not require any contact with the fluid. Water level indicator for water tanks shall be of the glass tube type with a protective metal casing. A valve shall be fitted at the lower end of the tank and a red float provided within the tube for easy viewing of the water level.

Pressure gauges shall conform to BS 1780 and shall be of minimum 150mm dial bourden tube type, with a brass dust and moisture proof case with a thick protective glass and legible white face and black figures. The scale value of the gauges shall be of the order of 150% of the maximum operating pressure and the graduations shall be in both in psi and pascals. All pressure gauges shall be fitted with gauge cocks. Pressure gauges shall be fitted at 1350mm above floor level.

SECTION 7 - PIPEWORK & FITTINGS

The section of the specification shall cover the supply, installation, testing and commissioning of the fire protection piping system.

PIPE MATERIALS

Unless otherwise stated in the drawings or elsewhere in the Specification, all piping shall comply with the following:

Pipes For Sprinkler, Wet Riser, Dry Riser & Hosereel System			Joints		Fitting
Material	BS	Size, mm	Type	BS	BS
Hot dipped galvanised steel pipe	BS 1387 heavy grade	≤50mm	screwed	BS21	BS1740
		65 to 150mm	welded	BS2971 BS2640	Galvanised wrought steel to BS1965
	BS 3600 (seamless) HFS grade 27 ERW grade 410	>150mm	screwed	BS2971 BS2640	Galvanised wrought steel to BS1965
		ASTM A53 Grade B seamless	≤50mm	screwed	BS21
	65 to 600mm		welded	BS2971 BS2640	Galvanised wrought to BS 1965
Underground pipes Ductile Iron	4772 Class 9 PN 16 rating	100 to 300mm	Spigot socket push in sealing ring joints	2494	Ductile iron

A mechanical grooved jointing system (victaulic system may be used instead of a welded joints).

PIPE INSTALLATION

All installation shall be done according to the drawings. Special care shall be taken in the arrangement of piping to ensure a neat finish and alignment. All piping and tubing used in the construction shall be straight, cleanly finished, round in cross section, free from cracks, surface flaws, laminations, scale and other defects and shall be supplied to site with the ends capped. All pipes and fittings should be thoroughly cleaned and free from burrs, swarf, scale and obstructions before erection. Clean sharp pipe cutters not hacksaws, shall be used to cut metal pipes. Threads shall be cut with clean sharp die. Bevels for welding shall be filed or ground.

Connections shall be as direct and as few as possible. Valves and fittings shall be grouped where this will not affect their operation. Supply and install all necessary isolating valves, check valves and other fittings as required and as shown on the drawings. Every section of major branch supply piping shall be controlled by a stop-valve at the point of connection to the main pipe. The valves shall be sited on a easily accessible position

for ease of operation. Pipe connection of 65mm dia. and above connected to equipment shall be flanged joints in accordance with BS4505 and pipe connections below 65mm dia. shall be screwed unions to permit removal for maintenance without disturbing other pipes.

Flanges shall be welded to the pipes. Flanged joints shall be flush and aligned and shall utilize corrugated jointing rings (BS 4865), coated on both sides with a non toxic jointing compound (BS 5292). The grade and thickness of jointing rings shall be suitable for the service conditions. Excess jointing compound shall be removed. All pipework other than in pump rooms and where stated shall be run in false ceilings, ducts, or chased in wall. Pipes shall be cut accurately to measurements at site and connected without any springing or forcing. Reduction in diameter for through flow pipes shall be made with eccentric reducer for horizontal pipes and concentric reducers for vertical pipes. Open end of all piping shall be capped with a plastic or wooden plug during construction to prevent the ingress of foreign matter. Joints shall not be made in inaccessible positions.

EXPANSION OF PIPEWORK

Pipe supports shall be selected to provide movement due to expansion. The amount of such movement shall be proportioned throughout the system by the provision of suitable anchor points. If tap-off are taken at points remote from the anchor point, it shall be arranged with a offset, expansion joint or other means, to take up expansion without axial movement of the branch. Expansion joint shall be provided for pipeworks as shown on the drawing for straight pipe run and wherever pipework runs across structural expansion joint. Expansion joints shall be of stainless steel guided bellow type.

SCREWED/ WELDED JOINTS

Screwed joint shall be made by means of screwed connections in accordance with BS21. All screwed joints shall be made with teflon thread sealing tape. Welding in steel pipe shall be single "V" butt weld type and shall be in accordance with BS2633 and BS 1971. Only approved qualified welders with a competency certificate shall be permitted to do the welding in accordance with BS 4872 Part 1. Welding rods for oxy-acetylene welding shall be copper coated low carbon steel to BS 1453 and for metal arc welding shall be in accordance with BS 639

MECHANICAL GROOVED JOINTING SYSTEM

Mechanical joints for use on a grooved jointing system shall be similar to the type manufactured by victualic systems. Joints shall comprise of two or more identical housing manufactured from one of the following materials.

- 1) Malleable iron to BS 6681 grade B32-10
- 2) Carbon steel to BS EN 10025, grade FE 430A
- 3) Ductile iron to BS 2784 grade 420/12

Joint housing shall be positive and effected by 2 or more oval neck or "D" neck bolts and nuts of material quality not less than BS 970 grade 070 M20. Sealing action shall be effected by pressure sensitive elastomeric gasket stretched over both pipe ends, using a suitable lubricant. The gasket shall be in compliance with the requirement of BS 5306 part 1 & 2 and shall be non toxic and manufactured in accordance with the IEE regulations. The joints shall be suitable for the type of services, working and test pressure and temperature. Joints shall allow limited angular movement and expansion and contraction in service. Grooves shall be prepared by rolling on pipes less than 300mm dia and may be rolled on cut in larger pipes. The grooved end shall be coated with a zinc rich primer paint to regain the coating thickness. The pipework installed shall be in accordance with the manufacturers or victualic systems latest published recommendation.

PIPE SUPPORTS

The Contractor shall supply and install all necessary, pipe supports, hangers, anchors, guides as required for proper support in accordance with BS 3974. Risers shall be supported at each floor with mild steel riser clamps. Horizontal pipe runs shall be supported on hangers of split ring or clevis type. Where practical supports and

hangers shall be located immediately adjacent to any change in direction and at valves and heavy equipment. Where pipe lines run in a common group they shall be supported from a common hanger bar fabricated from mild steel sections. The spacing of the support shall be based on the smallest pipe in the group. Pipe supports shall be as per Table 1 on page PF/5

Vertical pipes shall be also be supported at the top and bottom of each riser, at each floor level, and at each isolating valve. The support at the lowest point shall be a tubular support feet. Pipe risers higher than 30 meters shall be provided with spring cushion supports to accommodate pipe expansion. Pipes shall be run with a minimum clearance of 100mm from the structure and between pipes to accommodate pipe expansion and clearance for joints and accessories. The first 3 supports adjoining a pump shall be fitted with a vibration isolation support with a minimum deflection of 10mm. Piping connections to equipments to be independently supported to prevent stress on the equipment. Attach supports only to structural members and framing. Where supports are required between intermediate structural members, provide suitable intermediate metal support framing.

The Contractor shall supply and install sleeves where pipes penetrate through walls, floors etc. All exposed piping in occupied rooms shall be chrome plated. Pipe sleeves passing through walls or fire partitions shall be of medium gauge galvanised steel pipes to BS1387 or BS 3601. Sleeves shall be sized to give a clearance of 15 to 25mm around the pipe to allow for expansion/contraction of the pipe. Sleeves through exterior walls below ground, through foundation and floors below ground shall be of puddle flange construction using PVC to BS 3505 class D and of watertight construction. A proprietary water stop device shall be used to prevent ingress of water. Sleeves through fire rated shafts, walls, floors and roofs shall be tightly packed with rockwool and caulked with a intumescent fire seal and finished flush to the face of pipe sleeve to maintain the fire integrity of the wall. Sleeves through roof slabs shall project at least 150mm above roof. A proprietary type flashing system shall be used to ensure water tightness. Sleeves through floor slabs shall project at least 25mm above the floor to prevent water from flowing through the sleeve. Pipes penetrating through wall, floors, ceilings and partitions of occupied rooms or in public areas, shall be provided with a stainless steel or chrome plated cover plate, which shall be snug fit to the pipe and with concealed fixings.

AIR VENTS AND DRAINS

Automatic air vents shall be provided at each high point and drains and traps at each low point. Where possible, drains at low points shall be valved. Air vents shall also be installed at the top of all pump casings, except if the pumps are self venting. Drain pipe shall be provided from each automatic air vents, pump glands, and to the nearest waste traps or surface drains and arranged in such a way that the discharge are visible to show leakage, if any. At changes of direction plugged tees and unions shall be installed on the condensate piping for easy cleaning and disconnection.

FLUSHING OUT PIPES

Pipes shall be cleaned out in sections. Pipes larger than 200mm diameter shall be cleaned by having a wire brush followed by a fibre brush being drawn through followed by flushing out as described below. The system shall be filled with portable water to which has be added 50mg of chlorine and descaling agent for every litre of water. The system shall remain charged for 12 hours before being flushed out to remove dirt, debris, scale. etc. The flushing process shall be repeated until the discharge water is clean.

TABLE 1. Interval between supports for steel pipe

Size of Tube (mm)	Intervals for vertical runs (m)	Intervals for horizontal runs (m)	Hanger Rod dia (mm)
25	2.4	1.8	6
25 to 50mm	3.0	2.4	10
65 to 100mm	4.5	3.0	12
125 to 200mm	4.5	3.7	16
225 and larger	5	5	20

SECTION 8 - CONTROL PANELS

The control panels shall be built in accordance with IEC 439 "Factory Built Assemblies for low voltage" or BS5486 "Factory-built assemblies of Switchgear and Control Gear for voltage up to and including 1000V AC and 1200V dc". Switchboard and motor control centers shall be of **type tested design** conforming to tests conducted by ASTA or other recognised testing authority. Type test certificates obtained from the testing authority together with the construction details of the board on which the approval was obtained shall be submitted at the time of tender submission.

All factory built assemblies shall be capable of withstanding the electrical, mechanical and thermal stresses of making and breaking the prospective fault level and normal loads without any damage. The prospective fault levels of the various factory built assemblies are as indicated in drawings. All equipment used in the factory built assembly shall have been type tested. Type test certificates shall be submitted for all major equipment if requested. All factory built assemblies, as a complete unit shall have a rating equal to or greater than the integrated equipment rating as shown in the drawing.

Factory built assemblies shall be suitable for indoor installation unless specifically indicated otherwise in the drawings. All items of equipment used shall be suitable for a service condition of ambient air temperature not exceeding 40°C and average of 35°C over a 24 hours period, with relative humidity of 100%. The altitude does not exceed 2000m.

CONSTRUCTION

The factory built assemblies shall be of the totally enclosed, modular, cubicle type, which are extensible and suitable for floor or wall mounting as shown in the drawings. The factory built assemblies shall be compartmentalised and utilise sheet steel plates of thickness as detailed below. The panels shall be vermin proof and constructed to a minimum degree of protection of IP ratings to BS EN60947-1. The IP ratings indicated below shall be applicable unless otherwise indicated in the Bill of Quantities.

Motor Control Centers

- a. 2mm thick sheet steel
- b. Form 3 to BS5486 with separate compartment for busbar section, functional unit section and terminal compartment.
- c. IP54

Control Panels

- a. 1.6mm thick sheet steel
- b. Form 1 to BS5486 with all equipment in the same compartment.
- c. IP42

Each cubicle frame work shall be fabricated from rolled steel angle section and be self supporting when assembled. All cubicles shall be of standard size, uniform in height and depth from front and back. The maximum height of switchboards shall not exceed 2.1m. The top sides and back panels and doors shall be fabricated from sheet steel plate with edges rounded or turned at the front and sides to provide a neat, flush and pleasing appearance and rigid construction without welded cross struts. Full access shall be provided to service and maintain all equipment inside each cubicle by means of a suitable lift off hinged door which shall open a minimum of 150 degrees. Panels longer than 1.2 metres shall be provided with 3 point locking system while smaller panels shall be provided with 2 point locking system. All doors shall be provided with approved gaskets. For circuit breakers, the doors shall be mechanically interlocked with the circuit breaker to prevent any door being opened with the circuit breaker in the "ON" position.

Door fastener shall be a screw type where they are exposed to the public. Switchboard located in service area shall utilize a quarter turn lock or thumb screw. Distribution board shall utilise a push button spring release lock. A key lockable type handle shall be used where specified in the Bill of Quantities or drawings. All panels shall be protected against corrosion. Panels shall be degreased primed and powder spray finished to a thickness of 50 micron to colour BS 381C grey semi textured or RAL7032. Alternative thickness of sheet steel will be considered if additional bracing are provided to suit the sheet steel thickness offered. Synthetic transparent material for the front and back panels covers are preferred to be used instead of sheet steel. The plinth steel shall

be constructed from minimum 5 mm thick steel and suitable to support the weight of the panel.

No "Live" parts of components shall be mounted on the door. Operating devices such as Indicating lamps, push buttons, selector switches, meters, etc. shall be so mounted that all live carrying parts are mounted within the panels when the doors are open. Only the operating handle and non "Live" parts shall be allowed to be mounted on the door. If live parts are to be mounted on the door they must be double insulated and the back terminals protected with a transparent polycarbonate cover. All doors shall be independently earthed to the switchboard frame using a braided or coiled copper cable. All non current carrying metalwork on the switchboard shall be bonded to the main earth bar.

The switchboards and motor control centers shall generally be arranged with the busbar at the top, meters and indicating instruments at eye level and not below a height of 1600mm and operating handles at a minimum height of 800mm above floor level and a maximum of 1880mm above floor level. Provision shall be made within the factory built assemblies for the proper support and bracing of outgoing and incoming cables. Weatherproof cable glands and removable gland plates shall be provided for all cables entering or leaving the switchboard. The type of cable entry (ie top or bottom is as shown of the layout drawings).

All equipment and terminals shall be labelled as detailed on the drawings. Labels shall be of clear perspex, reverse engraved and filled flush with red filling. Labels shall be attached by means of chrome finished counter sunk screws and nuts. Cable tails shall be labelled using a cable tag or plastic ferrules. Labels shall indicate circuit number, source and destination, Danger sign labels shall be affixed adjacent to removable panels and covers.

The incoming section shall be separated from the other sections. All terminals bars, and lugs which are live after isolation of the main switch shall be fully shrouded/insulated. Sufficient auxiliary poles or shrouded isolating relays shall be provided to isolate all incoming low voltage live feeds. Warning labels shall be provided to indicate source of external supply. Voltmeters, ammeters, selector switches, relays, etc. shall be provided as shown in the drawing. The instrumentation section shall be segregated from other sections.

CONTROL & INSTRUMENTATION WIRING

Cables for control & instrumentation wiring shall be PVC insulated to BS6231 and the insulation shall be appropriately colour coded to correspond to the various phases, neutral and earth wiring. Wiring for controls shall be minimum 1.5mm² and those for current measurement shall be minimum 2.5mm². Where multistrand cables are used crimp type cable lugs shall be provided. All wiring shall be neatly run in plastic wiring channels with clip on cover and shall be bundled together in maximum group of 30 conductors using cable ties at maximum intervals of 300mm with additional strapping at bends. Separate cable channels shall be provided for different voltage categories and the utilisation factor shall not exceed 40%. All cables shall be identified at all terminals by means of numbered interlocking ferrules of white PVC with black characters.

Wiring to hinged doors shall be enclosed in spiral cable wrapping in flexible loom arrangement, and secured with fixed stud clamps. Terminal blocks shall be provided for all control cabling entering or leaving the factory built assembly. These blocks shall be located in a separate cubicle. Terminal blocks of different voltage groups shall be separated by barriers and distinctly labelled. Terminal blocks shall be polyamide construction and suitable for rail mounting. The terminals shall be **spring loaded** to ensure minimum contact pressure even if screws are loosened. All terminals and screws shall be fully shrouded. Terminal screws shall be of the captive type. Labels shall be provided for each terminal and shall be of the clip on type. Only one cable shall be terminated at each terminal. Where multiple cables are to be shorted, external links shall be used. Provision shall be made for a test socket to enable testing from the front of the panel. 20% spare terminals with a maximum of 10 terminals for each group shall be provided.

MCCB/MCB/RCD

The breakers shall comply with BS EN60947-2. The breakers shall be provided with overcurrent protection by means of thermal and magnetic tripping element. MCCB's shall have a mechanical endurance life of not less than 15000 operations. All breaker tripping mechanisms shall be ambient temperature compensated. Breakers of frame sizes greater than 150 amps shall be equipped with continuously adjustable magnetic pick up setting. MCCB's used for incoming main feeders shall in addition be provided with continuously adjustable rated current

settings in the range of 60 to 100% rated current. Where earth leakage relays are indicated in the drawings they shall be integral with the MCCB's. The earth leakage relays shall have an adjustable current sensitivity of 100mA to 1A and an adjustable time delay of 0.1 to 1 sec. The MCCB's shall have quick make and quick break mechanism independent of the operating speed. The tripping mechanism shall be mechanically "trip free" from the handle so that the handle cannot be closed against fault conditions.

The MCCB shall be provided with **door interlock** handles. All handles shall be large and robust to carry out the switching operation with ease. The handle shall clearly indicate the "on" "off" and trip positions. The handle shall be able to be locked in the "on" or "Off" positions. When locked in the "on" position it shall still be possible for the handle to indicate trip when the breaker has tripped. A interlock release mechanism shall be provided to enable the door to be opened when the breaker is locked in the on position. Multipole breakers shall have a common-trip bar so that a fault condition on any one pole of the breaker will cause all poles to trip simultaneously. The MCCB interrupting capacity shall be not less than that indicated on the drawings unless alternative schemes using cascading protection or other schemes are utilised.

MCCB when used for motor protection shall have characteristics suitable for the motor starting current characteristics. Standard range MCCB shall not be substituted for motor protection circuits. All moulded case circuit breaker protecting Supply Authorities incoming supply circuits shall be fully withdrawable for easy maintenance. The breaker shall have interlocks to prevent withdrawal when the MCCB is "on". All main moulded case circuit breaker shall be provided with at least 2 N/O and N/C Auxiliary contacts. All busbar couplers shall be fully withdrawable and of the four pole moulded case circuit switch type.

MCB's shall comply to BS 3871 Part 1 and shall be of the **current limiting** type having a sealed ambient temperature independent thermal magnetic tripping mechanism providing overload and short circuit protection. All MCB's shall be suitable for rail mounting and shall have a minimum mechanical and electrical service life of 20,000 operations. MCB's shall have minimum M6 category of duty with Type 1 time current characteristics. Those MCB's feeding motor circuits shall have type 3 time current characteristics.

Each pole of the circuit breaker shall have quick make & quick break mechanism and be fully rated and protected with suitable arc-control devices, so that every pole is capable of making and breaking both rated and short circuit fault current. The handles shall be provided with trip free features enabling the breaker to trip even if the handle is held in the closed position. RCB's shall comply to BS 4293 and shall be of the current operated type. The RCB shall be designed to trip within 20m sec at a current sensitivity of 30mA. The breakers shall be of 2 pole construction for single phase and 4 pole construction for 3 phase. All breakers shall be complete with test buttons. RCB shall have a minimum life expectancy of 20,000 operations.

METERS AND RELAYS/ISOLATORS, SWITCHES AND CONTROL SWITCHES

Indicating instruments shall comply with BS89. Meters and relays for external panel mounting shall be of the flush pattern type with square escutcheon plates finished matt black and polycarbonate cases. Ammeter and voltmeters shall be of moving iron spring controlled type with 96mm square dials, accuracy Class 2.5 with external zero adjustment screws which are accessible from the front. Ammeters shall be selected such that full load current indications are not less the two thirds of linear scale of the meter.

Ammeters shall be capable of taking overloads of 2 times continuously and voltmeter 1.2 times continuously. Ammeters at the main incoming feeders shall in addition to the moving iron mechanism be provided with thermal bimetal indicators with draw pointers to record maximum demands. The mechanism shall not respond to short current peaks and shall be manually resettable. Hour run meters shall be motor driven type without reset features and able to register to at least 99 thousand hours.

Frequency indicators shall be of the vibrating reed type. The meter shall be capable of proper operation for voltage variations of $\pm 20\%$ rated voltage. Power factor meters shall be of the electrodynamic crossed coil mechanism suitable for balanced load, three phase four wire system. The accuracy class shall be 1.5 and range 0.5 lag to 0.5 lead. Ammeter select switches shall have make before break contacts to ensure that the current transformers are never open circuited. Voltmeter selector switches shall have break before make contacts.

Protective relays shall comply to B.S. 142. Standard Inverse Definite Minimum Time (IDMT) earth fault relays shall have a definite minimum time variable from 0 to 2.2 seconds on a time multiplier of 1.0. They shall have

nominal current plug settings variable from 10% to 40% in steps of 5%. Withdrawable type relays shall be provided with automatic means of short-circuiting the current transformer secondary circuits and capable of breaking tripping circuits when the relay element is removed. Relays shall have a rated current equal to secondary current of the current transformer. The relay shall be complete with mechanically operated flag indicator.

Instruments, meters and relays located on the front of the switchboard shall be so positioned that as far as possible, each instrument, meter and relay is adjacent to the unit with which it is associated. Other relays more suitable for mounting inside the cubicle such as those required for back indication and tripping etc. shall be grouped conveniently in dust proof cases with removable covers to provide easy access for cleaning and adjustment without dismantling. All relays shall be heavy duty pattern, unaffected by external vibration and capable of operation in any position. Meter panels shall be hinged to provide ready access to connections and small wiring shall be enclosed in flexible plastic conduit. All meters and relays shall be fully tropicalised. All terminals shall be completely insulated and potential circuits shall be suitably fused.

Isolators and switches shall be of the on-load type, capable of interrupting the full load of current, and shall comply with BS EN 60947-3. They shall have quick make and break type operating mechanism. When installed inside a control panel, it should be door interlocked, to prevent access to the panel unless the switch is in the open position. It should also not be possible to switch on unless the door is closed or the interlock purposely defected. Isolator installed individually shall preferably be of moulded case weatherproof construction. All isolators shall be provided with padlocking facilities to lock the isolator in the 'off' position. Control switches shall be of the multi position rotary type. Each switch shall be provided with normally open or closed contacts as required. Switches shall be rated for at least 10A, 240V. All terminals shall be fully shrouded and labelled. The high rupturing capacity (HRC) cartridge fuses of rating shown shall conform to B.S.88 Part 2 Class Q1 with minimum breaking capacity of 80KA. When fuses are used for motor protection they shall have motor rated class. Fuse bases and carriers shall be made of high grade phenolic moulding.

INDICATOR LAMPS/ CONTACTORS

Indicating lamps shall be neon blub type with a minimum service life of 20,000 hours. Lamps shall be easily removed or replaced from the front of the panel without the use of extractors. The body shall be reinforced thermoplastic while the lens cover shall be thermal resistant thermoplastic. Pilot light identification shall be engraved on the lens cover. The colour coding of the lamps shall be in accordance to BS EN60073.

Contactors shall be manufactured in accordance with BS EN60947-4-1. Contactors shall be of AC3 duty category and selected to suit the load such that a minimum electrical life of one million operations is ensured. The mechanical life shall be at least 5 million operations. Contacts shall be renewable and constructed from silver faced hard copper, and designed to ensure freedom from contact bounce. Coils shall be Class B Insulated to BS 2613 and suitable for continuous operation. All live parts shall be fully shrouded. Arc chutes and magnetic blow out coils shall be fitted to contacts larger than 200A.

Contactors shall have at least 15 times making capacity and 10 times breaking capacity for contactors less than 100 amps and 10 times and 8 times respectively for contactors above 100 amps. The selection of contactors shall be coordinated with the prospective fault levels suitable at that point of installation. The devices used for motor starting shall be coordinated to provide a class 2 level of continuity of service and safety as defined in IEC 947-4-1. Contactors shall generally be suitable for rail mounting and be of modular design. The coil shall be suitable for +10% and -15% of nominal mains voltage. Provision shall be made on the contactors for affixing of termination and contactor identification labels.

TERMINATIONS

Tunnel type terminals shall be provided for cables up to 6mm². Cables larger than 6mm² shall be terminated with compression cable lugs or proprietary makes of termination approved by the Engineer. All cable terminals shall be labelled. Cable lugs shall be of the annealed copper one piece seamless construction type. Lugs shall be burr free and tin plated to prevent corrosion. All crimping of lugs shall be done using proper crimping tools. Terminal compartments with minimum space of 600mm shall be provided in the panel. All incoming and outgoing circuits shall be terminated in a terminal compartment. The terminal compartment shall be closed with a door for access to the terminals in the compartment. Support brackets/trays shall be provided

within the termination compartment for proper support of cables. Where single core cables are installed, brass or polyamide plates of 6mm thickness shall be provided to serve as gland plates and the glands and plates effectively earthed. Earthing of the armour of single core cable shall only be effected on the source side of the cable, while the other end is left unconnected.

TIMERS, RELAYS, TIME SWITCHES AND ACCESSORIES

Timers and time switches shall be of electronic type and provided with 2 sets of change over contacts. Timers shall have an setting accuracy of $\pm 5\%$. Time switches shall have 2 channel programmable change over contacts and minimum 48 hours battery back up. All timers relays and time switches shall have contacts rated for a minimum mechanical life of 2 million operations and electrical life of 1 million operations. Standard plug in bases suitable for rail mounting shall be provided. Connection diagrams shall be imprinted on the body of the accessories.

MOTOR STARTERS

Motor starters shall comply with BS EN60947-4 and BS5424. The type of starter used shall be as shown in the schematic drawings. The starter cubicles shall incorporate the components scheduled below together with any associated control items indicated on the schematic drawing.

Direct On-Line (DOL) Starters (for motors small than 8kw)

DOL starter shall contain the following:-

- Suitably rated circuit breaker, contactors and overload relays.
- Control fuses, selector switches, start/stop push buttons
- Green run, red tripped, amber alarm condition indicating lights.
- Auxillary contacts, relays, terminals, hour run meter, etc. if required.
- Direct reading ammeter on one phase for motors larger than 0.37kw and less than 5kw
- CT type ammeters for motors larger than 5kw c/w a selector switch.

Star Delta Starter (for motor smaller than 25kw)

Star Delta starters shall in addition to the item listed above for DOL starters include adjustable timers to control the run-up time in star connection. Closed transition Star Delta starters (for motor smaller than 37kw) shall in addition include a resistor incorporated with a manual reset type high temperature thermostat to trip the starter and operate the fault light. Resistors shall be sized for a minimum of 10 starts per hour. Resistors shall be housed in a well ventilated enclosure, outside of the switchboard.

Closed Transition Auto Transformer Starters (for motors small than 50kw)

Closed transition auto transformer starter shall in addition to the items listed above incorporate a autotransformer with 2 tapping (50% and 65%) and sized for 6 starts per hour. A set of 3 thermistors shall be incorporated in the autotransformer winding to cut out the starter if the winding temperature exceeds the maximum rated temperature. Motors larger than 50kw shall utilise starters as individually specified in the drawings and schedules.

Where the starter is not within view of the motor a latch off "stop" push button or isolator shall be installed in close proximity of the motor. Thermal bimetal overload relays shall have differential, temperature compensated operation to protect against phase imbalance and phase failure. The trip current setting shall be adjustable within $\pm 20\%$ full load and have a setting accuracy of $\pm 5\%$. A mechanical trip indicator which shall also be used to reset the overload relay shall be provided. Overloads shall have trip characteristics to trip the motor within 2 hours at 115% set load. All motors larger than 8 kw shall be provided with thermistor protection to trip the starter when the winding temperature exceed rated values. Auxiliary contacts as required plus one set of spare contacts shall be provided.

INTERFASING WITH OTHER SYSTEMS

The building monitoring system should monitor the main incoming voltage, current, power factor, and status of all circuit breakers. Sensing circuits and auxillary contacts shall be wired to a separate compartment within the main switchboard. The compartment should be sized to accommodate the necessary transducers and connection

terminals. All starters and motorised circuit breaker units shall allow for the starting and stopping by the building automation system. Auxillary contacts shall be provided for monitoring the run trip and off indications. Terminals shall be brought out to a separate compartment form where the building automation system wiring will be taken off.

FLOOR MATS/ CIRCUIT DIAGRAMS/SHOPDRAWING

Rubber floor mats of 6mm thickness and 1 metre width shall be provided for the complete length of all switchboards and motor control centers. Circuit diagrams affixed to a wooden base and covered by clear transparency shall be affixed next to all factory built assemblies. These circuit diagrams shall indicate the wiring schematics and control logic diagrams. For distribution boards and control panels a laminated schematic fixed on the inside cover of the panel will be accepted. The contractor shall submit shop drawings showing equipment type, arrangement, actual dimensions, schematics, wiring, labels, weights, fixing details etc. The construction shall only proceed after the drawings are approved.

SECTION 9 - MATERIAL IDENTIFICATION

This section of the Specification covers the painting of all equipment, hangers, brackets, etc. installed under other sections of the Specification. The work involved includes but shall not be limited to the supply and application of primer paint, thinners, identification labels, etc. unless specifically excluded elsewhere in this Specification. Factory fabricated equipment shall be painted at the factory and paintwork damaged at site shall be repainted to match the original finish. Tarpaulins, sheets and protective covers shall be provided over floor, walls, etc. before commencing painting.

PAINTING & PROCEDURE

All paints supplied and applied to the various surfaces shall be suitable for the surface to be painted and shall be best quality of an approved manufacturer. They shall be delivered to the site in the manufacturer's containers with the seal, etc. unbroken the manufacturer's name or trademark and contents and colour clearly marked. The paints used must be proven for use in local climatic conditions. All materials for the work, e.g. primers, under-coatings and finishing paints shall be obtained from the same manufacturer and shall be those recommended by the manufacturer as suitable for application together and for the type and duty of surfaces concerned.

No painting on exterior work to be done during wet weather, or upon surfaces that are not thoroughly clean and dry. During the execution of painter's work the contractor is responsible for taking all precautions necessary for the health and safety of his workmen. The paint shall be kept stirred during use and when more than one coat is specified, subsequent coats shall not be applied until preceding coats have thoroughly hardened, and are smoothed down with abrasive paper. Painting shall be carried out with one primer coat, 1 undercoat and two gloss furnishing coat. All works before painting shall be thoroughly cleaned down to remove all dirt, grease, scale rust, powdery residues by wire brushing, scrapping or other means. Surfaces shall be washed with solvent to remove oil/grease and with water to remove powdery residues. After any cleaning treatment, sufficient time shall be allowed for the surface to dry. All painting shall be carried out within seven (7) days of delivery and erection on site.

METAL SURFACE

Primer for metal surfaces shall be red lead or chromate metal prime or other approved equivalent. If the primer has thoroughly dried, apply one undercoat of appropriate shade, allow at least 24 hours drying time under normal weather conditions before application of each subsequent finishing coat. Finishing coat shall be high gloss paint. All galvanised steel surfaces shall be primed with a etching primer before application of the finishing coats.

EQUIPMENT / CABLES LABELLING

All cables shall be identified at terminals using a cable tag, engraved copper ring, or pvc furels. Submain cables shall be identified at 10m intervals along its route. All equipment like pumps, control panels, water heaters, AHU's etc. shall be labelled using black or white engraved laminated plastic labels identifying the equipment number and area of coverage. Labels shall be fixed using brass countersunk screws. Refer to individual sections of the specification for details of labels required for that particular section of work. Labels shall be between 1/10th and 1/20th the height of equipment being labelled and not less than 10mm.

PIPE & VALVE LABELING

Lettering on piping shall be painted in contrasting colours and shall be in centre of bands. The lettering shall be in block letter with minimum dimensions of 12mm high for pipes 50mm and under 38mm high for pipe over 50mm. Directional arrows shall be in white or two visible sides of all piping at each valve, fittings and long runs at 1.8m centres. The size of arrows shall be 75mm long on pipes up to and including 50mm diameter and 150mm long on pipe over 50mm diameter. Every valve in the installation, shall be provided with a 50mm diameter brass tag secured to it with a chain and stamped with the valve number, service and area of the valve controls. Each valve shall have on it a identification of the make, model and service pressure rating.

BASE COLOUR SCHEME

All pipework and equipment installed under this contract shall be painted in accordance with the following colour scheme:

<u>Pipe/Equipment</u>	<u>Base Colour</u>
Cold water service pipe	Light green
Fire protection pipes	Signal red
Valves normally open	Green
Valves normally closed	Red
Water pump & motors	Light blue
Steel work	To follow colour of pipe or equipment
Electrical containment	Orange
Emergency shut of devices	Red

On completion, the contractor shall make good all painting works which have been damaged during the progress of works for the handing over.

SECTION 10 - TESTING AND COMMISSIONING OF FIRE FIGHTING SYSTEMS

Before any of the systems in this contract are put into service, they shall be subject to a testing and commissioning procedure. Test instruments and qualified personnel required to verify the system and equipment performance shall be provided by the contractor. All test instruments are to be calibrated by an accredited laboratory. All equipment supplied should be factory tested before shipment and the contractor shall submit the factory certificates, mill certificate etc. before site testing.

CHECK LIST /TEST RECORD

The contractor shall prepare and submit a detailed and comprehensive checklist prior to commissioning and testing. The purpose of the checklist is to:

- a) Ensure that all items that should be checked are checked
- b) Produce a permanent record of the commissioning checks carried out.

Accordingly, the checklist must be built up from information contained in this Specification, from suppliers, manufacturers' installation and commissioning data. The detail of the checklist must be such that it can be completed with a reading or a tick.

A permanent record of all inspection and acceptance test should be prepared by the contractor. These records shall form part of the operation and Maintenance Manual.

- a) Data and time of inspection or test.
- b) Persons carrying out the test.
- c) Test results noted.
- d) Any external factors significantly affecting the results.
- e) Follow-up action required
- f) Work carried as a result of (e) with data and results of retest
- g) Final test results

HYDRAULIC TEST-PIPEWORKS

Pipework shall be hydraulically tested in convenient sections as the work proceeds and witnessed by representative from the Consulting engineer. Pipework shall be tested to 1½ times normal working pressure but not less than 1033 kPa (150 psig) and shall be applied and held for 24 hours. Pressure shall not show a drop more than 4% in 24 hours. In the event of test failure, leak shall be found, made good and the line retested. Hydraulic test on pipework shall be carried out before pipe concealment work. Any item which is liable to damage at the test pressure shall be isolated in an approved manner. During the test pipework under test shall be fully vented.

TESTING OF ELECTRICAL WORKS

The testing and commissioning procedures shall include the following:

- a) Visual check of all work for completeness
- b) Check that all work complies with the latest regulations, specifications, performance criteria.
- c) Check that all equipment is safe to operate, and that overloads, safety devices and interlocks are all in working order.
- d) Check operating sequences, function of all devices and rotation of motors.
- e) Verification of performance under site conditions, under load and simulated "Worst case" condition.
- f) Insulation tests shall be made with 500V "Meggar". No cable will be accepted with an insulation resistance, including termination of less than 50 meg-ohms.
- g) Test continuity and unique identification of all conductors in all cables.
- h) Measure resistance on main earth and test all earth continuity connections.
- i) Check polarity and phase rotation of supply and at all outlets

All tests shall be carried out in accordance with relevant BS standards and the latest IEE regulations. The test to be carried out on the hose reel system shall include the following:

- a) Flushing out and checking outlet connections.
- b) Hydraulic pressure test
- c) Flow test to record flow and pressure, while the maximum number of outlets required by the Code are operational. The pressure at the outlet of pressure reducing landing valves shall be adjusted to fall within the specified range.
- d) Every outlet to be tested for flow and pressure
- e) Verify operation of check valve at the breeching inlet, and all valves in the system
- f) Visual inspection of pipes, sleeves, valves, hoses, cradle, pipe supports labels and accessories.
- g) Refer to section on testing of pumps systems

PUMP INSTALLATION

The tests to be carried out on the pump installation should include the following:

- a) Visual inspection of the installation
- b) Verify that all supports, vibration isolators and connection are properly secured.
- c) Verify setting of controls, pressure switches, flow switches, timers and accessories are properly set.
- d) Conduct electrical test as specified in section “Testing of Electrical Works”.
- e) Ensure that tanks are full of water, make-up pipes operational and level switch interlocks operational.
- f) Ensure that all stop valves are in the appropriate position.

Start all pumping units, by operating the test valve in a manner which will simulate fire conditions and check the following:

- 1) Correct cut-in pressure and cut out pressure
- 2) Efficient pump gland operation
- 3) Operation of both local and remote ‘pump run’ alarms
- 4) Pump priming water
- 5) Verify motor current, temperature rise, speed and direction of rotation

On electric motor driven pump, check the phase failure alarm and check that there is no excessive vibration or noise. Pump shall be fully operational within 30 seconds.

- a) Verify that the necessary pressure and flow are achieved.
- h) Ensure that accessories like pressure gauges, check valves, water alarm gong, etc. are operating properly
- i) Verify operation of compression-ignition engine driven pumps and check the following items:-
 - Water, oil and fuel leaks and for loose fittings and ancillary equipment.
 - Belt drives
 - Battery charger power failure alarm
 - Check batteries including terminals for cleanliness and correct level of electrolyte in each cell to ensure that they are in good serviceable condition.
 - Obvious out of balance
 - Correct running speed
 - Before and after running, check water, oil and fuel levels. Top up if required.
 - After running, ensure that the engine stop mechanism automatically returns to the start position
- j) Test the interchangeability and function of the duty and standby pumps.
- k) After testing of the pumps and resetting of the systems, check and record the pressure at the installation gauge and water supply gauge to ensure that normal water pressure is being maintained.

ACOUSTICS

Measure and record octave band sound levels at designated locations and ensure that readings are within the specified parameters.

COMMISSIONING/ ACCEPTANCE CHECKS

Commissioning shall be deemed to include all operations required in order to correctly set the plant to work, adjust and calibrate to design conditions to comply with relevant CIBSE or BS Commissioning Codes and to the satisfaction of the Engineer. The above shall include, but not limited to, the testing and balancing of all systems, including associated plant and equipment. Balancing and adjusting to achieved correct pressure and flow rates, including setting and adjusting valves and other regulating devices. All valves shall be locked and marked in final setting positions. Final setting positions for all regulating and controlling devices shall be recorded, and such records shall form part of the Manual of Operating and Maintenance Instructions called for in this specification.

The subcontractor must carry out full scale commissioning, testing and balancing of all system before requesting the attendance at site of the Engineers and the representatives from client and authorities for carry out acceptance checks. The contractor is required to make application to the Engineer giving at least seven days notice in writing when requesting acceptance test on any portion of the works. The application must be accompanied by a completed set of record indicating all plant settings, water flow rates, pump and fan heads and noise level readings as adjusted by the sub-contractor, together with the respective design values.

The Engineer reserves the right to refuse any application which is not accompanied by this information. The subcontractor must have available at site during balancing operations calibration data including pump and fan characteristic curves to assist the Engineer in checking the balance of the system. The contractor must have staff available to operate and adjust all systems as required by the Engineer during testing. He must also be represented by a member of his technical staff. The contractor shall also provide the services of a skilled mechanic and electrician who shall stand by, operate and maintain the installation for a period of two weeks after the installation has been taken over and the building occupied. During this period, final adjustment and other essential rectifications are to be carried out.

ELECTRICAL SERVICES
(SPECIFICATIONS)

PECIFICATION FOR ELECTRICAL SERVICES

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
SECTION 1	General Specifications	GS/1 – GS/12
SECTION 2	LV Main Switchboard & Sub-board	M/1 – M/5
SECTION 3	Switchboards & DB's	SB/1 – SB/5
SECTION 4	Cabling	C/1 – C/4
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SECTION 9	AMF	AMF/1 – AMF/5
SECTION 10	Earthing System	ES/1 – ES/2
SECTION 11	External Lighting	EL/1 – EL/1
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SECTION 15	Addressable Fire Alarm System	AFS/1 – AFS/8
SECTION 16	Fire Extinguisher	FE/1 – FE/2
SECTION 17	Telephone	T/1 – T/3
SECTION 18	Defects Liabilities Period	SP/1 – SP/7

GENERAL SPECIFICATION

1.0 Scope of Work

The scope of works shall include supply, delivery, installation, testing, commissioning, completion, handling over, operational maintenance and servicing during the guarantee period of the entire electrical and associated works and allied works as described in this specification, drawings and schedules.

All works, performed under this contract must be in accordance with: -

- a) Regulations of the Institution of Electrical Engineers (latest edition)/BS 7671.
- b) Rules and Regulations of Department of Electrical Services, Negara Brunei Darussalam.
- c) Relevant British Standard Code of Practices.

Where the requirement shall be of the different rules, regulations or codes differ, the most stringent requirements shall prevail.

All materials shall be manufactured in accordance with the appropriate British Standards or such other National Standard as may be approved by the S.O.

The works to be performed under this tender shall comprise or but not limited to the following: -

- a) Supply and install electrical and associated works as described in the specifications and drawings.
- b) Supply three (3) complete sets of prints and one (1) set of reproducible tracings and one set of computer diskettes in AUTOCAD format of “As fitted/Installed” drawings, size of prints shall be A1 size (841mm x 594mm) for Electrical & Mechanical Installation and other services in the contract.
- c) Supply five (5) complete bind operation manuals for Electrical & Mechanical Installation and other services in this contract
- d) Testing and commissioning of the completion installation.

The Tenderer shall be fully responsible for the submission of all application forms, plans and drawings to maintain the necessary liaison with Department of electrical Services and other authorities having jurisdiction over the works and obtain approval from them for the complete installation specified.

3.0 Tenderer to Visit Sites

The tenderer shall be deemed to have visited the site so as to take into consideration of the existing conditions and to have satisfied himself as to the facilities for access, existing services and other site conditions prior to tendering. No claims will be allowed on the grounds of ignorance of the conditions under which the works will be executed.

4.0 Customs Restrictions, Quotas and Duties

The tenderer shall thoroughly acquaint himself with all the customs restrictions, quotas and duties imposed in Brunei and shall allow in his rates for such contingencies for which he may be liable and no claim in respect of these items will be entertained.

5.0 Progress, Completion and Maintenance of works

The successful tenderer shall before proceeding with the work, prepare in cooperation with the Employer and other tenderers a programme of work for the approval of the S.O. He shall further co-ordinate his work with the requirements of the Employer and other tenderers and the S.O.

After the certified date of practical completion, the tenderer shall provide 12 months free maintenance service.

6.0 Site Supervisor and Engineer

The tenderer shall supply a competent English speaking qualified and registered project engineer and a qualified and registered foreman or supervisor to be at the site during working hours. This project engineer and supervisor shall be empowered to receive and set upon instructions given by the S.O. and shall attend site meetings. Instructions given to them shall be taken as having been given to the tenderer.

7.0 Substitutions

Should the tenderer consider that any part of the work could be carried out quicker, better or more effectively by the substitution of materials or methods other than those specified, he may suggest them in writing to the S.O. for consideration.

Where the words “or equivalent” are used, the tenderer may request permission to use a substitute for what is specified, provide that the substitute is equal or better quality and effectiveness than that specified. However, the tenderer shall refer to the section “Instruction to Tenderers.”

8.0 Prototype

The tenderer shall supply drawings and prototype samples of items required in the specification/drawings and at the direction of the S.O.

Approved prototypes may be retained by the S.O. until the work is completed.

Samples and drawings shall be submitted for approval in sufficient time to allow for manufacture to commence to fulfill the required delivery site.

9.0 Failure to Comply with Space Limitation

Should the whole or any part of the installation be unable to fit into the space allocated, the S.O. may at his discretion permit the tenderer to carry out at his own cost such modifications to the equipment as he may propose to improve its adaptability and allow such time as he considers to be reasonable for the execution of such modifications.

Such permission will not be granted if S.O. considers the carrying out of the modification proposed by the tenderer to be not in the best interest of the Employer.

Notwithstanding the above, should the equipment be unable to fit into the space allocated, the S.O. may reject the whole or part of it.

The Tenderer shall at his own cost dismantle and remove from site the whole or part of the equipment which has been rejected and, at the discretion of the S.O., will be required to replace it with an approved alternative or to reimburse the Employer for the cost of such replacement carried out by others.

10.0 Failure to Achieve Guaranteed Performance

Should the whole or part of the installation be unable to produce on test the performance guaranteed in the Tender, the S.O. may, at his discretion, permit the tenderer to carry out at his own cost such modifications to the installation as he may propose to improve its performance and allow such time as he considers to be reasonable for the execution of such modification.

Such permission will not be granted if the S.O. considers the carry out of the modification proposed by the tenderer to be not in the best interest of the Employer.

Notwithstanding the above, should the installation be unable to produce on test (or on retest after the approved modification) the performance guaranteed in the Tender, the S.O. may reject the whole or any part of it.

The tenderer shall at his own cost dismantle and remove from site the whole or any part of the work which has been rejected and at the discretion of the S.O. will be required to replace it with an approved alternative or to reimburse the Employer for the cost of such replacement carried out by others, provided that the total amount of such reimbursement shall not exceed the original Total Tender Price.

11.0 Drawings.

The successful tender shall upon the award of this tender submit equipment details and scales (1:50) shop drawings for the approval of S.O. and shall within Three (3) weeks submit manufacturers certified drawings showing overall weights and dimensions and dimensioned fixing or mounting details particularly where such details have to be incorporated into building structures.

The tenderer shall on completion of this project supply one complete set of reproducible tracings and three complete sets of “as-installed” drawing to the S.O..

12.0 Operation, Maintenance Manuals and Instructions

On the completion of the project, the tenderer shall supply to the satisfaction of the S.O. five (5) copies of comprehensive operating and maintenance instructions for the equipment installed under this tender.

The form of the Maintenance manuals shall be as follows: -

- 1) General Description;
- 2) List of Equipment giving manufacturer, names and addresses;
- 3) Maintenance instructions for each item of equipment;
- 4) Catalogue list of spare parts;

- 5) List of spare parts supplied under this tenderer;
- 6) Instructions for adjusting controls and cut-outs;
- 7) Operating Instructions;
- 8) Emergency directions.

13.0 Cleaning Up

From time to time during the progress of the works, the tenderer shall arrange for cleaning and removal of accumulated debris as directed by the S.O. and shall at all times keep his working areas clean and tidy.

On completion, he shall remove from the site all plant, surplus materials and rubbish and clean up all floors, walls, ceilings and structures of dirt and stains resulting from his work and make good all tainted painting and finishing, all to the satisfaction of the S.O.

14.0 Safety Regulation

The tenderer and his personnel whilst working on site shall at all times observe all relevant safety regulations and rules.

15.0 Accommodation, Water, Lighting etc.

The Tenderer and Main Tenderer shall arrange for the use of water, artificial lighting, temporary power supply, etc. where available and requested.

16.0 Cutting and Making Good

The Tenderer shall do all cutting, drilling, etc. necessary for the installation of the work of this tender. This includes any chipping, cutting, etc. and subsequent making good of complete brick walls or other partitions.

Where openings are required to be formed in floors, beams, walls, partitions, ceilings or other sections as and when required for the installation, the main tenderer shall fix and provide/cut the location of such openings.

Failure on the part of the tenderer to provide the location of the openings in advance to the construction will result in the tenderer having to carry out this work at his own expense.

The Tenderer shall co-operate with other tenderers to the fullest extent possible to reduce cutting, drilling, etc. of finished work to a minimum.

Structural members shall not be cut or drilled with prior consent of the Structural Engineer.

Any Damage to the finished building work caused by the main tenderer or tenderer shall be made good at his own expense.

17.0 Other Requirements

17.1 Drawings

The tenderer shall submit the drawings for approval on or before the date named in the specification such drawings may as may be called for therein.

Drawings signed as above described shall not be departed from without the permission of the S.O. or the tenderer.

The S.O. shall have the right at all reasonable times to inspect at the factory of the tenderer all drawings of any portion of the works.

The Tenderer shall, if desired by the Client, furnish to the S.O. at the commencement of the maintenance period drawings other than shop drawings of the works as complete, in sufficient detail to enable the S.O. to maintain, dismantle, reassemble and adjust all parts of the works.

17.2 Mistakes in Drawing

The tenderer shall be responsible for any discrepancies errors or omissions in the drawings and other particulars supplied by him, whether such drawings and particulars having been approved by the S.O. or not.

17.3 Operation and Maintenance Instructions

The tenderer shall furnish to the S.O. before the works are taken over, operating and Maintenance Instructions together with drawings (other than shop drawings) of the works as completed in sufficient detail to enable the S.O. to maintain, dismantle, reassemble and adjust all parts of the Works. The Works shall not be considered to be completed for purposes of taking over under the terms of Clause 17.7 (Taking Over) until such instructions and drawings have been supplied to the S.O. But in any case, Operation and Maintenance Instructions shall be submitted not later than 6 weeks upon practical completion.

17.4 Manner of Execution

All plant to be supplied and all work to be done under this tender shall be manufactured and executed in the manner set out in the specification or, where not so set out, to the reasonable satisfaction of the S.O.

17.5 Inspection Testing

The S.O. shall be entitled at all reasonable times during manufacture to inspect, examine and test on the tenderer's premises the materials and workmanship of all plant to be supplied under the tender, and if part of the said plant is being manufactured on other premises, the tenderer shall obtain for the S.O.'s permission to inspect, examine and test as if the said tenderer's premises. Such inspection, examination or testing, if made, shall not release the tenderer from any obligation under the tender.

The tenderer shall give the S.O. written notice of the date on the place at which any plant will be ready for testing as provided in this tender and unless the S.O. shall attend at the place so named within 15 days of the date which the tenderer has stated in his notice the tender may proceed with the tests, which shall be deemed to have made in the S.O.'s presence and shall forthwith forward to the S.O. duly certified copies of the test readings.

Where the tender provides for test on the premises of the tenderer or any other tender, the tenderer except where otherwise specified shall provide free of charge such assistance, labour, material, electricity, fuel, stores, apparatus and instruments as may be requisite and as may be reasonably demanded to carry out such tests efficiently.

If after inspection, examination or testing any plant, the S.O. shall decide that such plant or any part thereof is defective or not in accordance with the tender, the S.O. may reject the said plant thereof by giving the tenderer within a reasonable time notice in writing of such rejection, stating therein the grounds upon which the said decision is based.

Where the tender provides for tests on the site, the tenderer, except where otherwise specified, shall provide free of charge, subject to the provisions of Clause 17.6 – Tests on completion, such labour, materials, electricity, fuel, stores and apparatus as may be required and as may be reasonably demanded to carry out such tests efficiently.

17.6 Tests on Completion

The tenderer shall give to the S.O. in writing twenty-one days notice of the date after which he will be ready to make the tests on completion. Unless otherwise agreed, the tests shall take place within ten days after the said date on such day or days as the S.O. shall in writing notify the tenderer.

If the S.O. fail to appoint a time being having being asked to do so or to attend or to arrange for his assign to attend at any time or place duly appointed for making the said test, the tenderer shall entitle to proceed in his or their absence and the said tests shall deem to have been made in the present of the S.O.

If, in the opinion of the S.O., the tests are being duly delayed, he may by notice in writing call upon the tenderer to make such test within ten days from the receipt of the said notice and the tenderer shall make the said tests on such days within the said ten days as the tenderer may fix and of which he shall be give notice to the S.O.. If the tenderer fails to make the test. All tests as made by the S.O. shall be at the risk and expense of the tenderer unless the tenderer shall establish that the tests so made shall be at the risk and expense of the S.O.

If any portion of the works fails to pass the tests of the said portion shall, if required by the S.O. be repeated within a reasonable time upon the same terms and conditions, save that all reasonable expenses to which the S.O. may be put by the repetition of the tests shall be deducted from the tenderer's Price.

17.7 Taking Over

As soon as the works have been completed in accordance with the tenderer, except in minor respects that do not affect their use of the purpose for which they are intended and except for the maintenance thereof and have passed the tests in completion, the tenderer shall obtain from the S.O. a Certification (herein called a certificate of practical completion) in which he shall certify the date on which the works have been so completed and have passed the said tests and the Employer shall e deemed to have taken over the works on the date so certified but the issue of a certificate or practical completion shall not operate as an admission that the works have been completed in every respect. In the event of the works being divided by the tenderer into two or more sections, the tenderer or the Employer shall be entitled to take over any section or sections before the other or others and thereupon the tenderer shall issue or obtain from the S.O. a certificate in respect thereof. If by agreement between the tenderer of the Employer and the tenderer any portion of the works (other than a section or sections) shall be taken over before the remainder of the works. The tenderer shall issue or obtain from the S.O. a certificate of practical completion in respect of that portion.

17.8 Maintenance Period

For a period of 12 months after the works or any portion thereof have been taken over, the tenderer shall be responsible for making good with all possible speed any defects arising from defective design (other than a design made, furnished, or specified by the tenderer) materials or workmanship or from any act or omission of the tenderer that may develop in the works under the conditions provided for by the tender and under proper use.

If any such defect shall occur the S.O. shall inform the tenderer thereof stating in writing the nature of the defect. If the tenderer replaces or renews any portion of the works, the provisions

of this clause shall apply to the portion of the works so replaced or renewed until the expiration of 12 months from the date of such replacement or renewal.

If the replacement or renewals are of such a character as may affect the efficiency of the works of any portion thereof, the S.O. may within one month of such replacement or renewal give to the tenderer notice in writing requiring that tests on completion by carried out as provided in Clause 17.6.

These conditions shall apply to all inspections, adjustment, replacements and renewals and to all tests occasioned thereby, carried out the tenderer during the maintenance period.

17.9 Tender Change

The S.O. shall have full power from time to time during the execution of the tender by notice in writing to direct the tender to alter, amend, omit, add to or otherwise vary any of the “Works” and the tenderer shall carry out such variations and be bounded by the same conditions as far as applicable as though the said variations were stated in the specification. If, in the opinion of the S.O. or tenderer, any instruction to vary the works will involve an increase or decrease in the tender Price, the amount of such increase or decrease shall be determined before the work is put in hand unless the tenderer is otherwise instructed in writing by the S.O. The tender or prices analogous thereto, or if such prices are not applicable, at rates generally ruling at the date of the tender for the type of work concerned.

No claims shall be made by the tenderer for payment in respect of any alleged increase or decrease in the quantity or type of work on account of alternations made in the work to comply with the requirements of the specification, or to suit the tender’s method of working or to suit the tenderer’s requirements.

MAINTENANCE AND MANUALS

1.0 MAINTENANCE

The contractor shall nominate and confirm the list of personnel/specialists to fully maintain the whole installation for twelve (12) months during the defect and liability period.

The Contractor shall be responsible to carry out all maintenance and inspection works recommended by the Manufacturer for all the equipment included in the Contract to ensure that the equipment will operate under optimum condition with long service life.

The maintenance work shall ensure a safe, proper and satisfactory function of the system to facilitate maximum operation continuity and minimum breakdown stoppage.

It is the responsibility of the Contractor to provide an efficient and effective breakdown maintenance at all time. In this manner, the Contractor shall provide 24-hour standby to answer call for attendance to failure of equipment.

2.0 OPERATION AND MAINTENANCE MANUALS

2.1 GENERAL

The operation and maintenance manuals shall cover the following aspects and shall be provided in separate volumes: -

- Equipment installation,
- Equipment operation,
- Workshop repair and system maintenance, and
- System description

The Manuals shall deal with all the standard options and arrangements provided in the Contract,

If there is more than one version of a particular type of equipment supplied, then the one volume shall cover all versions of the equipment and include sections showing the variations between the different versions of that equipment.

The manuals shall include the following:

- a) Instructions and procedures for placing equipment in initial operation or start-up instruction, controls and accessories operation sequence and interlocks including operation parameters and/or data
- b) Operation and use
- c) Troubleshooting malfunctions
- d) Routine Maintenance including recommended schedules
- e) Disassembly and re-assembly
- f) Illustrated parts breakdown of each major assembly. Parts lists shall include a complete list of component part of an item of equipment together with an expanded view or equivalent means to identify the parts
- g) Special tool lists shall include all tools and devices required for assembly and disassembly, operation and maintenance of the equipment and an indication of the use of each item. The lists shall further identify the source of manufacture, consumable supplies and special tools that are normally furnished with the purchase of the equipment or to be furnished as part of the contract. In addition, a list shall be provided showing items recommended by the manufacturer for two years operation including bench level materials.

2.2 PRESENTATION

All manuals shall be in English. Printing and drawings shall be clearly presented. Covers shall be durable and strong. A description title of equipment and/or subject shall be printed on the front and the spine, together with the type and identification number of the equipment. The schedule and the Contract number of the plant to which the manuals refer shall be shown on the first sheet inside the cover.

Manufacturer's standard brochures may be incorporated provided they refer particularly to the Plant and all extraneous matter shall have been marked as inapplicable.

The Original manufacturer's drawing numbers, spare parts, name plates, serial numbers, part names and numbers and all other details in respect of the Plant shall not in any way be changed.

The manuals and the parts list referred to in the specification which may include approved Contractor's drawings reduced to a convenience size, shall be bound in a loose-leaf style and not inserted into cover pockets. Manuals shall be convenient to handle and suitable for addition of amendments. If any volume should be unduly bulky, then the volume shall be subdivided and produced in multi-volume form.

Each Volume shall contain an index to the sections included. Explanation and descriptions shall be accompanied by photographs and drawings inter spread throughout the text. Drawings shall fold out clear of the text where appropriate. It shall be possible to fold out and read drawings when the handbook is closed.

Terminology shall comply with that normally used by civil aviation electrical and electronic personnel. All terms, abbreviations and symbols shall be defined in glossary of terms in each volume. Different groups of information within one handbook shall be separated by means of robust separating cards with a form of identification such as an edge strip clearly visible with the book closed.

2.3 INSTALLATION MANUALS

These manuals shall be generally used by the Contractor's installation staff. They shall describe and illustrate the installation of the equipment, commencing with transporting and unpacking, these instructions shall continue in a logical sequence until the equipment is fully assembled, erected, wired and connected to power and associated equipment. The basic electrical testing shall be described.

The manuals shall describe the complete mechanical installation of the equipment in its various standard applications. For example, equipment may be floor mounted either back-to-back or against a wall, suite mounted or wall mounted.

All mechanical components of the Contractor's mounting arrangement shall be completely listed and clearly depicted in drawings and photographs.

Sufficient details shall be given to enable all necessary installation works and part of the works to be correctly carried out by others. The manuals must include complete details of standard alternative equipment arrangements and rack assemblies appropriate to the works, fully dimensioned and illustrated by photographs with all sub-units, terminals, test points, etc. labeled for identification.

Drawing shall be provided showing details of mounting requirements, cable entries, air ducts, interfaces, connection pressurizing equipment and features requiring special building design.

Sizes and weights of all major items making up the installation shall be given.

Drawing shall show interconnection wiring and station cabling etc., and all other appropriate items.

The manuals shall prominently state precautions to be observed by installers to avoid risk of damage to the equipment.

2.3 OPERATION MANUALS

Information in these manuals shall be sufficient for semi-skilled staff to operate and maintain the system in an operational condition.

The approach to these handbooks shall be determined by the maintenance philosophy that the field staff will replace faulty units with equivalent working units from the stock of spares and, the faulty units subsequently repaired at the electrical maintenance depot.

Clear instructions shall be given for:

- a) Undertaking first-in maintenance and sub-sequent routine maintenance (e.g. meter checks cleaning).
- b) Procedure for routine system measurements including arrangement of test instrument.
- c) Checking equipment operational condition by meter readings and procedure of identification of faulty unit.

Test instruments shall be accompanied by their own operational handbooks explaining facilities and application.

The manuals shall make full use of drawings and photographs as part of the instructions. They shall include:

- a) Drawings and photographs of racks or assemblies for all standard applications appropriate to the Works.
- b) All units shall be clearly labeled and inert-connections shall be clearly shown.
- c) Functional block diagrams of the rack of assembly.
- d) Functional block diagrams of units.
- e) Drawing indicating test and metering points and showing frequencies, level and impedances at interfaces of units.
- f) Drawings showing test arrangements for all re-commended routine test procedures.
- g) Description of equipment functions and circuits.

All equipment supplied shall be fully described. The test shall incorporate a complete series of illustrations and drawings explaining the equipment from general principles to details necessary for complete operation, maintenance and repair by maintenance staff.

- h) Performance specification and physical details of all equipment assemblies and sub-units.

The guaranteed performance specification shall be explicitly stated. Other performance figures shall also be stated such as expected performance, line-up figures (with limits) and operational figure (with limits). These figures shall be quoted against all items and sub-items as far as practicable. Physical dimensions and weights of items shall be stated. The power consumption of each active unit shall be stated.

- i) The description of equipment supplied shall be supported by complete sets of drawings and photographs for each basic maintenance unit and for each sub-unit.

A complete set, unless otherwise approved, shall consist of:

- Photograph(s)
- Component layout drawings,
- Schematic drawings of circuits, jack strips, interconnections, and
- Functional drawings which shall include levels and impedances at interfaces and other appropriate points, test points and metering points.

2.4 WORKSHOP MANUALS

These manuals will be the reference for skilled staff based at repair and control centres when they initially line-up and test the equipment, periodically maintain the system, analyze supervisory indications, locate faults and repairs faulty units.

The manuals shall comprehensively describe the equipment, its performance, operation and maintenance with full supporting technical details.

The manuals shall include the following:

a) Alignment and Commissioning of new Equipment

The full sequent of steps to commission equipment shall be detailed. Equipment required to test and align each system shall be listed and describe with illustrations, in particular, any special adaptors and non-standard materials and alignment tools.

b) Maintenance of Equipment

The Maintenance routines recommended by the Contractor shall be specified, particularly the routines which must be observed to ensure validity of the Contractor's guarantees or warranties.

c) Techniques for Alignment and Maintenance

Full and detailed instructions shall be included to enable line-up and repairs to be undertaken by skilled staff. All techniques normally followed by the Contractor's factory shall be included, together with values and ranges for all equipment parameters measured in the course of completion line-up.

d) Description of Equipment Functions and Circuits.

All equipment purchased shall be fully describe, the test incorporating a complete series of illustrations and drawings explaining the equipment from general principles down to the details necessary for complete operation, maintenance and repair by maintenance staff.

e) Performance Specifications and Physical details of all Equipment Assemblies and Sub-units.

The guaranteed performance specification shall be explicitly stated. Other performance figures shall also be stated such as expected performance, line-up figures (with limits) and operational figures (with limits). These figures shall be quoted against all items and sub-items as far as practicable. Physical dimensions and weights of items shall be stated. The power consumption of each active unit shall be stated.

f) Drawing and Photographs

The description of the equipment supplied shall be supported by complete sets of drawing and photographs for each basic maintenance unit and for each sub-unit.

A complete set, depending on the type of equipment being provided, shall consist of:

- Photographs(s)
- Component layout drawings,
- Schematic drawings of circuits, jack strips, interconnections,
- Functional drawings which shall include levels and impedances at interfaces and other appropriate points, test points and metering points and
- Component listing indicating components of a special or critical nature which have to be supplied by the equipment manufacturer on a continuing basis to ensure equipment performance is maintained.

In addition, drawings shall be provided showing:

- Equipment assemblies at terminals and repeaters showing standard options provided,
- Assemblies of units making up standard racks or their equivalent, and
- Functional block diagrams of typical standard stations and racks.

2.5 SYSTEM MANUALS

The system manuals will be used by staff as reference manuals for description of the overall system. The manuals shall have a format and indexing system which permits ready access to the information sought.

System manuals shall contain the following information.

- a) System description,
- b) Description of system facilities,
- c) A summary of the electrical performance characteristics of the equipment,
- d) Station inventories for the equipment type supplied,
- e) A schedule of system maintenance,
- f) Description of the tests to determine the overall system performance and
- g) Block schematic diagrams for each station.

2.6 FEATURES OF TECHNICAL DRAWING FOR MANUALS

Contractor shall pay particular attention to the following features which are required:

- a) Drawing numbers and titles shall enable ready identification of the drawings with the relevant units. The descriptive title of the unit, the type number and any appropriate serial number shall feature clearly in the title blocks of the drawings.
- b) Drawing showing an assembly of units and sub-units shall incorporate standard drafting techniques (such as clearly recognizable border lines or area shading or colouring) to indicate particular units which are modular or discrete and which can be replaced as a whole. The units which are sub-units shall be clearly labeled.

MAIN SWITCHBOARDS AND SUB-SWITCHBOARDS

2.00 TYPE AND RUPTURING CAPACITY

The Main and Sub-Switchboards shall be the self-contained, extensible floor or wall mounting, metal clad, flush fronted, cubicle type as shown on the Specification Drawings for front and/or rear access built up from completely enclosed units housing main circuit breakers, contactors, moulded selector switches, indication lamps, meters, bus bars, sealing glands, anti-condensation cubicle heaters complete with indicating lamp and switch relays and other necessary items of equipment whether specified hereinafter or not suitable for indoor service in an ambient temperature of up to 40° C with 100% R.H. at maximum continuous rating without exceeding the maximum temperature permitted by the relevant B.S. Specification to which reference is made herein for operation on a 415/240 Volts 3 phase 50 Hz system operating with solidly earthed neutral.

Generally, the Main and Sub-Switchboards shall be capable as a whole of withstanding without damage the electrical, mechanical and thermal stresses produced under short circuit conditions equivalent to 31 MVA at 415 volts for 3 seconds and shall comply with all requirements of B.S. 162. However, lower rupturing capacity switchboards compatible with the prospective fault levels at the points of application may be permitted if details could be submitted to substantiate the fault levels at the locations concerned.

Special attention shall be given to insulation and finish of all items and no linseed oil varnish, press pan, fiber to hygroscopic material shall be used in any position and all components shall have a tropical finish including electro tinning of non-ferrous parts and vacuum impregnation of operating coils.

All items of equipment of similar design and dimensions shall be, wherever possible, made to jig and be fully interchangeable with each other and care shall be taken to ensure that all parts fit accurately.

The switchboard shall be factory assembled and tested before delivery to site in sections and of suitable sizes for installation in the situation as shown on the Specification Drawings.

2.01 CONSTRUCTION

Each cubicle framework shall be fabricated from electro galvanized angle sections of not less than No.12 SWG electro galvanized sheet metal and self supporting when assembled and of standard size, uniform in height and depth from front to back. The cubicle roof, side panels and doors shall be of not less than No. 14 SWG sheet steel with turned edges to the front panels and so framed as to provide a clean, flush and pleasing and rigid construction without welded cross-structs. Where necessary, the cubicle shall be strengthened by horizontal and vertical folded channels and corner gussets.

Full access shall be provided to control equipment inside cubicles by means of suitable hinged doors secured with adequate numbers of captive thumb screws. Full access shall be provided to control equipment inside cubicles by means of suitable doors with car type handle and integral cylinder lock. For circuit breakers, the doors shall be mechanically interlocked with the main switch to prevent any door being opened with the circuit breaker in the 'ON' position. All doors shall be provided with approved type of gasket. The front, top, back and bottom of all cubicles together with switch/circuit breakers chassis, access doors and other ferrous components shall be manufactured from electro-zinc plated metal sheet. The exterior of the cubicles shall be finished semi-gloss grey to colour No. 631 of B.S. 381C with end plates and heads of any external fixing bolts or set screws similarly finished except those steel parts normally left bright which shall be cadmium plated and operating parts finished semi-gloss black.

The interior of each cubicle shall be finished matt white and shall be dust, insect and vermin proof. The interior of each piece of equipment shall be clearly marked to show the phases with either colored plastic disc screwed to fixed components or with colored plastic sleeving for identification. Plastic tape will be permitted. Proposed Fisheries Processing Complex for "Golden Corporation Sdn Bhd" on lot 6079 ('A'), Kg. Serasa, Muara Brunei Darussalam

Proper steel mounting frame and other steel support shall be provided where required.

2.02 BUSBARS AND SECONDARY WIRING

Busbar markings and arrangements, connections and grade of copper shall all comply as appropriate with B.S. 158, 159, 1433 and 1977.

The Switchboard shall be so arranged that the main busbars run horizontally through each sectionalized length in a ventilated separate compartment. The busbars shall be of adequate cross-sectional area to give the current ratings as shown in the drawings after allowing for derating factors. The main busbars shall comprise four rectangular section bars of equal cross-sectional area (i.e. full size neutral) fabricated from hard drawn high conductivity copper, electro-tinned for the entire length, rigidly mounted on non-hygroscopic insulators with connections from the busbars to the circuit breakers and switches effected by means of copper bars or rods securely clamped to the bars and identified by means of colored plastic sleeving or proper painting to indicate the phase colors.

Secondary busbars where used shall be HDCH copper similar to the main bars. Copper connections shall be provided from busbars to the distribution equipment and when required from distribution equipment to the cable terminations. Connection shall be so arranged that they do not impede access to cable entries and also subsequent maintenance of the switchboards. All connections shall be manufactured from HDHC copper, however for lower rated circuits of 100 Amp or below PVC single core cables may be permitted for connection provided the cables are the double PVC insulated type and of adequate cross-sectional area to withstand the prospective fault level. PVC/PVC Cable connections where permitted shall be identified with PVC sleeving.

All secondary wiring shall be of 600-volt grade PVC Cables with multistrand copper conductor of not less than 1.5 sq.mm section and shall be fixed securely without strain by cleats of the compression type. Multiples runs of wiring shall be enclosed in proprietary make PVC trunking specially designed for installation within the switchboard. For the purpose of identification different insulant colors shall be provided to distinguish the various circuits and each connection shall terminate at an approved type of terminal block place in an easily accessible position for testing at site with coded ferrules of an approved type on both ends of each conductor.

No connections or soldered joints shall be permitted in the wiring. The wiring shall be formed in a neat and systematic manner, with cables supported clear of panels and without crossovers. Bushes shall be provided as necessary to prevent chaffing of cables.

2.03 CABLE ARRANGEMENT

The switchboards shall be wall mounted as shown on the Specification Drawings and shall be designed for cables entering and leaving the switchboards vertically from above or below as appropriate.

Unless otherwise indicated, cable boxes for the termination of paper insulated cables entering or leaving the cubicle from below shall be mounted at or near the bases of cubicles whereas cable boxes for cables entering or leaving the cubicles from above shall inverted type and be mounted at the top portion of the cubicles, cable boxes shall be of the split type manufactured from good quality cast iron free from blow-holes complete with filling orifice, drain, plug, expansion dome, brass cone shaped wiping gland of appropriate size, armoured clamp and of such design as is

suitable for attachment to the adjustment served and such as to permit cable conductors to be formed into equipment terminal without undue bending.

Cable termination shall be mounted adjacent to the associated equipment. The bottom and top sheets of the cubicles shall be sectionalized and vermin proof for bottom and top entry cables respectively, entry plates shall be provided for top entry cables. Where necessary, cables clamps or pins racks as appropriate. Cubicles shall be arranged to accommodate entries of all types of cables and gland plates.

The Contractor shall liaise with the Department of Electrical Services authorities and provide acceptable cable dividing box complete with glands etc. for termination of the incoming DES service to consumer's MV Switchboard.

The various cubicle housing the respective control units shall be grouped in multi tier arrangement and a further part shall constitute a cabling and wiring chamber of ample dimensions in which terminal boards, cable boxes and gland plates shall be located.

2.04 SWITCHBOARD ARRANGEMENT

The Contractor shall provide the proposed switchboards layout drawings for the Engineer's approval before fabrication of switchboards. The switchboards shall be arranged to suit the spaces provided.

2.05 EARTHING

A suitable earthing terminal shall be provided on the frame of each section of the Switchboard for connection to earth. A suitable HDHC copper earth bar to be extended the entire length of the switchboard shall be provided in each switchboard for connection to all outgoing circuits and equipment frames.

2.06 METERS AND RELAYS

Meters and relays for external panel mounting shall be of the flush pattern, with square escutcheon plates finished matt black and pressed steel cases. Indicating instruments shall be to B.S. 89 1st grade, moving iron spring controlled with 100mm diameter dials (240 deg. scale) with external zero adjustment, integrating meters shall be to B.S. 37 Parts 1 and 2 and Part 4 with cyclometer registers and protective relays to B.S. 142.

The main incoming circuit breaker shall be provided with both over-current and earth fault protection. The Contractors shall liaise with the Department of Electrical Services in providing the correct types of these devices prior to installation.

The over-current relays shall have adjustable over-current settings 50% to 200% of rated values and adjustable time lag setting of 0 to 3.0 seconds, instantaneous high-set elements shall be provided for the main circuit breaker. The earth fault relays shall incorporate adjustable time lag 0 to 1.0 second and adjustable current settings from 5% to 40% in steps of 5%.

Voltmeters shall incorporate selector switches to enable phase to phase to neutral voltage to be read. Ammeters, being provided with selector switches shall be able to read all the line currents. Generally, ammeters shall be 20% over scaled, however ammeters associate with motor circuits shall be 500% over scaled.

Instruments, meters and relays located on the front of the switchboard shall be segregated from the interior of the cubicle and so positioned that as far as possible, each instrument meter and relay is flushed with the hinged dust proof access doors and is adjacent to the unit with which it is associated.

Other relays more suitable for mounting inside the cubicle such as those required for back indication and tripping etc. shall be grouped conveniently in dust proof cases with removable covers to provide easy access for cleaning and adjustment without dismantling. All relays shall be heavy duty pattern, unaffected by external vibration and capable of operation in any position.

Meter panels shall be hinged to provide ready access to connections and small wiring shall be enclosed in flexible plastic conduit. All meters and relays shall be fully tropicalized. All terminals shall be completely insulated and potential circuits shall be suitably fused.

Approved means shall be provided on the relays panels for the testing of protective relays and associated circuits.

2.07 MOULDED CASES CIRCUIT BREAKERS (MCCBs)

Moulded case circuit breakers shall comply fully with B.S. 4752: Part 1 and the case shall be of moulded insulating material of good mechanical strength and non-tracking properties. The tripping mechanism shall be calibrated in compliance with British Standards at the factory and the breaker shall be sealed to prevent tampering.

Moulded case circuit breakers shall be of manual or automatic tripping operation as required. The automatic type shall each incorporate a trip unit to provide overload and short circuit protection. The trip unit for each pole shall provide inverse time delay under overload conditions and instantaneous magnetic tripping for short circuit protection. The trip unit for each pole shall provide inverse time delay under overload conditions and instantaneous magnetic tripping for short circuit protection. The trip units in all the circuit breakers shall be interchangeable.

The MCCBs shall be so designed that when on tripped conditions, the circuit breakers cannot be switched on again unless it has been reset switching to OFF position first. The operation condition (i.e. ON, OFF or TRIP) of the circuit breaker shall be clearly indicated.

Moulded case circuit breakers shall be Single Pole and Neutral (SPN) Double Pole (DP) or Triple Pole and Neutral (TPN) Type as required. The construction and operation of the circuit breakers shall be such that if a fault occurs, all the poles of the circuit breakers shall have operated simultaneously to isolate and clear the fault efficiently and safely without any possible risk to the operator or to the installation.

Each circuit breaker shall incorporate 'trip-free' mechanism to ensure that the breaker cannot be held closed in fault conditions.

The operating mechanism of the circuit breakers shall be hermetically sealed at the factory and all metallic parts associate with the operating mechanism shall be treated against rust and corrosion. The short-circuit breaking capacity of the MCCBs shall not be less than the maximum prospective fault levels at the point where the MCCB is installed.

The Contractor shall be responsible to select and provide the correct type of circuit breakers for protection of the types of circuit involved. The Contractor shall also be responsible to ensure that the fuses where used in connection with MCCBs shall coordinate with the circuit breakers to give good and proper protection and discrimination of the electrical system.

The respective fault level at the Main Switchboard and Sub-switchboard are taken to be 31 MVA (43 kA) and 16 MVA (22 kA) respectively.

Moulded case circuit breakers may be used in location where the short-circuit current exceeds the breaker's established interrupting ratings provided suitable current limiting fuses are incorporated in the breakers. The rating of the breaker and fuse must be carefully selected to prevent damage to the breaker and to ensure co-ordination and high short circuit protection

required. Tenderer must provide the relevant data for formal approval by the Engineer before the use of integrally fused MCCBs.

2.08 CURRENT AND VOLTAGE TRANSFORMER

Current and voltage transformers shall comply with BS 3938 and BS 3941 as appropriate. They shall be of suitable ratio, output, type and class of accuracy for their function.

Current transformers for protection purposes shall be rated Class 5P20, 15 VA unless otherwise stated in the specification drawings.

Current transformers for indicative metering shall be rated Class 1, 15 VA unless otherwise stated in the specification drawing.

Secondary windings shall be wired to suitable terminal boards and earthed at one point in the circuit.

All transformers shall be wired with an identifying label giving type, ratio, class output and serial number.

2.9 LABELS All cubicle doors shall be appropriately labelled to indicate the service. Labels shall also be provided to identify all items of equipment, circuits, cables and where applicable current rating of fuses and setting of relays. Labels on the exterior of equipment shall be clear perspex, reverse engraved filled flush with black (or red as suitable) filling and the back painted the same colour as the equipment. Labels shall be attached by means of machine screws and nuts or machine screws driven into drilled and tapped holes.

2.10 INDICATION LAMPS

Indicating lamps shall be the type with built-in transformer and made of brass with chromium plated bezel and locking ring. The lamps shall be adequately ventilated and easily removed or replaced from the front of the panel without the use of extractors. Lamps shall be clear and fit into an accepted standard form of lamp holder.

The colour in coloured lamp glasses shall be in the glass and not an applied coating. Transparent synthetic materials may, however, be used instead of glass, provided no material flow or discolouration takes place due to heat from lamps.

2.11 FUSE

Cartridge fuses complete with carriers for protection of auxiliary circuits shall be provided. Fuses shall be of the HRC type category 440/AC 4 class Q to BS 88.

2.12 SAFETY ARRANGEMENT AND WARNING LABELS

All terminals, connections, relays and other components which may be alive when the front access doors are open shall be adequately screened and suitable warning labels shall be fitted. Components within the cubicles shall also be adequately labelled to facilitate testing.

Isolators or links clearly labeled shall be provided in such positions and so connected that maintenance can be carried out with the maximum safety. This particular applies to control circuits fed from a remote position. Where it is necessary to maintain certain components in a cubicle in a live condition when the isolator is in the off position, such apparatus shall be so screened and labeled as to eliminate the possibility of any accident.

- END OF SECTION 2 -

SWITCHBOARDS AND DISTRIBUTION BOARDS

The switchboards, motor control centers, distribution boards and control desks shall be built in accordance with IEC 439 "Factory Built Assemblies for low voltage" or BS5486 "Factory-built assemblies of Switchgear and Control Gear for voltage up to and including 1000V AC and 1200V dc". All factory-built assemblies shall be capable of withstanding the electrical, mechanical and thermal stresses of the prospective fault level experienced. The prospective fault levels of the various factory-built assemblies are as indicated in drawings.

All equipment used in the factory-built assembly shall have been type tested. Type test certificates shall be submitted for all major equipment if requested. All factory-built assemblies, as a complete unit shall have a rating equal to or greater than the integrated equipment rating as shown in the drawing. Factory built assemblies shall be suitable for indoor installation unless specifically indicated otherwise in the drawings. All items of equipment used shall be suitable for a service condition of ambient air temperature not exceeding 40°C and average of 35°C over a 24 hours period, with relative humidity of 100%. The altitude does not exceed 2000m.

CONSTRUCTION

The factory-built assemblies shall be of the totally enclosed, cubicle type, which are extensible and suitable for floor or wall mounting as shown in the drawings. The factory-built assemblies shall be compartmented and utilize sheet steel plates of minimum 1.6mm thickness. The panels shall be vermin proof and constructed to a minimum degree of protection of IP22 ratings to BS EN 60947-1. All panels shall be protected against corrosion. Panels shall be degreased primed and powder spray finished to a thickness of 50 micron to colour BS 381C grey semi textured or RAL7032.

Alternative thickness of sheet steel will be considered if additional bracing is provided to suit the sheet steel thickness offered. Synthetic transparent material for the front and back panels covers are preferred to be used instead of sheet steel. The plinth steel shall be constructed from minimum 5 mm thick steel and suitable to support the weight of the panel. No "Live" parts of components shall be mounted on the door. Operating devices such as Indicating lamps, push buttons, selector switches, meters, etc. shall be so mounted that all live carrying parts are mounted within the panels when the doors are open. Only the operating handle and non "Live" parts shall be allowed to be mounted on the door. If life parts are to be mounted on the door they must be double insulated. All doors shall be independently earthed to the switchboard frame using a braided or coiled copper cable.

The switchboards and motor control centers shall generally be arranged with the busbar at the top, meters and indicating instruments at eye level and not below a height of 1600mm and operating handles at a minimum height of 800mm above floor level and a maximum of 1880mm above floor level. Provision shall be made within the factory-built assemblies for the proper support and bracing of outgoing and incoming cables. Weatherproof cable glands shall be provided for all cables entering or leaving the switchboard. The type of cable entry (i.e. top or bottom) is as shown on the layout drawings). Panels shall be divided into sections of about 2 meters width to enable easy handling and transportation. Panels shall be transported to site on fully enclosed timber pellets. Transportation eye bolts shall be provided for handling at site. Panels which are poorly packed and result in signs of corrosion will be rejected. All equipment and terminals shall be labelled as detailed on the drawings. Labels shall be of clear perspex, reverse engraved and filled flush with red filling. Labels shall be attached by means of chrome finished counter sunk screws and nuts. Cable tails shall be labelled using a cable tag or plastic ferrules.

BUSBARS AND CONNECTIONS

Busbar shall be of hard drawn high conductivity copper or Hybrid Bus bars of aluminium core and copper sheath. The current rating, temperature rise and spacing between conductors shall comply with B.S. 159. The minimum clearance between phases and earth shall be 19mm. The minimum creepage distance in air shall be 38mm between phases and 25mm to earth. The main busbar shall be sized to carry the specified current rating and busbar connections to air circuit breakers, fuse switches and moulded case circuit breakers and shall be adequately sized so that temperature rise in any part will not exceed 30 degrees Celsius above ambient. Busbar selection charts and support spacing charts shall be submitted at the time of submission of shop drawing.

All busbars shall be heat shrink insulated (rachim or equivalent) and rectangular cross-section type. They shall be rigidly supported and have a short circuit rating as specified in the drawings for a duration of 1 sec. They shall be so arranged that extension can be done without difficulty and the resistance of any length of busbar with a joint shall not be greater than that of an equal length of similar bar without a joint. Busbars shall not be drilled to make connections. All busbar joints shall be clamped. If busbars are to be drilled for connections, then the cross-sectional area must be increased in proportion to the size of the drill hole. All busbar connections shall be

made in an approved manner to ensure faultless contacts. Bolts shall be tightened with an even tension and approved washers shall be used at all joints. Cadmium plated, high tensile steel bolts and nuts shall be used. Access to the busbars and busbar connections shall be gained by removal of cover plates secured by bolts or screws. Busbars which extend outside the busbar chamber to connect to circuit breakers, etc., shall be shrouded with insulating sleeves designed to prevent accidental contact with the live parts. Sleeves should be of the heat shrinkable type suitable for the operating temperature and voltages.

An earth bar of minimum size 50mm x 6mm or half the live bar size shall be run the full length at the bottom of each switchboard and motor control centre and the neutral bar shall be the same size as that of the phase bars. Before assembly, all busbar joint surfaces shall be filed or finished to remove burrs, dents and oxides and silvered to maintain good continuity at all joints. All busbars shall be painted with red, yellow, blue, black and green colours at appropriate points to distinguish the phases, neutral and earth bars respectively. All busbars and switchgear terminals to which outgoing or incoming cables are terminated shall be designed for a maximum temperature rise of 30°C above ambient.

CONTROL & INSTRUMENTATION WIRING

Cables for control & instrumentation wiring shall be PVC insulated to BS6004 and the insulation shall be appropriately colour coded to correspond to the various phases, neutral and earth wiring. Wiring for controls shall be minimum 1.5mm² and those for current measurement shall be minimum 2.5mm². Where multi-strand cables are used crimp type cable lugs shall be provided. All wiring shall be neatly run in plastic wiring channels and shall be bundled together using cable ties. All cables shall be identified at all terminals by means of numbered interlocking ferrules of white PVC with black characters. Terminal blocks shall be provided for all control cabling entering or leaving the factory-built assembly. These blocks shall be located in a separate cubicle. Terminal block of different voltage groups shall be separated by barriers and distinctly labelled.

Terminal blocks shall be polyamide construction and suitable for rail mounting. The terminals shall be spring loaded to ensure minimum contact pressure even if screws are loosened. All terminals and screw shall be fully shrouded. Terminal screws shall be of the captive type. Labels shall be provided for each terminal and shall be of the clip-on type. Only one cable shall be terminated at each terminal. Where multiple cables are to be shorted, external links shall be used. Provision shall be made for test socket to enable testing from the front of the panel. 20% spare terminals with a maximum of 10 terminal for each group shall be provided.

MOULDED CASE CIRCUIT BREAKER (MCCB)

The breakers shall comply with IEC157 or BS EN 60947-2. The breakers shall be provided with overcurrent protection by means of thermal and magnetic tripping element. MCCB's shall have a mechanical endurance life of not less than 15000 operations. All breakers tripping mechanism shall be **ambient temperature compensated**. Breakers of frame sizes greater than 160 amps shall be equipped with continuously adjustable magnetic pick up setting (2 to 10 times nominal setting). MCCB's used for incoming main feeders shall in addition be provided with continuously adjustable rated current settings in the range of 60 to 100% rated current. Where earth leakage relays are indicated in the drawings they shall be of definite time lag type which have a adjustable current sensitivity of 100mA to 1A as shown in the drawings and an adjustable time delay of 0.1 to 1 sec. All MCCB's larger than 400A shall be equipped with a earth leakage/earth fault relay.

The MCCB's shall have quick make and quick break mechanism independent of the operating speed. The tripping mechanism shall be mechanically "trip free" from the handle so that the handle cannot be closed against fault conditions. The MCCB shall be provided with **door interlock** handles. All handles shall be large and robust to carry out the switching operation with ease. The handle shall clearly indicate the "on" "off" and trip positions. The handle shall be able to be locked in the "on" or "Off" positions. When locked in the "on" position it shall still be possible for the handle to indicate trip when the breaker has tripped. An interlock release mechanism shall be provided to enable the door to be opened when the breaker is locked in the on position. Multipole breakers shall have a common-trip bar so that a fault condition on any one pole of the breaker will cause all poles to trip simultaneously. The MCCB interrupting capacity shall be not less than that indicated on the drawings unless alternative scheme using cascading protection or other schemes are utilized.

Automatic change over MCCB's shall be of the **motorized** type with both **mechanical and electrical interlock**.

The transfer operation shall be controllable by a adjustable time delay of between 0.1 to 30 sec. The actual transfer time of the MCCB's shall not exceed 2 sec. The motor mechanism shall utilize universal motor with electro magnetic clutch and shall be equipped with pull handles to allow manual operation of the circuit breaker.

All automatic change over MCCB's shall have a minimum mechanical life of 10,000 operations. MCCB when used for motor protection shall have characteristics suitable for the motor starting, current characteristics.

Standard range MCCB shall not be substituted for motor protection circuits. All moulded case circuit breaker

protecting Supply Authorities supply incoming circuits shall be fully withdrawable for easy maintenance. The breaker shall have interlocks to prevent withdrawal when the MCCB is "on". All busbar couplers shall be fully withdrawable and of four pole type moulded case circuit switch.

MINIATURE CIRCUIT BREAKERS (MCB)

MCB's shall comply to BS 3871 Part 1 and shall be of the **current limiting** type having a sealed ambient temperature independent thermal magnetic tripping mechanism providing overload and short circuit protection. All MCB's shall be suitable for rail mounting and shall have a minimum mechanical and electrical service life of 20,000 operations. MCB's shall have minimum M6 category of duty with Type 1-time current characteristics. Those MCB's feeding motor circuits shall have type 3-time current characteristics.

Each pole of the circuit breaker shall have quick make & quick break mechanism and be fully rated and protected with suitable arc-control devices, so that every pole is capable of making and breaking both rated and short circuit fault current. The handles shall be provided with trip free features enabling the breaker to trip even if the handle is held in the closed position.

RESIDUAL CURRENT BREAKERS (RCB)

RCB's shall comply to BS 4293 and shall be of the current operated type. The RCB shall be designed to trip within 20m sec at a current sensitivity of 30mA. The breakers shall be of 2 poles] construction for single phase and 4 pole constructions for 3 phase. All breakers shall be complete with test buttons. RCB shall have a minimum life expectancy of 20,000 operations.

METERS AND RELAYS

Indicating instruments shall comply with BS89. Meters and relays for external panel mounting shall be of the flush pattern type with square escutcheon plates finished matt black and polycarbonate cases. Ammeter and voltmeters shall be of moving iron spring-controlled type with 96mm square dials, accuracy Class 1.5 with external zero adjustment screw which are accessible from the front. Ammeters shall be selected such that full load current indications are not less the two thirds of linear scale of the meter. Ammeters shall be capable of taking overloads of 2 times continuously and voltmeter 1.2 times continuously.

Ammeters at the main incoming feeders shall in addition to the moving iron mechanism be provided with thermal bimetal indicators with draw pointers to record maximum demands. The mechanism shall not respond to short current peaks and shall be manually resettable. Frequency indicators shall be of the vibrating read type. The meter shall be capable of proper operation for voltage variations of $\pm 20\%$ rated voltage. Power factor meters shall be of the electrodynamic crossed coil mechanism suitable for balanced load, three phase four wire system. The accuracy class shall be 1.5 and range 0.5 lag to 0.5 lead. Ammeter select switches shall have make before break contacts to ensure that the current transformers are never open circuited. Voltmeter selector switches shall have break before make contacts.

Protective relays shall comply to B.S. 142. Withdrawable type relays shall be provided with automatic means of short-circuiting the current transformer secondary circuits and capable of breaking tripping circuits when the relay element is removed. Relays shall have a rated current equal to secondary current of the current transformer. The relay shall be complete with mechanically operated flag indicator. Instruments, meters and relays located on the front of the switchboard shall be so positioned that as far as possible, each instrument, meter and relay is adjacent to the unit with which it is associated. Other relays more suitable for mounting inside the cubicle such as those required for back indication and tripping etc. shall be grouped conveniently in dust proof cases with removable covers to provide easy access for cleaning and adjustment without dismantling. All relays shall be heavy duty pattern, unaffected by external vibration and capable of operation in any position. Meter panels shall be hinged to provide ready access to connections and small wiring shall be enclosed in flexible plastic conduit. All meters and relays shall be fully tropicalized. All terminals shall be completely insulated and potential circuits shall be suitably fused.

FUSES/ CURRENT TRANSFORMERS

The high rupturing capacity (HRC) cartridge fuses of rating shown shall conform to B.S.88 Part 2 Class Q1 with minimum breaking capacity of 80KA. When fuses are used for motor protection they shall have motor rated class and rating. Fuse bases and carriers shall be made of high grade phenolic moulding.

Current transformers shall comply to BS3938. Measuring current transformer shall be of accuracy Class 1 and for metering of accuracy Class 0.5. Protection current transformer shall be of accuracy Class 5P20. The burden requirements shall be selected according to the load and in no case, shall be less than 15VA. The output secondary current shall be 5 amps. Links shall be provided on the bus bars for the installation of the Supply

Authorities metering current transformers.

INDICATOR LAMPS

Indicating lamps shall be neon blub type with a minimum service life of 20,000 hours. Double insulated transformer type indicating lights where specified shall utilize lamps with a life of 4000 hours. Lamps shall be easily removed or replaced from the front of the panel without the use of extractors. The body shall be reinforced thermoplastic while the lens cover shall be thermal resistant thermoplastic. Pilot light identification shall be engraved on the lens cover. The colour coding of the lamps shall be in accordance to BS EN60073.

CONTACTORS

Contactors shall be manufactured in accordance with BS EN60947-4-1. Contactors shall be of AC3 duty category and selected to suit the load such that a minimum electrical life of one million operations is ensured. The mechanical life shall be at least 5 million operations. Contacts shall be renewable and constructed from silver faced hard copper and designed to ensure freedom from contact bounce. Coils shall be Class B Insulated to BS 2613 and suitable for continuous operation. All live parts shall be fully shrouded. Arc chutes and magnetic blow out coils shall be fitted to contacts larger than 200A.

Contactors shall have at least 15 times making capacity and 10 times breaking capacity for contactors less than 100 amps and 10 times and 8 times respectively for contactors above 100 amps. The selection of contactors shall be coordinated with the prospective fault levels suitable at that point of installation. The devices used for motor starting shall be coordinated to provide a class 2 level of continuity of service as defined in IEC 947-4-1. Contactors shall generally be suitable for rail mounting and be of modular design. The coil shall be suitable for +10% and -15% of nominal mains voltage. Provision shall be made on the contactors for affixing of termination and contactor identification labels.

TERMINATIONS

Tunnel type terminals shall be provided for cables up to and below 6mm². Cables larger than 6mm² shall be terminated with compression cable lugs or proprietary makes of termination approved by the Architect. Cable lugs shall be of the annealed copper one-piece seamless construction type. Lugs shall be burr free and tin plated to prevent corrosion. All crimping of lugs shall be done using proper crimping tools. Where single core cables are installed, brass or polyamide plates of 6mm thickness shall be provided to serve as gland plates and the glands and plates effectively earthed. Earthing of the armour of single core cables shall only be affected on the source side of the cable, while the other and is left unconnected.

TIMERS, RELAYS, TIME SWITCHES AND ACCESSORIES

Timers and time switches shall be of electronic type and provided with 2 sets change over contacts. Timers shall have a setting accuracy of $\pm 5\%$. Time switches shall have 2 channel programmable change over contacts and minimum 48 hours battery back up. All timer's relays and time switches shall have contacts rated for a minimum mechanical life of 2 million operations and electrical life of 1 million operations. Standard plug in bases suitable for rail mounting shall be provided. Connection diagrams shall be imprinted on the body of the accessories.

DISTRIBUTION BOARD

The equipment used and construction details shall be as detailed in earlier sections of this specifications. Additional space shall be allowed in each distribution board for increasing the no. of circuit way by at least 10% and suitable blank plates shall be provided for the initial installation. Each distribution board shall be complete with a neutral and earth bar of square or rectangular cross section having terminal connections for each single-phase way on the board. For termination of conductors larger than 4 square millimeters cross sectional area, cable sockets with four screw cable clamp pattern terminations shall be used. The neutral and earth bar provided in each distribution board shall have adequate number of terminals. Spare terminals shall be provided for future circuit which may be connected to the spare ways provided. A schedule of circuit shall be provided inside of the hinged cover of the distribution board on clear transparency.

FLOOR MATS/ CIRCUIT DIAGRAMS/ DANGER SIGNS & ARTIFICIAL RESPIRATION CHARTS

Rubber floor mats of 6mm thickness and 1-meter width shall be provided for the complete width of all switchboards and motor control centers. Circuit diagrams affixed to a wooden base frame and covered by clear transparency shall be affixed next to all factory-built assemblies. These circuit diagrams shall indicate the schematic diagram and control wirings diagram. For disruption boards and control panels a laminated schematic fixed on the inside cover of the panel will be accepted. Danger signs shall be affixed on all factory-built assemblies to warn of possible danger. Artificial respiration charts shall be affixed in all main switch rooms, and

genset rooms.

TESTS AT SITE

After construction the following minimum tests shall be carried out at the factory. All tests shall be carried out in the presence of the Supervising Engineer.

1. Insulation and continuity test
2. Di-electric test - 3kv for 1 minute
3. Primary injection tests to verify settings of current tripping devices.
4. Check of clearances and creepage distances.
5. Physical inspection of the assembly and finishes
6. Verification of CT polarity and ratio
7. Mechanical operation, Control interlock, and functional tests
8. Earth continuity tests
9. Verification of Phase sequence after the switchboard is energized
10. Verification of busbar contact resistance

After installation at the site, all the tests mentioned above, except for tests 2 and 4, shall be repeated in the presence of the engineer. All costs, materials, equipment, labour etc necessary for the execution of the testing shall be provided by the contractor.

SHOP DRAWINGS

The contractor shall submit shop drawings showing equipment type, arrangement, actual dimensions, schematics, wiring, labels, weights, fixing details etc. The construction shall only proceed after the drawings are approved.

ELECTRICAL CABLING

The cabling system shall comply with the requirements of the latest IEE Regulations, Building Codes, Fire Codes and Authorities requirements. Cables shall be installed in one continuous length and straight through joints shall only be permitted on cables where length exceed the standard drum length. All joints shall be identified on the as built drawings. Terminations and joints shall be made without the reduction in the number of strands. Proprietary type straight through joints shall be used. The type of system used shall be submitted for the approval of the Engineer. Cables shall be colour coded by Pigmentation on the Insulation using red, yellow and blue for Phase wires, black for neutral and green/ yellow for protective conductor. Control cables shall be white and numbered in black.

Cables should be delivered to site with the seals intact, and bearing the manufacturer's name, classifications, size, type, length and grade marked on. Fire stopping of the same rating as the compartment wall shall be provided for all cables, trays, trunkings and sleeves which pass through a fire compartment. Cables of different categories shall be segregated in accordance with the latest IEE Regulations. All cables shall be of copper in accordance with BS 6360. The single line wiring diagram indicates the type and size of cable required, while the layout drawings indicates the routes of all submain cables.

FINAL SUB-CIRCUIT/ FLEXIBLE CABLE

Wiring of final sub-circuits for lighting and power shall generally be carried out in P.V.C. Cables of 450/750 volts grade and rating manufactured in compliance with the BS 6004. Cables having insulation of Butyl rubber or silicon rubber to BS 6007 or other heat resisting cables shall be used for termination to luminaries or where cables pass through luminaries. The type of cable used shall be suitable for the operating temperature. The minimum size of multistrand cable used for final sub-circuits shall be as shown in the drawings and schedule.

Flexible cables shall be minimum 1 mm² or larger and of circular construction, colour coded and incorporating a earth conductor. Cables shall be PVC to BS 6004 or Butyl rubber to BS 6007, when used in higher temperature conditions, while the conductor shall be of copper and comply with BS 6360. The flexile cable shall be multicore, multistranded and of sufficient strength to support the mass of the luminaire or equipment supported.

RECTICULATION MAINS CABLES

Submain cables shall be copper cables of 600/1000 volts grade and shall be manufactured to the following standards.

PVC	- BS6004, BS6469, BS6746, BS6360
PVC/SWA/PVC	- BS6346, BS6746, BS6469, BS6360
XLPE/SWA/PVC	- BS5467, BS6360, BS6234, BS6746, BS6467
XLPE/AWA/PVC	- BS5467, BS6360, BS6234, BS6746, BS6467
FIRE RESISTANT CABLE (Silicon rubber insulated)	- IEC 331 and BS6387 category C.W.Z, BS4066

Low smoke (LSF) cables shall have an extruded layer of low smoke Zero halogen material and shall comply with BS 6724. The outer sheath of all armoured cable shall be anti termite treated. The type and make of all cables shall be embossed on the outer sheath. Bending and termination of the cables must be done by a qualified electrician and proper tools are to be used. A minimum bending radius of ten times the diameter of the cable should be used.

Submain cables shall be installed spaced to ensure effective heat dissipation. Grouping of cables will only be permitted if specifically shown on the drawing, or if the contractor resizes the cable accounting for all the necessary factors. Every length of cable shall be tested before and after termination and the reading should be greater than 50m ohm It should be tested again after a period of 24 hours to be certain that no moisture has been absorbed. Submain cables shall be labelled at 10m intervals using a cable tag or engraved copper rings, all cable ends shall also be labelled.

CONDUIT WIRING

PVC conduits shall generally be used except when liable to mechanical damage & direct sunlight. PVC conduits and fitting shall comply with BS 6099 and BS 4607. PVC conduits shall be classified for heavy mechanical stress and non-flame propagating (ie High impact heavy gauge conduit). All jointing of PVC conduits shall be by means of adhesive jointing. Adequate expansion joints shall be allowed to take up the expansion of PVC conduits. Conduit shall be galvanized steel where exposed to mechanical damage and direct sunlight. Conduits shall be Class "B" galvanized steel screwed conduit to B.S.31 and BS4568. Fittings and accessories shall be galvanized and manufactured from steel to B.S. 31. Conduits shall be concealed where possible. Where conduits are installed

directly on walls and concrete works, they shall be fastened by means of heavy gauge spacer-bar saddles and rawl plugs at maximum intervals of 1.2 meters for straight runs and at all bends. Rawl plugs shall be drilled into walls and concrete work. Spacer-bar saddles shall be fastened by means of round head, brass screws and washers. All exposed conduits shall be painted orange in colour, unless otherwise specified.

Where conduits are to be concealed in the plasterwork of walls, the contractor is required to cut the necessary chases in the walls for the installation of the conduits. Initial plastering of chases shall be undertaken by the subcontractor after the conduits have been installed, but the final plastering of chases shall be undertaken by the Main Contractor. Conduits buried in the slab shall have a minimum cover of 15mm while those in the wall shall have a minimum cover of 5mm. Wherever the exposed galvanized surface has been cut or otherwise damaged, a layer of rust inhibiting paint shall be applied. Conduits shall be securely fixed to prevent movement and all ends and joint boxes shall be effectively plugged to prevent the ingress of water and dirt before concrete is poured. All bends must be made with the proper conduit bending machine so that the inner radius of any bend is not less than 2.5 times the outer diameter of the conduit. Where condensation is likely to take place, provision shall be made for the water to drain off without entry into terminations. The detailed layout of conduit shall be the responsibility of the sub-contractor. Conduit shall be run neatly in straight lines parallel to walls, and building lines wherever possible.

The ends of conduit shall be cut square, filed and reamed out and care shall be taken to ensure removal of cutting oil and swarf. The finished end shall be free from sharp corners which will damage the cable insulation when it is drawn. Conduit terminations at switches, switchboards, distribution boards, socket outlet boxes, etc are to be properly secured with couplers and male bushes. Conduit and terminations to apparatus subject to vibration or movement shall be made off in flexible conduit with adaptors for connection to the rigid conduit system at each end. Flexible conduits for connection to outdoor devices and equipment subject to vibration shall be in PVC sheathed metallic conduit with heavy brass adaptors. The length of the flexible cable shall be adequate to permit withdrawal of the equipment or to absorb the vibration without any stress. Flexible conduits shall be in accordance with BS 731 and the minimum length shall be 300 mm. Where conduits cross the expansion joints purpose made expansion coupling shall be used to facilitate relative movement of the sections. Where long runs of conduit are unavoidable, junction boxes shall be provided at 8m intervals for ease of drawing-in of cables. Junction boxes shall also be provided within 300mm of bends. Draw-in wires shall be provided inside each conduit to facilitate the drawing-in of cables.

Conduits sizes shall be selected as to allow removal or replacement of any one cable without disturbing the others and shall not be less than 20mm diameter or larger than 32 mm diameter. In no circumstances shall the number of cables drawn into any one conduit exceed that stated in the latest Edition of the I.E.E. Regulations. All conduits shall be swabbed out and free from moisture before wiring is installed. The use of the metallic conduit system as a sole means of earthing will not be permitted. A separate earth continuity conductor of suitable size shall be used and run inside the conduit. The whole conduit system shall be effectively earthed.

Cables for power and lighting circuits and extra low voltage systems shall not be drawn into the same conduit. Lighting and power final sub- circuits shall be run in separate conduits except, where an adaptor box is employed as final distribution point, a number of final sub- circuits may be grouped together in larger conduits between the distribution board and the adaptor box provided that all sub-circuits in one conduit are of the same phase. In the case of three phase circuits, all three phases including neutral, if any, shall be drawn into the same conduit.

PVC CASINGS AND TRUNKINGS/TRAYS/TRUNKING/LADDERS

PVC casings and mini trunking shall comply with BS 4678 and be classified for heavy mechanical stress, non-flame propagating, white finish, with a clip-on cover. All corners, tees, adaptors etc shall be factory fabricated accessories. PVC casings and trunking should only be used if specifically specified.

Cable trays shall be fabricated from perforated galvanized steel with 12mm return edges at each side, and sized in accordance with the numbers of cables they are required to support, plus 20% spare provision for future cables. In this regard, cables shall be installed in a single layer formation, with the exception of single core cables required to be installed in a trefoil configuration, with adequate space allowed for air circulation. cable tray shall be capable of carrying the total weight of the cables without undue deflection (ie maximum deflection of 20 mm). Cables laid horizontally in the tray shall be secured with cable ties spaced at an interval of 600mm and at all bends. Cables installed in the vertical plane shall be supported at 1-meter interval by cable cleats or cable saddles and clips for MICC cables. Cable trays shall be manufactured from steel 1.6mm in thickness for those not exceeding 300mm in

width, 2mm where wider sections up to 600mm are required, finished using a hot dip galvanizing or approved equivalent process, and provided with factory made sets, bends and intersection pieces as required, the finishes of any cut sections being made good with cold galvanizing paint. Where cable trays wider than 600mm are required multiple cable trays of maximum 600mm dimension are to be used.

Cable trays shall be supported using purpose made brackets or proprietary accessories fixed such that there is an air space of 75mm minimum to the structure to which they are secured, and installed in straight runs, true, horizontal or perpendicular to building line in a manner such as to reduce the number of bends and sets to a minimum. The spacing between brackets shall be 1 meter on straight runs and additional brackets at bends. The sub-contractor shall be responsible for checking the size and routes of all cable trays where indicated on the drawings to determine that they are adequate for the cables to be installed and that the routes are fully coordinated with all other trades. Should the size of any cable tray require resizing, this shall be advised to the Engineer prior to ordering and/or installation. Cable trays shall be sized to permit the cables to be installed spaced apart (ie grouping factor of 1).

Cable trunking shall be manufactured from galvanized steel sheets of not less than 1.2mm for trunking up to 50mm and 1.6mm minimum for trunking up to 200 mm and 2 mm for larger sizes. The trunking shall be filled with cables to not more than 45% of its usable capacity. Trunking lids shall be removable and secured at centres not exceeding 600mm by cadmium plated mushroom head screws. The screws shall seat into bushes on the trunking return edges. Trunking lids shall be clip on with quarter turn lock nuts where specified. Cable trunking shall be employed to replace multiple runs of conduit in addition to the instances where specifically indicated, and provided with removable cable retaining straps installed at a maximum interval of 600mm along the length to permit covers being removed and replaced without impedance from the cables enclosed.

Cables in steel trunking shall be supported by means of hardwood clamps spaced at 600mm centres. Fire barriers shall be provided where trunking passes through compartment slabs. The rating of the fire barriers shall be the same as that of the compartment.

Internal fish plate couplings of 2.5mm thickness c/w tinned copper bonding links shall be installed between adjacent lengths to facilitate electrical conductivity and mechanical union. Each side of the couplings shall be secured by means of four (4) mushroom head screws with the nuts installed external to the trunking. Integral partitions shall be provided throughout the length of ducting where it is necessary to accommodate services of different voltages and frequencies within a common trunking run. Each service shall be mutually segregated and completely surrounded by earthed metal. Cable trunking shall be installed complete with all requisite accessories in straight runs true, horizontal or perpendicular to building lines to reduce the number of bends and sets to a minimum, where necessary factory-made bends, sets and sections and intersection pieces shall be used. The spacing between support brackets shall be 1 meter on straight runs and additional brackets at bends.

Where multiple circuits are installed in the same trunking each circuit shall be grouped together by cable ties at 2m intervals and distinguished by identification label at 20m intervals. Cable trunkings shall be installed such that there is a minimum clearance of 10mm to the structure to which they are secured. Trunking covers shall be installed either on the top or sides but not at the bottom.

Cable ladders shall be of hot-dipped galvanized steel construction. The thickness of steel used for both rungs and side rails shall be not less than 1.6mm for widths up to 450mm and 2.0mm for longer width. The depth of side rail shall be not less than 1.5 times the overall diameter of the biggest cable fixed on to the cable ladder. Generally, the rung spacing shall not be more than 300mm in straight runs. Cable ladders shall generally be sized with a 20% spare space provision for future cables. Cable ladders shall be completed as required with prefabricated reducers, elbows, tees, crosses, splice plates so as to form a complete installation. Cable ladders installed horizontally shall be adequately supported by galvanized steel Channel and rods fixed to structure in an approved manner. For vertical runs, hold down clamps shall be used to secure cable ladder to walls. Support spacings shall be such that the cable ladder does not deflect by more than 10mm when loaded. In any case the minimum distance between support shall not exceed 2 metres. The entire cable ladder shall be earthed to the system earth by means of earth continuity conductor of suitable size. Copper grounding straps shall be used to improve earth continuity across splice joints. Cables fixed on to the cable ladder shall be clipped with heavy duty galvanized saddles and bolts. Three phase circuits using single-core cables shall be bunched with the neutral and secured as a group. Saddles shall not be spaced at more than 600mm apart.

CABLE TERMINATION AND JOINTING

Cables shall be run continuous from one termination point to the other without any joints. Approval must be sought before any cable joints are made. Jointing and termination of cables shall be carried out by accredited and fully experienced jointers or electricians and evidence of this shall be produced before jointing or termination is started. All joint boxes, jointing materials, and tools shall be of the type recommended and approval by the cable manufacturers. All joints which are buried in the ground shall be compound filled. The design of the box and the composition shall provide an effective seal to prevent moisture gaining access to the conductor ferrules and armour clamps. Provisions shall be made for earthing the wire armour of single core cables to the main earth bar at the supply end by means of a metallic bond of adequate conductance. Bonding connection should be as short and straight as possible. For multicore cables, both ends of the armour shall be bonded to the earth bar.

The wire armouring shall be maintained electrically continuous, and careful attention shall be paid to the design of all bonding clamps in joints and termination to ensure that the resistance across a clamp is not higher than that of the equivalent length of the complete wire armour of the cable. All cables shall terminate with glands complying with BS 6121. Cable gland installed outdoor shall provide a seal onto the outer sheath and be moisture proof. Additional protection shall be provided to all glands by means of PVC shrouds. All glands shall also be equipped with a earthing tag for equipotential bonding of the armour to the switchboard earth bar. Glands for flame proof and explosion proof locations shall be similarly rated. Cables terminals shall be fitted with electro tinned cable lugs which shall be compression fitted to the cable. All cable lugs shall be fitted with a colour coded PVC shroud for a neat finish.

All cable ends shall be properly sealed during storage and such time till they are ready for termination. Cable armouring shall not be used as the sole means of earth continuity (e.c.c.). A dedicated earth continuity cable shall be run alongside the armoured cable to provide earth continuity. The earth cable shall be sized in accordance with the latest IEE Regulations. Where the subcontractor proposed alternative routes, to those shown in the drawing, they shall resize the cable to take into consideration the new derating factors for temperature, grouping, voltage drop and fault level.

LIGHT FITTING

Luminaire's shall comply with B.S. 4533 unless otherwise specified or scheduled. Luminaire's shall be arranged such that control gear and auxiliary wiring is separated from the lamp compartment by means of removable covers which prevent inadvertent contact during re-lamping operations; access between compartments for wiring shall be through holes fitted with grommets. Each luminary shall be fitted with a fused terminal block and earthing terminal and be suitable for 20mm conduit entry. The fitting shall be embossed with the logo of the manufacturer on its body at a position visible during inspection. Stick on logos are not acceptable. Comply with BS5394 with regards to radio interference. All luminaries shall be labelled on the inside cover. The labels shall identify the circuit number. Labels shall use a strong adhesive.

FINISHES

All equipment shall be protected to minimize the effects of corrosion and galvanic action. Ferrous metal casings used shall be of gauge not less than 0.8mm and treated against corrosion by galvanizing, cadmium plating, chroming or painting. All surfaces to be painted shall be cleaned, degreased, primed, painted with an undercoat of finished stove enameled to a suitable colour. Internal reflecting surfaces shall be painted matt white. Powder spray painting using thermosetting epoxy paint shall be accepted as an alternative to enameled paint finish. For proprietary equipment, the manufacturer's standard finishes may be accepted provided they are, equal or superior to the standards of finishes described.

DIFUSSER/LOUVRES

Where indicated, luminaires shall be fitted with diffusers/louvres which shall:

- have good light transmitting and diffusing properties;
- in the case of plastic diffusers/louvres be made from acrylic; and be resistant to colour change, stable in relation to heat distortion and not affected by aging;
- be held securely to the body of the luminaire without any visible deflection being perceived;
- diffusers shall be fitted with gaskets and secured to prevent ingress of insects or foreign matter into outdoor luminaire;
- be of adequate thickness and strength to prevent sag under normal operating conditions. Acrylic diffusers shall be minimum 3mm thickness.
- the diffusers shall be of hinged on clip on construction, to allow easy access for relamping and servicing.
- aluminium reflectors and louvres should be aluminium alloy with an anodic coating of AA10 to B.S. 1615 for enclosed fittings and AA15 for open light fittings. Minimum thickness of reflectors shall be 0.6mm.

WIRING WITHIN FITTINGS

Luminaries shall be supplied with all internal wiring colour coded and completed. Wiring shall have Class 105 deg C PVC insulation except where internal temperatures are likely to exceed the safe limits of such insulation, in which case braided (Class C) glass wool insulation shall be used. Conductors shall be of adequate size and rating for the particular duties and terminations. Single strand conductors shall be used for clip connections and multi-stranded conductors for screw connections. Wiring shall be neatly arranged within the fittings and clipped to the metal ware at intervals not exceeding 200mm.

Wires shall be kept clear of auxiliary components. The method of clipping shall be such as to prevent damaged to the insulation. Adhesive tape shall not be used for clipping or looping of wires. A fixed two terminal fused connector blocks with an earth terminal adjacent or integral shall be provided near the incoming cable entry of each fluorescent and discharge fitting. The fuse shall comply with requirements of B.S. 88 and generally be of 2A rating. Luminaire's shall be designed to promote cooling, ensuring that in service, temperatures in excess of the thermal ratings of any of the components are not exceeded. The external housing of the light fitting shall be designed such that its temperature does not exceed 70°C.

BALLASTS

Fluorescent ballasts shall comply with B.S. EN 60920, 60921 and BS 5394. All ballasts shall be polyester impregnated low power loss, silent operation type unless otherwise specified. Switch start ballasts shall be of low power factor induction type. Separate ballasts shall be used for each light fittings. The power loss for ballasts shall not exceed: -20W - 5.5W, 40W - 6.5W, 65W - 10.0W. When measured at the maximum normal operating temperature. Noisy or otherwise defective drivers or ballasts will not be accepted. Drivers and Ballasts shall be an approved type or acceptable alternative.

Fully electronic high frequency ballasts where specified shall have the following characteristics: -

1. Have excellent radio interference suppression, inductive interference elimination, silent operation and

harmonic limitation and comply with BS 5394.

2. Have a operating range from 200V to 240 Volts.
3. Ensure power factors of greater than 0.9, low power loss and elimination of stroboscopic effects. Wave form distortion shall be kept to a minimum and shall comply with IEC 82.
4. Ensure reliable lamp starting (within 0.2 second) without flickers.
5. Shut down automatically on failure of a lamp. Circuit should reset automatically where lamp is fitted.
6. Be able to operate with all type of fluorescent tubes.
7. Be capable of dimming when used in dimmed circuits.

Discharge and fluorescent fittings shall be fitted with metallized polypropylene capacitors to correct power factor of 0.85 lagging. Capacitors shall comply with B.S. EN 61048/49. Discharge resistors shall be provided on all capacitors. Capacitors shall not use PCB or have liquid fillings and shall be suitable for ambient temperature up to 85°C.

STARTER

Where installed, starters must be compatible with, and in accordance with, the ballast and lamp and tube manufacturer's recommendations. Starters used for fluorescent lamps shall be of the electronic quick start type with built-in cut out features similar to OSRAM DEOS series. Starter sockets shall have metal strip spring type contacts for connection by twist action. Housings shall be moulded plastic. Thermoplastic materials used in the construction of starter switches and holders shall comply with B.S. 3772.

LAMP HOLDER

Lamp holders shall be constructed of non-flammable high impact resistant materials which do not deteriorate under the temperatures encountered during service (porcelain or brass type). Lamp holders shall be secured to the body of the luminaires such that they maintain their position and plane during lamp replacement. Lamp holders for fluorescent tubes shall comply with the requirements of B.S. 5101 Part 1 and Part 3 and B.S. 5042 Part 4 and be of the two-pin retractable or counter twist type with metal strip spring type contacts, designed to positively retain the lamps.

LED LIGHTING FIXTURES

LED lighting is a combination of a solid state light source, a control gear for operation of the LED lighting and optics for light distribution. The key aspects to be taken into account in specifying LED products are the following - LED lighting construction and light distribution, LED driver and lighting controls, thermal management, energy efficiency, colour quality, life and lumen maintenance, and performance and quality assurance.

LED lighting construction and light distribution

LED luminaire consists of LED modules, ballast or driver where applicable, heat-sink for thermal management, fixture and optics assembly. A self-ballasted lamp or luminaire can be connected to the supply mains directly, whereas a non-self-ballasted lamp or luminaire is to be connected to the supply mains via a separate driver. Control gear for starting and operating LED lighting is often called a driver.

Ingress protection class

Adequate ingress protection (IP) rating of the LED luminaire should be prescribed for the intended application under specific environmental conditions. IEC 60529 specifies the degree of ingress protection by enclosure. IP54 or IP55 may be required for luminaires for general outdoor applications. Other weather specific factors (e.g. sunlight, temperature, rainwater) should also be considered for outdoor luminaires.

Glare control

Reflectors, diffusers or other features may be incorporated to control glare. Glare rating GR and UGR could be used to evaluate quantitatively disability glare and discomfort glare respectively of lighting design schemes.

Safety and environmental requirements

LED modules and luminaire should comply with relevant safety and environmental standards. With reference to IEC 62471 for photo-biological safety, the risk group of potential optical safety hazard of LED luminaires should be checked.

Key safety standards include IEC 62031 for LED modules, IEC 61347-2-13 for LED drivers, IEC 62471 for photo-biological safety, IEC 60598 for aspects similar to general luminaire, IEC 62560 for self-ballasted LED lamps (>50V), IEC 60838-2-2 for particular requirements on connectors for LED modules. EC Directive

2002/95/EC and related Commission Regulations specify restriction of the use of certain hazardous substances (RoHS) in electrical and electronic equipment including lighting.

Safety considerations on retrofit LED tubes

If an LED replacement tube solution is deemed to be appropriate, it is essential that the equipment used is safe and the replacement lamp installed in a safe manner, to avoid risk during installation and also for future maintenance or subsequent replacement. IEC 62776 specifies the safety and interchangeability requirements, and the exchange operation together with the test methods and conditions required to show compliance of double-capped LED lamps with G5 and G13 caps, intended for replacing fluorescent lamps with the same caps.

Radio frequency interference and electromagnetic compatibility

LED lighting and the associated control gear (i.e. the driver) are to comply with the Telecommunications (Control of Interference). The LED lighting and control gear should also comply with the relevant electromagnetic compatibility standards. Electromagnetic compatibility refers to the ability of the LED lighting system and components to function satisfactorily under the electromagnetic environment without unduly affecting the environment. Key electromagnetic compatibility standards include IEC 61000-3-2 for limits on harmonic current emissions, IEC 61000-3-3 for limits on voltage changes, voltage fluctuations and flicker, and IEC 61547 for immunity requirements.

LED driver and lighting controls

A basic LED driver consists of two stages, i.e. a power supply for converting the alternating current in the supply mains into direct current for the LED and a current control unit for providing constant current supply for stable operation of the LED. Suppliers could be asked to provide substantiation or warranty on compatibility between the driver and the LED lighting. Dimmable drivers are designed for broader current range to suit the dimming operation of the LED lighting. LED drivers may also incorporate devices to handle power quality issues e.g. power factor correction, filter for harmonic distortion.

Maximum allowable ambient temperature

Maximum allowable ambient temperature for the LED lighting should be considered so that the LED lighting can operate without adversely affecting its life or colour stability. This is to ensure that the maximum case temperature of the driver and the design LED junction temperature not be exceeded. Typical ambient temperature for continuous service of the lighting to be up to around 35 to 40 deg C depending on the environmental condition for the lighting.

Energy efficiency

Luminous efficacy is a measure of energy performance of the lighting. Luminaire efficacy also accounts for driver, thermal and luminaire optical losses, in addition to the efficacy of the LED modules. In general, luminaire efficacy = LED efficacy x driver efficiency x optical efficiency x thermal efficiency.

Rated power and measured input power - Overdriving (i.e. driving beyond the rated current) may increase lumen output but would be at the expense of lamp life due to increased junction temperature. Lighting manufacturers may choose driving current ranges for their LED lighting taking into account different luminaire design factors, e.g. thermal management, ambient temperature condition, service life, light output and power consumption. For LED lighting with dimming operation, design may need to be compromised so that the LED driver could deliver broader range of driving current to meet the design light output range. It is desirable to have a high power factor for LED lighting as a low power factor load will draw more current for the same amount of real power in the electrical circuit.

Colour Quality

Correlated Colour Temperature (CCT) of the LED light source should be considered. CCT describes the colour appearance of a light source. In general, CCT for warm white light ranges from around 2600K to 3500K and that for cool white light is over around 5000K. LEDs with higher CCT are generally more energy efficient. It is noted that perception of colour consistency may be affected by the viewing angle.

Colour Rendering Index

Colour Rendering Index (CRI) of the LED light source should be considered. CRI describes the degree of change in colour appearance of an object when illuminated by LED light source as compared with that when

illuminated by a reference light source. For general applications such as in offices, CRI of 80 or above is good enough. LEDs with higher CRI normally have lower efficacy.

L80B10 – B value means the failure data at the L data. LB value indicate the real lifetime at a certain hours. Like L80B10 at 50,000 hours means the LED lamp keeping 80% lumen from initial lumen and only 10% light failed to reach 80% lumen.

Overall Summary LED Light Fitting Construction

LED lighting brand should be an approved type and shall comply and generally be of the switch start type. Specified Wattage, Lumens and IP, CCT: 3000K, 4000K, 6000K or other equal manufacture. LED's shall have a guaranteed life span of 25,000hrs to 50,000hrs. Power Factor of >0.9, 220-240 VAC, L80B10, UGR <16 or <19, CRI>90.

FIXINGS

Luminaries shall be provided with standard means of achieving satisfactory fixings;

- in the case of pendant types, have 85 deg C suspension cords, and where the suspension is metal or other arrangement with the cable inside, the cable shall be glass or PTFE insulation;
- in the case of recessed or semi-recessed type, in addition, be provided with concealed holes for side screw fixings into the ceiling aperture trimming;
- in the case of surface mounted type, be furnished with minimum of two fixing supports at the ends of the fitting. Fittings wider than 150mm shall be provided with 4 fixing supports. Surface mounted florescent fittings where installed on flammable surfaces shall be provided with a 15mm non-flammable heat insulating backing.

All ceiling recessed luminaire fittings wider than 150mm shall be individually secured with 2mm dia. galvanized steel wire to the building structure. Where chain suspensions are required they shall be of welded, twisted link pattern, minimum 18-gauge (1.20mm) diameter. Fixings shall be brass screws sunk at least 25mm into rawl plugs or plastic expansion devices properly set in, or standard BSF bolts screwed into properly placed metal sockets.

FINAL CONNECTIONS

All recessed luminaires shall be connected to the fixed wiring system by a length of flexible conduit. The cables within the conduit shall be looped into and terminate only in the luminaries. All fixed wiring within the luminaire shall be sleeved with braided glass wool high temperature insulation.

`EXIT' SIGN LIGHTS

`Exit' sign lights shall be supplied and installed as shown on the drawings. The exit lights shall generally use a 2W LED c/w driver. The `Exit' sign light fitting shall generally be a maintained unit i.e. the lamp is continuously lit from normal mains supply and upon mains failure powered by a sealed nickel cadmium battery. The illumination level shall be uniform throughout the sign fixture with sufficient downward illumination. The exit sign light fitting shall utilize a graphic sign or the words "Keluar" as detailed in the equipment schedule or bill of quantities. The sign shall utilize luminous paint to ensure that the signage is visible even when the lamps have failed.

The graphic sign when specified shall be detailed by the architect during the construction stage. The graphic sign may be single or double sided as specified in the bill of quantities/equipment schedule. The word `Keluar' shall be in letters 150mm high, 75mm wide and 19mm wide strokes. The lettering shall be illuminated white against a green background. The `Keluar' signs shall consist of the following types.

- a) Single sided signs with the lettering `KELUAR' with or without directional arrows.
- b) Double sided signs with the lettering `KELUAR' with or without directional arrows.

The `Exit' sign light units shall be provided with high temperature rated nickel cadmium batteries in replaceable packs having a minimum capacity capable of maintaining the units in full illumination for a period of at least 3 hours (after 24 hours charge) when the mains supply is interrupted. An automatic 2 rate solid state charger unit with voltage regulated, temperature compensated, trickle charge, and low voltage cut out feature, which maintains the battery in a fully charged condition shall be incorporated within each unit. The battery and charger system should be designed for a useful life of 4 years or 400 charge-discharge cycles to 50% depth of discharge at an operating temperature of 45°C. The units shall also be provided with a red LED for mains and charger healthy indication, and a mains failure simulation micro press button test switch.

SELF CONTAINED EMERGENCY LIGHTS

Emergency light units of the type specified shall be supplied and installed as shown on the drawings. The Emergency Light shall generally be a `non-maintained' unit i.e. the lamp is off as long as there is mains supply, and the same lamp is illuminated from a nickel cadmium battery when the mains is interrupted. Maintained and switchable type emergency lights shall be supplied, when specified. The battery and charger shall be as described above for `exit' lights.

SWITCHES, SOCKET OUTLET AND ACCESSORIES

The location of outlets shown on the drawings are approximate and the exact location shall be determined prior to installation. Location of outlets may be varied at any time up to the time of roughing in and such variations shall be carried out at no extra cost provided that the variations are within 5 meters of the indicated location.

Where switches, plug receptacle, etc. are located in tile work, face brick or similar surfaces with exposed lines they shall be placed symmetrically in the pattern. The locations of switches and outlets, etc shall be coordinated with the fittings (thermostat, volume controllers, etc) installed at the same location, by other trades. All final outlets shall be labelled. The label shall identify the circuit number. Labels shall be fixed on the front or back of the outlet as instructed. Labels shall use a strong adhesive.

Switch locations shall be as shown on the plans. Switches shown adjacent to doors shall be placed about 150mm from the edge of the switch plate to the edge of the door frame and on the lock side. Switches shall be mounted unless otherwise indicated with the base at 1350mm above floor level. Where several switches occur at the same location, multi gang units mounted on single plates may be used.

Switches shall be rocker operated type, grid pattern, single pole, one way or two ways or intermediate as required on the layout drawings. Switches shall be of the quick make and slow break, silent switch action type with solid silver alloy contacts and in accordance to B.S. 3676.

Dimmers shall be fixed with RF interference suppression filter to BS EN 55014 and fuse links and comply to BS5518. Dimmers shall be rated from 60W to 1000W. Switches shall be suitable for flush or surface mounting, as required, and be complete with PVC base box with brass thread screw inserts box, adjustable grid plate, switch interior and cover plate. A minimum clearance of 9mm shall be provided between the back of the switch and the back of the conduit box. The switches of each phase shall be grouped in row(s) and adequate insulation shall be provided between the phases. A warning sign "DANGER 415 VOLTS" shall be placed near switch centre where different phases are grouped together.

SWITCH SOCKET OUTLETS

Switch socket outlets shall be of the three pins (i.e. 2 poles and earth), shuttered type conforming to B.S. 1363. Industrial plugs, socket outlets and couplers shall conform to BS 4343. Switch socket outlets exposed to weather shall be die cast aluminium or polycarbonate weatherproof type complete with protective captive screw- on cap to cover the socket orifice when not in use. Weatherproof plug tops shall be provided together with the outlet. Generally, switch socket outlets shall be installed with the base at 225mm above floor level. Switch socket outlets shall be installed at 1350mm above floor level in kitchens, plant rooms, car parks and other service areas.

HAND DRYERS

Hand dryers shall be of the slimline moulded case automatic type and shall be installed at a height of 1300 to base of unit. The power to the hand drier shall be through a base box located at the back of the hand dryer. Hand dryers shall be of double insulated construction to ensure safety. The hand dryer shall start operation when the hands are placed below the outlet and shall stop when the hands are withdrawn. The electronics should be able to distinguish between a static object and a hand. The infra red automatic sensing system shall have a safety cut out after 60 sec. The unit shall be quiet in operation (65 db at 1 m). The heating element should be rated about 2 kw, while the air discharge shall be about 200 m³/hr at 50°C. The unit shall be approved type and unless otherwise specified.

SHAVER SUPPLY UNIT

Electric shaver supply units shall comply with BS 3535, and shall incorporate a double wound isolating transformer rated at 20 VA at 230 and 115 volts and shall be safe for use in bathrooms. The unit shall be shuttered, and the transformer shall be protected against overloads by an electronic overload device with auto reset features.

ACCESSORIES

The accessories used throughout the installation shall be in accordance with the following:

- | | |
|---|------------------------------|
| 1. Fused connection units | BS 5733 |
| 2. RCD protected 13A switch socket outlet | BS 7288 |
| 3. 5A & 15A socket outlets and plugs | BS 546 |
| 4. Blank plates | BS 5733 |
| 5. 13A fused plugs and SSO | BS 1363/BS 1363A + BS1362 |
| 6. Cooker control units | BS 4177 and BS 1363 |
| 7. Light and shaver unit | BS 4533 |
| 8. Safety lamp holders | BS 5042 |
| 9. Ceiling roses | BS 67 |
| 10. Coaxial outlets | BS 3041 |
| 11. Telephone outlets | BS 5733/Brunei telecoms |
| 12. Weatherproof SSO | BS 3676, BS 1363, BS EN60529 |
| 13. Weatherproof isolators | BS EN 60947 IP 56 |
| 14. Junction boxes | BS 6220 |

The finish of the accessories shall be as described in the drawings and Bill of Quantities.

EMERGENCY STANDBY GENERATORS

1. SCOPE OF WORK

The Contractor shall supply, deliver to site, install, test and commissioning, and hand over in proper running order a complete Standby Generating System.

The installation shall be in accordance with the accompanying drawings, specification and schedule of contained herein.

The Contractor shall carry out the following and/or unspecified, undersigned or non-indicated work which becomes necessary in the course of the installation.

The work involved is defined below but not limited to the following general section:-

- a. The supply, delivery to site, installation, testing and commissioning of one (1) Diesel Generator sets complete with accessories as per specification, drawings and as follows :
 - i. Diesel generator including supporting frame and spring type anti-vibration dampers.
 - ii. Complete wiring installation of all internal circuits of generators.
 - iii. Radiator including all connection pipework, fan, pump, pipework and other accessories for fuel transfer.
 - iv. Fuel supply system complete with fuel tank, pump, pipework and other accessories for fuel transfer.
 - v. Electric starting equipment including batteries, battery charger, starting motor, etc.
 - vi. Complete exhaust system to the requirement of the relevant governing authorities.
 - vii. Internal sound proofing of the generator room.
- b. The successful tenderer shall liaise with the DES, Fire Department and relevant bodies in all matters regarding private power generator and test setting of the generator set.
- c. The Contractor is to include for the specialist services necessary for the proper erection and setting to work, commissioning and testing of all items of the generator set and the cost of this is deemed to be included in the Contract price. The extent of these services is to be given in the Tender.
- d. Repairing, patching and making good all building works inclusive of plinth.
- e. All requirements of the relevant local authority, Department of Environment shall be complied by the Contractor to ensure a complete installation of the Generating Set.

2. GENERAL SPECIFICATION

The sets shall be rated as follows:-

Rated continuous output	-	As specified in drawing or schedules
Speed	-	1,500 rpm or 1,000 rpm
Voltage	-	415/420 Volts 3 phase star connected
Frequency	-	50 Hz
Power Factor	-	0.8 lagging

The Diesel Generating set shall operate as an emergency power supply and shall be able for automatic starting on complete or partial power failure of the main power supply and automatically stopping the engine on the restoration of the main supply.

3. DIESEL ENGINE

The diesel engine shall be of multi-cylinder, four stroke, direct injection, water cooled with honeycomb radiator, turbo-charged intercooled type designed of instant starting and in general compliance with B.S 49/1958 as minimum and also be suitable for local condition of maximum temperature 105⁰F and 100% R.H.

The crankcase shall be single unit cast-iron type and shall be protected against explosion. The cylinder leads shall be single- and one-piece casting type with valve seat insert. Cylinder liners shall be centrifugally cast, removable wet type, complete with seals at both ends of the liners.

The piston shall be light aluminum forging type complete with cast ring groove and cooling system. The crankshaft shall be drop forged, tempered and nitride steel. The connecting rod shall be drop-forged and treated steel type.

The cooling system shall be close water circuit complete with centrifugal pumps and thermostatic control facilities. Shut down facilities shall be provided.

a. ACCESSORIES

The following shall be a complete standard accessories :-

24 Volts DC heavy duty axial type electric starter motor.

24 Volt heavy Nickle Cadmium Battery of sufficient capacity suitable to provide six (6) successive abortive starts of engine without recharging.

Automatic battery charger complete with Ammeter, Voltmeter suitable of 2 rates of charging.

Switching cabinet for electric starting by automatic or manual control.

Electronic governor, with speed drop adjustable from isochronous to 5 percent of Hydraulic governor as specified in the drawing and tender schedules.

Mechanical force-feed lubricating system gear type oil pump.

Full flow oil pan with a minimum capacity of 12 imperial gallon.

Lubricating oil pressure gauge.

Engine mounted tachometer with normal working speed marker.

Thermometer for exhaust temperature.

Exhaust silencer of the absorptive type capable of reducing the exhaust noises of the engine to an acceptable level.

Engine driven cooling fan.

Flexible, laterally coupling for positive alignment between the engine and the alternator.

Flywheel, coupling bolts, foundation bolts and vibration mountings.

Good quality standard tools in metal box for normal maintenance to manufacturer's recommendation.

Erection drawing and erection, operation and maintenance instruction manuals.

6 set of operation instruction manual.

One unit of diesel fuel storage tank.

b. PROTECTIVE DEVICES

The generator set shall be complete with protective devices as follows:-

- a. High Cooling water temperature thermostat arranged to trip the fuel cut off solenoid and lock out the engine start relay when the operating temperature rises above 195^of.
- b. Low oil pressure warning and cut off when the oil pressure goes below the recommended pressure.
- c. Overspeed trip to trip the fuel oil pump rack to the 'No Fuel' position and to trip the fuel cut out solenoid and to lock out engine start relay when the engine overspeed 20%.
- d. Low fuel level warning arranged to give warning in good time before the fuel tank become empty.
- e. Failure to start, arranged to lock out the starting relay in the event that the engine fails to start for a period of a one minute.
- f. Overvoltage protection, arranged to shut down when the A.C output voltage exceeds a pre-set value.

All the protective devices shall energize the audible alarm and visual indication on the control panel when they are in the tripping position.

c. EXHAUST SYSTEM

The engine shall be provided with exhaust system to carry the exhaust gases from engine and to dissipate them to the atmosphere. All piping for the exhaust system shall be Class 'B' type and be protected from corrosion by application of heat resistant paint.

Flexible connection shall be provided between the piping fixed to the building structure to minimize the vibration of the engine from the engine to the building. A sleeve shall be provided wherever exhaust piping is required to pass through the wall.

Suitable sound insulation shall be provided to keep ambient sound to acceptable level.

d. FUEL OIL STORAGE TANK

The Contractor shall supply and install one unit of fuel storage tank with a capacity to permit 24 hours for continuous operation on full-load. It shall be non-pressure type, fabricated from M.S. sheet and be painted both inside and outside with minimum two coats undercoat and two coats of oil resistant enamel.

A semi rotary hand operated oil pump shall be provided and installed for filling the tank with suitable length of oil resistant hose for off-loading fuel from drums. The piping connected between the fuel tank and the engine oil pump shall be of galvanized iron Class 'B' type and to be welded to BS 1387. A drain cork with suitable locking device to be provided.

The Contractor shall supply full tank of Diesel fuel before handing over the installation to the employer and the cost for this fuel shall be included in the Schedule of Prices.

e. ALTERNATOR

The alternator shall be brushless self-regulating, with static control drip proof screen protected fan ventilated industrial type in accordance in all respect with BS 2613/1970. The winding shall be tropically impregnated to suit local condition of maximum ambient air temperature of 105⁰F and 100% R.H. It shall be rated continuously not less than the specified KVA at 0.8 p.f. lagging when wound for 415 Volts, 3 Phase 4 Wire, 50 Hz supply. It shall be capable of maintaining without damages a sustained overload of 10% in current at full rated voltage for one hour in any 12-hour period. Good output wave with the waveform deviation of less than 5% shall be maintained both at no load and full load with lagging power factor of 0.8.

4. VOLTAGE REGULATORS

The voltage regulator shall be of solid-state SCR type with ample capacity of maintaining with + 2 ½% from no load to full load at any power factor from 0.8 lagging to unity.

The system must be able to reduce output voltage automatically if the load exceeds the engine capacity.

5. BEDPLATE

The engine and alternator shall be mounted on a heavy fabricated steel bedplate produced from high rolled channel electrically welded with mechanical engine and alternator mounting pad.

6. MODE OF OPERATION

On failure of any phase of mains supply or of low voltage, the voltage sensing relays in the control panel, after receiving the signal, shall automatically start the standby generating set within 01-10 sec. and as soon as the speed/frequency and voltage reach the normal limits, the voltage and frequency speed sensing relay shall signal the automatic changeover switch over from the main supply to the supply from the generator set. When the mains supply is restored, the sensing relays shall trip the generator set and signal the automatic changeover switch to switch back to its original mains supply position after a short time delay of 10 minutes. Final settings of the above-mentioned modes of operation shall comply with the Fire Department requirements.

7. CONTROL PANEL

- a. The control panel shall be metal clad, flush fronted, totally enclosed cubicle pattern, free standing with adequate ventilation and back entry removal cover giving access to the control gears terminal and connection blocks. The dimensions of the panel shall be kept to a minimum. It shall incorporated two sets of the equipment as listed below :-

1	3 inches scale voltmeter – flushed mounted
1	Voltmeter selector switch
3	Current transformers
1	Plant control switch
1	Battery charger switch
1	Fail-to-start indicator lamp
1	Overload indicator lamp
1	Standby test on lamp
1	Start/stop button
1	Emergency stop button (latch type)

1	Voltage sensing relay
1	Overcurrent earth leakage relay IDMT (Non -directional
1	Frequency meter
1	KWH meter
1	KW meter
1	Hour counter
1	Standby test button
1	Pair N/O and N/C auxiliary contactor
1	Mains contactor
1	Alternative contactor
1	Selector switch giving 'Auto', 'Off' and 'Manual'
1	Time delay adjustable from 0-60 seconds
1	Alarm with ON/OFF and reset switch

Fuse switch/switch fuse/A.C.B. as indicated in the drawings.

Both the mains and alternator contactor forming the automatic changeover switch shall be of 4 pole type capable of separating the neutral of the main supply. They shall be electrically and mechanically interlocked to prevent parallel operation. The contactors shall be provided with a short time delay device to ensure a clean break between opening of one and closing of the other. A rated capacitor of suitable to provide stored energy so that the contactor will remain sealed in for about one second before dropout in the event of momentary interruption of power supply.

A standby test button shall be operative only with the selector switch in 'Manual' position and the 'Standby' test on lamp shall be energized over contacts of the first relay to operate the engine start cycle and shall remain lit until the automatic test is complete.

8. WIRING

All necessary power cables and auxiliary cables between the M.V Switchboard and the stated shall be supplied and installed in G.I. conduit with PVC Cable in accordance with appropriate clause of this specification

9. FINISHING

All metal parts of the generating set shall be suitably prepared to achieve high quality finishing. The metal parts shall be treated first with an etching primer followed by three coats of undercoat and lastly two coats of oil-proof enamel.

10. EARTHING

The generating set and the neutral shall be solidly earthed and the system of earthing shall fully comply with the rules of DES. It shall be the responsibility of the Contractor to investigate the earth condition on site so that this quotation cover the cost of installing a complete earthing system which complies with the above requirements.

11. FACTORY TEST

Factory load test shall be carried out in the presence of the Engineer and three officials (two from DES and one from DCA). The approval by the Engineer of the results of any such test shall not prejudice the right of the Engineer to reject the equipment if it fails to comply with the Specification when erected or give complete satisfaction in service.

The cost to carry out all tests shall be borne by the Contractor and shall be deemed to be included on the contract price.

Factory load test shall be carried out for the following loads and period :-

<u>Load</u>	<u>Period</u>
25% f.l	One Hour
50% f.l	One Hour
75% f.l	One Hour
100% f.l	Two Hours
110% f.l	One Hour

The Contractor shall submit factory certified test log in triplicate on all readings and curve showing the results obtained to the Engineer for approval. The results recorded at half hour intervals throughout the test, shall indicate fuel consumption in lbs/kw, exhaust temperature, cooling water temperature, lubricating oil temperature, oil pressure, engine speed and shall alternate output at rated voltage and frequency. Governor trails shall be carried out in accordance with BS 649 immediately after the load test.

Any defects, in the opinion of the Engineer, which become evident during these test shall be corrected and certified by the Contractor at his own expense and tests be repeated to the satisfaction of the Engineer.

12. TEST ON SITE

Test on the generating set shall be carried out on the completion of plant erection. The test shall include the test on the electrical control switchgears and the test on the generating set on starting, stopping, running and full loading. The Contractor shall provide all facilities such as water, oil, instruments, fuel, labour, etc. without extra charge to the Employer for carrying out the testing of the generating set. Any defects, in the opinion of the Engineer which become evident during this test shall be corrected by the

Contractor at his own expense and tests on generating set, after the rectification shall be repeated to the satisfaction of the Engineer.

13. MAINTENANCE AND WARRANTY

The Contractor shall provide 12 months of free service to the generating set commencing from the date of handing over the set in approved working order and also a minimum of 13 months operation guarantee against all defects and parts of the generating set.

14. INSTRUCTION BOOK

The Contractor shall provide to the Owner three sets of Erection, Operation, Maintenance Instruction and spare parts list, bound in stiff cardboard covers covering the whole of the plant for Owners record and reference.

15. BATTERY CHARGER

The battery charger shall be of the static automatic type with two rates of charging and shall be suitable for continuous operation at full rated load output at an input of 240V single phase without the temperature rise of the transformer choke or any other component exceeding 55⁰C.

The charge shall be provided with manually operated boost charging switch and a separate ammeter.

The charger shall be housed in a sheet metal enclosure and shall be complete with the necessary control gear, double pole input switch and output switch, input and output HRC fuses, double wound transformer(s), set of rectifiers, smoothing choke, battery ballast resistance, voltage control equipment, input and output terminals. It is preferred that the unit be housed in the lower compartment of the Control Panel.

In the event of a battery earth fault or mains failure to the charger, audio and visual alarms and warning indicating should be shown on the Control Panel.

16. TESTING OF MECHANICAL AND ELECTRICAL SERVICES

The generator set may be used for testing of the Mechanical and Electrical Services as directed by the Engineer.

The duration of the testing shall be as stipulated in the drawings or other schedules.

The testing may be carried out before handing over but after Practically Completion of the installation.

The warranty and maintenance period of the installation shall not be affected by this testing.

The tenderer shall provide at least one qualified site personnel to attend the whole testing period and ensure that the generator set is operated properly.

Genset Maintenance and Training

01 MAINTENANCE DURING THE WARRANTY PERIOD

The sub-contractor shall guarantee against fault or defect, all materials and work as set out in this specification for the duration of the defects liability period. The sub-contractor shall at his own expense pay for spare parts, and other items necessary for the operation of the system.

The maintenance shall consist of all required servicing of the plant installed including attention to emergency call.

The Engineer may issue the Certificate of Practical Completion at his discretion provided that:-

- a) All required testing has been completed and approved.
- b) All adjustment to equipment which may be necessary to ensure satisfactory operation have been made.
- c) All operation instruction, wiring diagrams and layouts have been received.
- d) A maintenance schedule setting out the proposed programme of maintenance inspections and servicing together with advice of arrangements of prompt attention to emergency call has been submitted and approved by the Engineer.

At the beginning of the Maintenance Period, the sub- contractor shall provide a log book which shall be lodged with a person nominated by the Engineer. The log book shall remain at the site and shall be used to accurately record all service calls whether emergency of routine, setting out the work performed the date, the duration of each visit, the repair or adjustment made.

02 TRAINING

The sub-contractor shall provide the services of a suitably qualified operator for a period of two (2) days during the Defects Liability Period as and when nominated by the Engineer. The operator shall be required to train the employer's services personnel on all aspects of the operation and maintenance of the installation.

03 SERVICE CONTRACT

The Owner shall have the option to enter into an annual service contract, after the sub-contractor has fulfilled the obligations of maintenance during the warranty period. The service contract shall include emergency service and regular maintenance. The cost of spare parts and materials shall be charged to the Owner in the case of "non-comprehensive" coverage, and covered by the Contractor in the case of "comprehensive coverage".

04 SUGGESTED MAINTENANCE SCHEDULE

The following is intended to indicate the items, where applicable, requiring inspection and attention during weekly, monthly and yearly maintenance service. A detailed list shall be prepared by the contractor based on the equipment manufactures recommended maintenance schedule.

Item		Check Point	Action	10 Hrs or Weekly	100 hrs or monthly	200 hrs or yearly
1	Engine	1.1	Check lubricating oil level	x		
		1.2	Change lubricating oil/filter			x
		1.3	Check fuel tank level	x		
		1.4	Check water coolant level	x		
		1.5	Check fuel filter			x
		1.6	Check vee belt tension			x
		1.7	Clean air filter or if oil bath type check level	x		
		1.8	Check all for fuel, exhaust, water/oil leaks			x
		1.9	Drain sediment from fuel tank			x
		1.10	Check fuel tank breather			x
2	Engine Electrics	2.1	Check electrolyte level in battery and verify operation of charger	x		
		2.2	Check state of charge with hydrometer		x	
		2.3	Clean cable terminations on battery and regrease			x
		2.4	Check fuel solenoid is operating correctly		x	
		2.5	Check auxiliary terminal box connection		x	

Item		Check Point	Action	10 Hrs or Weekly	100 hrs or monthly	200 hrs or yearly
3	Generator	3.1	Clean apertures and inlets with a dry air supply		x	
		3.2	Grease bearings (if required)			x
		3.3	Check ventilation areas for obstructions	x		
		3.4	Check electrical connections		x	

Item		Check Point	Action	10 Hrs or Weekly	100 hrs or monthly	200 hrs or yearly
4	Switchgear	4.1	Check functioning of all relays, lamps, fuses, meters and switches	x		
		4.2	Check functioning of all switches (including engine)			x
		4.3	Check that contacts of circuit breakers and contactors are clean			x
		4.4	Check condition and rating of fuses and trip devices		x	
5	General	5.1	Check and tighten all nuts and bolts (as required)			x
		5.2	Check condition of anti-vibration mountings (if fitted) & unusual vibration			x
		5.3	Check cable tightness			x
		5.4	Check ATS operation	x		
		5.5	Verify fuel pump system operation		x	
6	Complete Set	6.1	Run set for one hour on load and verify 1.Approx starting time. 2.That all engine instruments are functioning. 3.That all meters are functioning 4.All lamps are operating correctly. 5.All switches are functioning. 6.Unusual vibration & loose	x		

Item		Check Point	Action	10 Hrs or Weekly	100 hrs or monthly	200 hrs or yearly
			parts 7.Record all meter readings 8.Adjust AVR, RPM, Etc as necessary 9.Verify exhaust smoke colour			
		6.2	Clean complete set and exterior of panel and remove dust		x	
7		7.1	Have generating set inspected by manufacturer			x

AUTOMATIC MAINS FAILURE GENERATOR

The sub-contract shall include the complete supply, installation, testing, commissioning, handing over in approved working order and maintenance during the defect's liability period the whole of the sub-contract work as detailed hereafter and as shown on the drawings. The diesel generator set shall be of the "package" type, complete with all accessories on a combined under frame. The generator shall have a duty output rating as shown on the drawings and at 0.8 power factor lagging, 415 volts, three phase, 4 wire and 50 Hz. at 1500 rpm. Standard range of generator units with rating within plus or minus 2.5% of the specified rating may be offered. The generator must be appropriately derated for the ambient conditions of 40°C and 90% RH, at 2000 m attitude.

PERFORMANCE

The generator shall exhibit the following characteristics at load power factor of 0.8 lagging.

- (a) Steady state, load change: 0 - 100% F.L., Voltage - $\pm 1\%$, Frequency - $\pm 0.5\%$
- (b) One Step load change of 60% from no load with initial voltage transient limited to $\pm 15\%$ of rated voltage, recovering to within $\pm 3\%$ of rated voltage in less than 0.2 s and frequency at $\pm 6\%$ to $\pm 8\%$ returning to steady state within 0.5 seconds.
- (c) With a 50% out of balance load the voltage regulation should be within $\pm 6\%$.
- (d) To withstand a 3 phase short circuit current of approximately 3 times rated value for 5 seconds.
- (e) The generator should generate a waveform with deviations from a sine wave not exceeding 1.5% on open circuit and 4% on balanced load conditions as defined in B.S. 5000 Part 99.

MAIN COMPONENTS

The engine shall be of the multi-cylinder water cooled, direct injection, two (2) or four (4) stroke diesel engine, turbo charged with air to air charge cooling or naturally aspirated, vee form, heavy duty, compression ignition type in compliance with BS 5514, BS 1649, BS 3926, BS 4675 & BS 4959. The charge cooler shall be integral with engine cooling radiator. The power output developed shall meet the output rating specified, at normal temperatures and pressures in accordance with BS5514, at a speed of 1500 rpm.

In addition, the engine shall be capable of a 10% overload for a period of one hour in any consecutive 12-hour period. The machine should also be able to withstand 150% overload for 2 minutes. The governor shall be of the electronic type giving regulation complying to B.S.5514 Class "A1" governing. The governor shall have provision for varying the speed droop from 0 to 4.5%. The engine shall be complete with Fuel injection pump, fuel lift pump and duplicate fuel filters, lubricating oil pump and filters, circulating water pump and filters, duplicate full flow lubricating oil filters, lubricating oil pressure gauge, tachometers, integrating hour run recorder, air inlet filter, Water temperature gauges, Electronic governor with hand operated fine speed control, Overspeed trip, high water temperature trip and low oil pressure shut down protection and alarm, 24 volts D.C. operated starting motor, Guards on all exposed moving parts & 24 volts alternator. The engine shall be capable of cold starting and shall start within 10 seconds automatically upon public main supply failure. The engine shall be suitable for running on Class "A" oil engine fuel, generally complying with B.S. 2869. Proper filter shall be provided for fuel, oil and air. A drip tray of 2mm galvanized sheet steel with minimum 12mm high sides shall be provided where drips are likely to occur. A label "DANGER - KEEP CLEAR OF THIS SET. IT IS REMOTELY CONTROLLED AND MAY START AT ANY TIME" shall be clearly visible and provided in suitable location in the genset room.

The alternator shall be a 4-pole self-exciting, self-regulating single bearing, brushless, type fitted with a damper winding and complying with the requirements of BS 4999/5000. The unit shall be screen protected and drip proof to IP22. The rotor assembly shall be carried on a heavy shaft and shall be dynamically balanced to BS 5625 grade 12.5. The rotor shaft shall support the centrifugal ventilation fan, rotor, excitor rotor assembly and rotating rectifier assembly. The design of the core should permit and good ventilation for proper cooling. The alternator shall be fitted with a sealed for life bearing and a flexible drive disc for close coupling to the engine. The excitation system shall comprise a separate excitation winding to provide a low voltage D.C. supply for energizing the exciter field winding through a solid state transistorized AVR to control the level of excitation in response to changes in load temperature and engine speed. Rapid voltage build up shall be assured by the use of permanent magnet inserts in the exciter pole system. The power to the excitation winding shall be obtained through a rotating rectifier unit.

Current compounding circuit shall provide additional excitation proportional to load current to give much faster

response to load change, increasing circuit fault current capability and improving motor starting performance. The alternator performance characteristics shall be as described in the earlier section. A voltage trimmer shall be provided on the AVR for fine adjustment. The starter winding shall be epoxy coated. The rotor and excitor shall be triple, dipped in moisture, oil and acid resisting polyester varnish, and coated with anti tracking varnish. All windings shall be Class H insulated in accordance with BS 2757. The continuous operation of the machine at rated load shall result in Class 'F' temperature rises. All machines shall be capable of 10% overload for 1 hour in any 12. In addition, the machine should withstand 150% rated current for 2 minutes. The generator shall be provided with electric heater on the stator to prevent condensation and the neutral shall be solidly earthed to less than one ohm.

GENERAL ARRANGEMENT

The diesel engine and alternator assembly shall be mounted upon a fabricated steel under frame or base frame, by means of oil resistant mounting, of shear-compression type. The base frame shall also carry the radiator. The alternator shall be close coupled through a flex disc coupling bolted directly to the engine fly wheel. High tensile bolts shall be used. This assembly shall then be bolted down to a concrete plinth through oil resistant anti-vibration mountings of the adjustable level, bonded rubber type. Generator larger than 600kw shall be provided with housed steel spring supports with limit stops. Springs selected shall have additional travel to solid of 50% of deflection. All piping's, conduits and cables connected with the generator shall be provided with flexible coupling, or below, as necessary to prevent transmission of the vibration.

BATTERY/CHARGER UNIT

The engine shall be arranged for 24 volts starting by means of an axial type starter motor and contactor, engaging on tooth ring on the flywheel on generators larger than 600 KW 2 nos starter motors shall be provided. Batteries shall be 24 volts heavy duty lead-acid or nickel-cadmium type as indicated in the Bill of Quantities, with ample capacity for six (6) successive starts or attempts of 6 secs with a 15 sec rest period. Terminals and bare connections of batteries shall be suitably covered and protected against accidental shorting by tools.

The Battery Charger Unit shall be of the solid-state type capable of maintaining the batteries in a charged condition for optimum fully automatic operation. The charger unit shall incorporate a 2-stage charger selector switch. The charger stages being a) Automatic and b) High Boost Rate. For automatic charging the charger shall have constant voltage charging characteristics with a stability of $\pm 2\%$. Under automatic operation the charger shall provide automatic boost and float/trickle charging to maintain the battery bank in a fully charged state. Under the automatic mode of operation, the charger shall be capable of charging the battery bank from a fully discharged condition to a fully charged condition within a maximum period of 24 hours. The charger output voltage shall be adjustable between 1.35 and 1.7 volts per cell. The charger shall maintain any set voltage between $\pm 2\%$ with charger input AC voltage fluctuation of $\pm 10\%$, AC supply frequency fluctuation of $\pm 5\%$, and output load variations between 0 and 100%. The charger unit shall be provided with an output voltmeter, charging ammeters, D.C. fuses, Off/Auto/High Boost Rate charge selector switch, switches and relays.

The voltmeter shall monitor continuously the charge voltage and shall have a scale that reads within 0.5 volt. The charge voltage of the battery shall be marked in red on the inside of the instrument face plate. The ammeter shall be connected in the battery supply circuit to measure the charge and discharge of the battery. The ammeter shall be provided with a range switch which shall be non-locking in the low current range to facilitate reading of the battery charging current within 20mA. If one instrument is unable to provide the above facilities, then more instruments shall be provided as required. The normal float charge and high boost rate current for the battery shall be marked as specified for the voltmeter. The charger unit shall be provided with overload and short circuit protection. Current limiting devices shall be provided to limit short-circuit current to 120% of full load current.

COOLING/EXHAUST SYSTEM

The double belt driven radiator cooling air fan, shall be connected by means of a flexible canvas section and galvanized sheet steel ducting to a louvred air outlet, set in the wall. The fan shall be capable of developing the necessary static pressure to achieve the required air flow. The duct work, louvred frame and all necessary works associated shall be provided and installed by this sub- contractor. Shop drawing showing construction details shall be submitted for approval prior to installation. Ductwork shall be constructed in accordance with BS DW 142. An efficient silencer of residential type with stainless steel bellow section shall be provided and installed integral with the exhaust piping. Exhaust piping shall be of steel to BS1387/BS3601. All pipework shall be insulated with 50mm thick rock wool and covered with a layer of 0.6mm thick polished aluminium cladding.

The resulting noise level shall not exceed 85 dBA at 1 meter from the exhaust pipe under true field conditions. Exhaust piping though the wall shall be sleeved, the outer pipe being provided with a split circular flange properly fixed to each side of the wall, the sleeve to be packed internally with rock wool and grouted to the wall. Exhaust piping shall be supported by means of static deflection type supports using steel springs in series with neoprene such as manufactured by Kinetics type SH or MASON type HS. A moisture trap with drain cock shall be fitted at the lowest point. Shop drawing showing construction details shall be submitted prior to installation. The discharge of the combustion products shall be located such as to meet the requirements of the relevant authorities.

DAY FUEL TANK/_FUEL PIPING

An elevated rectangular fuel tank manufactured from minimum 3mm thick grade CR4 carbon steel plates with welded seams and suitably stiffened internally of capacity as shown in the drawings shall be provided. Galvanised steel shall not be used. The tank shall be constructed in accordance with BS799. All welding shall comply with the requirements of BS5135. The tank shall feed the engine by gravity, and the inside and outside to be painted with oil-resistant primer and externally finished with oil resistant paintwork. The fuel tank shall be mounted on angle iron supports. The bottom of the tank to be 300mm higher than the fuel inlet of the Engine.

The following accessories and fitting shall be provided on the tank:

- a) A 300 x 300 inspection opening with hinged cover
- b) A calibrated PVC content gauge with protection guard
- c) 1 no. M10 bolt for earthing terminal
- d) A 12mm dia screwed socket for drainage c/w gate valve and plug
- e) A 50 dia mm fill-in pipe with filter cap
- f) A 50 dia mm goose-neck vent pipe with S.S. wire gauge covered opening.
- g) A 25mm dia screwed socket for fuel supply to genset c/w gate valve and strainer filter.
- h) A 25 dia mm screwed socket for fuel return from genset
- i) Level sensing device c/w mercury switch for high/low level alarm
- j) A handpump c/w 20 dia mm bend pipe to tank and 1500mm length flexible hose.

Where bulk fuel storage tank is required, the following accessories shall also be provided at the tank.

- a) A 50mm dia flanged connection for feed-in pipe from bulk tank
- b) A 50mm dia flanged connection for fuel overflow back to bulk tank

A manual refilling pump shall be provided complete with all necessary valves and fittings. The hand pump should have a capacity of 20 times the rate of fuel consumption of the engine.

Fuel piping shall be in copper to BS 2871 table X with silver brazed joints to BS 1845 and fittings to BS 864 Part 2. Brazing alloy filler shall have a minimum 15% silver content and shall be in accordance with BS 1845. Fuel piping laid below ground shall be black steel pipe to BS 1387, with welded joints. Pipes shall be protected against corrosion by painting with 2 layers of bitumastic paint and wrapping with a 3 mm thick bitumastic tape. All pipes and fittings should be thoroughly cleaned and free from burrs, scale and obstructions before erection. Pipe supports shall be in accordance with BS 3974. Supports for copper pipes shall incorporate an insulation strip to protect against the effects of dis-similar metals in contact. All pipes shall be hydrostatically tested to 150 PSI for a duration of 24 hours. A maximum pressure drop of 3% shall be acceptable.

PROTECTION DEVICES

The generator shall be provided with the following protection devices: engine low lub. oil pressure alarm and trip, engine high water temperature alarm and trip, overspeed trip and alarm, failure to start circuit, permitting 6 successive attempts before automatic lockout and alarm operation, Underspeed trip and alarm, overload trip and alarm, low battery voltage alarm, terminals for connection of remote alarms, battery charger failure alarm & main tank and day tank low fuel level alarm.

AMF SWITCHBOARD

The switchboard shall be floor mounted, free standing cubicle type. Construction of the board shall conform to specification detailed under the section "Switchboard & Distribution Boards". The following are principal features required for the control panel.

- a) Indicator lamp to show operation of engine protective device with "test" and "reset" buttons.
- b) Selector switch for operation on "off" "auto" and "manual" positions.
- c) A test switch for testing of the entire system including main failure detection time delay, engine starting and automatic shut down, with or without operation of the load changeover contactors.
- d) Push buttons for manual start and emergency stop
- e) Lamp test push, reset and alarm cancel buttons
- f) IDMT overload and earth fault protection relays.
- g) voltmeter, ammeter c/w selector switches
- h) battery charger c/w selector switch, charging ammeter & voltmeter
- i) frequency, kwh and hour-run meter
- j) Indication Lamps for low battery voltage, battery charger failure, low fuel level, plant failed to start, low oil pressure shut down warning, overheat shut down warning, underspeed shut down warning, overcurrent warning, mains "available" indication, standby available indicator, heater on indicator, non automatic flashing indicator,

All interconnection wiring shall be factory built with proper colour cables in accordance to colour coding scheme "IEE & B.S. Code of Practice".

The generator control system shall include dry contacts and terminals for remote monitoring. The contacts and terminals shall be centralised on a common terminal strip and appropriately labelled. The provision required are as Voltage terminals c/w space for mounting of voltage and frequency transducers, Current terminals c/w space for mounting of current transducers, Generator main ACB/MCCB status, Fail to start, Low oil pressure, High water temperature, Overspeed trip, Switchgear fault, Overload/earth fault trip, Low fuel level in day tank, Low fuel level in bulk tank, Charger failure, Low battery voltage alarm & Underspeed trip.

MODE OF OPERATION

Mains Failure The generator set shall give full automatic main. Failure operation so designed that the plant will start at a preset voltage variation adjustable between 10 to 30% of the nominal voltage of any one of the phases. The genset should be fully operational within 10 seconds and be capable of accepting in one step 60% load and the remaining 40% in the next 10 seconds. The operation of the Generator Set Installation shall be such that under normal condition, the essential loads shall be supplied via the mains contactor/MCCB/ACB by the mains supply. The mains and emergency changeover contactor/MCCB/ACB shall be mechanically and electrically interlocked to prevent ☺parallel operation. It shall be positively interlocked mechanically in either the normal or emergency position. The contactors shall be provided with a short time delay device to ensure a clean break between opening of one and closing of the other.

Transient Disturbance To guard against unnecessary operation on transient disturbances, an adjustable time delay shall be provided after which the engine start/run circuit shall be energized (0-5 seconds).

Run-Up Period Provided the mains supply is still unavailable when the correct voltage and frequency is obtained, then the emergency load shall be transferred to the generator via the change-over. The time lag between starting of emergency set and closing of emergency contactor shall be adjustable between 0 to 5 seconds. Should the mains supply be once again available during the engine `Run-up' period, the automatic changeover switching shall abort. However, the genset shall run-up, ready to assume load for the present run-on period and be available during this period for essential load supply. On expiry of the run-on period the shutdown sequence shall commence.

Mains Return When the normal supply is restored i.e. all phase voltages return to above 90% of its rated value, the genset shall continue to run on load for an adjustable period (normally 0-60 secs) after which the load shall automatically switch over to the mains supply. The genset shall then commence the shutdown sequence.

Shutdown Sequence (Run-on Period) The shutdown sequence shall incorporate a time- delay to allow the engine to run unloaded for a short period before stopping the engine (1-10 mins). All settings must then return to the normal position for automatic operation.

If the mains fails during the shutdown sequence when the genset is running unloaded, then the genset shall (after a predetermined period (0-5 secs) to guard against operation on transient disturbance of mains supply) take on the load.

TOOLS AND ACCESSORIES

Each unit system unit shall be supplied complete with the following:

- 1 set of AVR
- 1 set of engine manufacturers standard tools
- 1 set outlet fuel nozzles
- 1 set of engine gaskets
- 2 sets of belts, fuel filter, air filter and lub oil filter.

MAINTENANCE & TRAINING

The sub-contractor shall guarantee against fault or defect, all materials and work as set out in this specification for the duration of the defects liability period. The sub-contractor shall at his own expense pay for spare parts, and other items necessary for the operation of the system. The maintenance shall consist of all required servicing of the plant installed including attention to emergency call. The Engineer may issue the Certificate of Practical Completion at his discretion provided that:-

- a) All required testing has been completed and approved.
- b) All adjustment to equipment which may be necessary to ensure satisfactory operation have been made.
- c) All operation instruction, wiring diagrams and layouts have been received.
- d) A maintenance schedule setting out the proposed programme of maintenance inspections and servicing together with advice of arrangements of prompt attention to emergency call has been submitted and approved by the Engineer.

At the beginning of the Maintenance Period, the sub- contractor shall provide a log book which shall be lodged with a person nominated by the Engineer. The log book shall remain at the site and shall be used to accurately record all service calls whether emergency or routine, setting out the work performed the date, the duration of each visit, the repair or adjustment made. All entries to the log book shall be handed over to the Engineer on completion of the maintenance period.

The sub-contractor shall provide the services of a suitably qualified operator for a period of two (2) weeks during the Defects Liability Period as and when nominated by the Engineer. The operator shall be engaged all time at site and shall be fully responsible for the starting, shut down, cleaning, servicing and general maintenance of the installation. The operator shall also be required to train the employer's services personnel on all aspects of the operation and maintenance of the installation.

EARTHING SYSTEM

This section of the specification shall cover the supply, installation, testing & commissioning of the earthing system. The system shall be in accordance with the requirements of B.S 7430 & latest IEE wiring regulations BS 7671, and as shown in the drawings.

EARTH ELECTRODE

Earth electrode shall be 16mm dia. copper clad low carbon steel rod section of 1.5m length. Rod shall have tensile strength of 600N/mm² (approx.) and a quality of not less than grade 43 of BS4360. Copper cladding should be 99.9% pure electrolytic copper molecularly bounded to the steel core. The thickness of the copper should not be less than 0.25mm. Rods shall be interconnected by screwed coupling made from silicon bronze alloy of grade CS 101 of BS 2874. A hardened steel tip shall be fitted as the driving cap. Electrode terminal connections shall be 'U' type cast gunmetal clamps with phosphor bronze bolts or exothermic welding.

The earth electrode shall preferably be driven to a minimum depth of 6 metres. Multiple earth rods are to be used to achieve the specified earth resistance. (Typically, less than one ohm for the electrical earth and less than 10 ohms for the lightning protection earth.) Spacing between the electrodes shall be at least equal to the depth of the earth rod and not greater than twice the depth of the earth rod. Interconnecting links between rods and main earth bar shall be as shown in the drawings.

INSPECTION CHAMBER

Polycarbonate earth inspection chambers complete with cover shall be used to protect/inspect each earth electrode. The earth inspection chamber shall extend to a depth of 200mm below finished ground level and kept free of soil. Each earth electrode shall be clearly marked 'SAFETY EARTH - DO NOT REMOVE' A heavy duty steel cover (Grade A BS497) shall be used when the earthing chamber is located on the road.

EARTH CONNECTION

An earth cable shall be extended to all electrical equipment and accessories, from the main earth bar via main switchboards, sub switchboards and distribution boards. All extraneous metalwork, cable trays, trunkings, metallic conduits, pipes, ceiling frames, structural steel, metallic flag posts, aerial, etc. shall also be bonded to the electrical earth with appropriately sized earth conductors. The minimum size of the earth conductor shall be as shown in the drawings and not less than the sizes indicated in the following tables or calculated in accordance with IEE regulations.

Buried copper tapes/cables shall be installed at a minimum depth of 750mm below finished ground level and mechanically protected by means of upvc conduit, brick cover or cable tile marker. Earth cables for submains shall preferably be installed spaced one cable diameter away from the main power cables and clipped separately. Earth cables may be installed bunched or as a core in a cable provided the appropriate rating factors have been considered in the calculations for sizing the earth cable. The insulation for safety earth cable shall be colour coded green with yellow strips, while the insulation for the neutral earth conductor shall be colour coded black.

Earth conductors up to 10 sq mm may be terminated with tunnel type connectors while cables above 10sq mm shall be terminated with crimping type cable lugs and nuts and bolts. Single core armoured cable glands shall be earthed only at the source end and cable glands on the receiving end shall be mounted on an insulated gland plate. Multicore armoured cable glands shall be earthed at both ends. Where the gland is terminated on a painted sheet steel plate, a cable gland earth tag and earth cable link shall be provided to bond the gland to the main earth bar in the switchboard. Alternatively, the glands may terminate on a brass plate which has a common link to the main earth bar.

Table 1 Minimum cross-sectional area of protective conductors in relation to the area of associated phase conductors.

Cross-sectional area of phase conductor (S)	Minimum cross-sectional area of the corresponding protective conductor (Sp)
mm ² S < 16 16 < S ≤ 35 S > 35	mm ² S 16 S/2

Table 2 Minimum cross-sectional area of protective conductor where it does not form part of a multicore cable or run in a cable containment system.

(a) 2.5mm ² if mechanical protection is provided
(b) 4.0mm ² if mechanical protection is not provided

Table 3 Minimum cross-sectional areas of buried earthing conductors

	Protected against mechanical damage	Not protected against mechanical damage
Protected against corrosion	normal sizing	16mm ² copper
Not protected against corrosion	25mm ² copper	25mm ² copper

CLEAN EARTHING

For telecommunication, audio, computer and other systems which require a clean earth, an independent, insulated earthing lead shall be brought directly from separate earth electrodes or a separate earth cable from the main switchboard main earth bar to the equipment earthing point as specified in the drawings.

EXTERNAL LIGHTING

Supply and install external lighting comprising of lighting columns, floodlights, bollards, wall, ceiling and decorative garden lights inclusive of all cabling as shown on the drawings and described in the bill of quantities.

Light fittings shall be supplied complete with control gear, cut off fuses, lamps, mounting brackets, adaptors, weatherproof cable glands and accessories.

All lighting columns shall be complete with a flush fitted door, backboard for mounting the MCB cut out and cable slot suitable for looping in and out 3 nos 3 core PVC/SWA/PVC cables at the bottom. Each armoured cable shall be fitted with an armoured clamp earthing device to ensure earth continuity to meet the IEE regulation. A 2.5 mm² or larger PVC/PVC line and earth cable shall be extended from the cut out to the lantern.

Lighting columns shall comply with the following British Standards :

BS 5369 lighting Columns

BS 1308 Concrete Street Lighting Columns

BS 1840 Steel Columns for Street Lighting

BS 3989 Aluminum Street Lighting Columns

INSTALLATION

The light fittings shall be installed as per manufacturers instructions. All necessary concrete plinths and anchors shall be provided as shown in the drawings. All lighting columns and bollards shall be installed plumb, and in correct relationship to the footpath, kerb or road.

CABLE LAYING

The cable shall be installed as shown in the drawing and in accordance with the specification section "cabling". Excavation of cable trenches may either be carried out normally or by using a mechanical excavator with the provision that other services such as power, telephone, water or sewerage will not be damaged. The cable trenches shall be clear of any form of hard materials such as stones, roots or any debris that may damage the cable to be laid. The cable trench shall be excavated to a depth of 750mm with a width of 200mm.

After the cable has been laid along the bed of the trench, loose earth shall be used to cover the cable and compacted up to a depth of 300mm from the bottom of the trench. Approved cable markers shall then be laid before complete backfilling and re-instatement of the trench is made. Insulation and short-circuit tests shall be performed on the cable by the contractor before and after cable laying works to ensure that the cable is serviceable. Unterminated cable ends, exposed to weather, shall be protected with PVC tape to prevent the ingress of moisture. All debris resulting from the excavation or cable termination works shall be cleared from the site. The trench work is to be inspected by the engineer before backfilling and compacting the trench.

LABELLING

All light fittings shall be labelled, identifying the fitting number and circuit number. Labels shall be fitted beside the terminal block or on the inside cover of the door. All incoming cables shall be labelled to identify the source and outgoing loop cable labelled to identify the destination.

STREET LIGHTING INSTALLATION

LIGHTING POLE

Light pole shall be manufacturing and designed to BS 5649. The columns shall be manufactured from steel conforming to BS4360:72 Grade 43C or BS4360:72 - Grade 50C, and welded in accordance to BS 5135.

The columns shall consist of tapered octagonal sections which shall be connected together be forced fit slip joints with a minimum overlap of 1.25 times their width at the joints. The intermediate sections shall be less than 5.6m. The bracket arm shall finish in a round pipe with a "spigot" for the safe mounting of the lantern.

A weatherproof lockable hinged-door shall be provided for access to the cable termination compartment. A baseboard of non-hygroscopic material shall be provided for mounting of cable termination accessories. An earthing boss of 6mm diameter shall be provided within the cable termination compartment.

The columns shall be designed to withstand loading comprising the weight of the column, luminaries and wind loads up to 27m/sec. The column shall be protected against corrosion by hot dip galvanising internally and externally in accordance to BS729.

ERECTION OF LIGHTING COLUMN

The lighting column shall be assembled on site as per manufacturers instructions. The sub-contractor shall be responsible for the provision of all necessary tools and equipment for the assembly works.

The lighting column shall be installed as shown in the drawing. All necessary steps shall be taken to ensure that the lighting column is installed vertically. The contractor shall provide a suitable crane to lift the lighting column into position. A concrete mixture of 1:2:4 in volume shall be used for the base and top foundation at the column.

CABLE LAYING

Excavation of cable trenches may either be carried out normally or by using a mechanical excavator with the provision that other services such as power, telephone, water or sewerage will not be damaged.

The cable trenches shall be clear of any form of hard materials such as stones, roots or any debris that may damage the cable to be laid. The cable trench shall be excavated to a depth of 750mm with a width of 200mm. After the cable has been laid along the bed of the trench, loose earth shall be used to cover the cable and compacted up to a depth of 300mm from the bottom of the trench. Approved cable markers shall then be laid before complete backfilling and re-instatement of the trench is made.

Insulation and short-circuit tests shall be performed on the cable by the contractor before and after cable laying works to ensure that the cable is serviceable. Un-terminated cable ends that are exposed to weather, shall be protected with PVC tape to prevent the ingress of moisture. The trench work is to be inspected by the Engineer before backfilling and compacting the trench.

LANTERN & LAMPS

All lantern shall comply with BS4533 and shall be:

- Provided with integral control gears in a separate compartment from the lamp compartment
- The lamp compartment shall have a minimum index of protection of IP54 and gear compartment IP43.
- Be provided with power factor correction capacitors to maintain a minimum power factor of 0.95

- Utilise non-corrosion type housing
- Utilise a polyester impregnated low power loss choke to BS EN 61048/49.
- Utilise electronic ignitor which switches off the lamp if it fails to ignite within 90 sec.

PHOTOCELL CONTROL UNIT

The photocell unit shall switch on at 55 lux and have a switch off/on differential of 1.5 to 2. The unit shall have an inherent time delay to prevent false operation.

CUT OUT UNIT

The cut off unit used shall be complete with a cable gland plate, terminal lugs and a 10A Type 3, M6 MCB. The unit shall be similar to that manufactured by TOFCO Ltd., UK or BICC, UK, TOFCO Ltd. model no HK/1F/435. The cable gland plate used shall be suitable for 3 nos. 4 core 16mm² PVC/SWA/PVC cable.

LABELLING

All street light columns shall be labelled to identify the pole number and circuit number. Labelling shall be stencilled on a yellow background, with 60 mm high lettering in black or vice versa for black poles.

LIGHTNING PROTECTION SYSTEM

The lightning protection system for the building shall comply with the recommendations of the British Standard Code of Practice BS 6651 & BS EN 62305. The Protection of Structures against Lightning". The system supplied shall be from Furse or other recognized manufacturers.

AIR TERMINATION NETWORK

The air termination network shall consist of roof conductors run along the ridges of pitched roofs, or parapet walls or as shown on the drawings.

The materials used for the air termination network shall comprise of roof conductors using 25mm x 3mm annealed copper tape to BS 1432 grade C101 and 8mm dia annealed copper to BS1432 grade C101, and air terminals using 15mm dia annealed copper rods of 500mm height and tapered at the tip. The fixing centers for horizontal conductors fixed on horizontal surfaces shall be 1000mm and for horizontal conductors on vertical surfaces shall be 500mm. Fixing shall be by means of purpose made metal saddles. The nuts, bolts, screws, washers and saddles used shall be made from phosphor bronze or bronze or navel bronze complying to BS 2874. Purpose made fixings shall be used for securing to ridges, slate roofs and corrugated roofs. The fixing shall be designed to ensure water tightness of the roof.

DOWN CONDUCTORS

Down conductors shall be of the same size and type of materials as used for the air termination network. Down conductors shall be securely jointed to the roof conductors and to the earth electrodes at ground level. Down conductors shall run on the outside of the building at positions shown in the drawings and shall be secured by specially made clips and saddles. Down conductors shall be as direct and vertical as possible. Right angle bends are not permissible. All bends must be made with as large a bending radius as possible.

The fixing covers for vertical conductors shall generally be at 1000mm. Where vertical conductors exceed 20 metres and 25 meters the fixing centers shall be at 750mm and 500mm respectively. A test joint shall be provided at 0.5m above ground level or as shown in the drawings at every down conductor. All down conductors shall be protected by PVC sleeving from 2.4m downwards to ground. Down conductors shall be painted to a similar colour as the surrounding finishes.

JOINTS/ BONDING

Joints shall be avoided as far as possible. Where unavoidable, conductors shall be welded using a exothermic process similar to the system used by Furse or Cadweld. All metallic parts of the building within 3m of the lightning protection network shall be bonded to the lightning protection network. Where dissimilar metals are bonded together steps shall be taken to avoid electrolytic action.

EARTH TERMINATION NETWORKS

The earth termination network shall comprise of a system of earth electrodes interconnected by copper tape. All jointing shall be by exothermic welding. The earth electrode shall be driven to a minimum depth of 6 meters. The electrodes shall be built from copper clad steel rod sections of 1.5 meter length and 16mm diameter interconnected by screwed couplings. Interconnection between electrodes shall be by means of a 25mm x 3mm copper tape buried at a minimum depth of 0.6 meter depth. The interconnecting copper tape shall be protected by a brick cover. Where multiple earth rods are required to achieve the required earth resistance of less than 10 ohms, the additional earth electrodes shall be placed in a triangular arrangement with a maximum spacing of 3 meters.

Copper clad steel rods shall have cores of low carbon steel with a tensile strength of approximately 600N/mm² and a quality of not less than grade 43A of BS4360. The cladding should be of 99.91 pure electrolytic copper monocularly bonded to the steel core. The radial thickness of the copper should not

be less than 0.25mm. Couplings for copper clad steel rods should be made from silicon bronze allow grade CS101 of BS2874. A hardened steel tip shall be fitted as the driving cap.

Earth electrodes shall be installed as close as possible to the building being protected. Polycarbonate earth inspection chambers complete with cover shall be used to protect each earth electrode. The earth inspection chamber shall extend to a depth of 500mm below finished ground level and kept free of soil.

Each earth electrode shall be clearly marked "Safety Lightning Connection - Do Not Remove". A heavy-duty steel cover shall be used when earthing chambers are located on the road.

SURGE PROTECTION SPECIFICATION

1 Surge Protection Standard - AS 1768: 1991

In selecting a lightning surge protector, it is important the device complies to the recommendations of most of the International Standards. Among the most prestigious standards are Australia Standard AS 1768:2003, British Standard BS 6651:1Q99, ANSI IEEE C62.41:1991 and The International Electro-Technical Committee IEC 1024-1.

Australia Standard AS 1768 outlines the major factors to consider when choosing and specifying lightning surge protection such as Location Categories, Modes of Protection, Product Testing and Let Through Voltage, apart from the other criteria that must be taken into consideration such as Survivability, System Compatibility, End of Life and Warranty Period. Others relevant standard are stated below:

- AS 3000-2000 Wiring Rules
- AS 3015-1993 Electrical Installations-Extra-low voltage DC power supplies within public telecommunications networks
- AS 4070-1992 Recommended practices for protection of low-voltage electrical installations and equipment in MEN systems from transient over voltages
- AS/NZ 4117:1996 Surge suppression devices for telecommunication applications
- AS 4262.1-1 995 Telecommunication over voltages - Part 1: Protection of persons
-

1.1 Location Categories for retail station application

AS 1768 divides a typical low voltage distribution network into 3 categories broadly described below. The surge protector shall survive and provide a low let through voltage as required by this standard.

Location Category C is classified as:

- Point of entry at highly exposed elevated and critical positions with voltage waveform of 6kV at 1.2/50us and m n t waveform of 70kA at 8/20us.
- Point of entry for external services such as supply mains with voltage waveform of 6kV at 1.2/50us and current waveform of 20kA at 8/20us.

Location Category B is classified as:

- On the power distribution system between the load side of the incoming distribution board and the supply side of a socket outlet within 30m. The surge voltage waveform can be as high as 6kV at 1.2/50uS and current waveform of 3kA at this sub-circuit level.

Location Category A is classified as:

- On the power distribution system between the load side of the incoming distribution board and the supply side of a socket outlet within 60m. The surge voltage waveform can be 6kV at 0.5/100kHz and current waveform of 200A or 500A may appear at the final sub-circuit.

1.2 Modes of Protection

Transient voltages appearing between line and ground are called common mode disturbances. Typical of these includes lightning strikes where equal voltages can be induced into both conductors with respect to earth. Certain types of electrical system earth faults will also create common mode voltages.

Transient voltages existing From line to line are called transverse or differential mode voltages. These are commonly created by power system operations, motor starts etc.

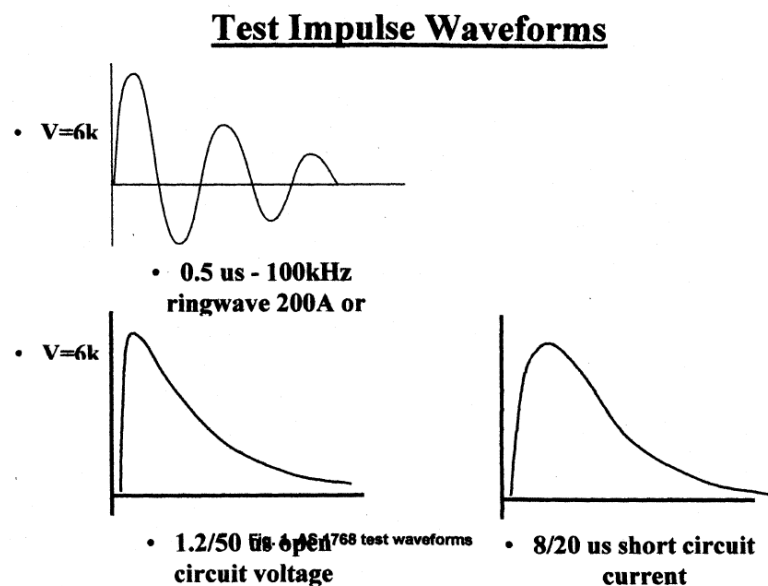
For full and effective protection, a surge protection device must provide protection for both common and transverse mode disturbances.

1.3 Product Testing

A well-equipped laboratory shall be able to testify the following: -

- The effectiveness of the surge protector.
- The let through voltage of the surge protector.
- The electronic component damage limits against lightning surge.

AS 1768 specifies the surge impulse waveform used for testing equipment to be installed at Category B and C locations shall be a combined waveform of 6kV, 1.2/50us and 3kA 8/20us as shown in the following waveform diagram. This combined waveform is also called for in BS 6651:1999 Appendix C and IEEE C62.41:1991.



1.4 Surge Rating

A higher quality surge protector shall be able to withstand multiple strikes without any destruction. A single lightning surge discharge can have surge current up to 100kA at one time. Lightning activity varies from region to region; therefore, it is important to install a surge protector that has proven performance in the region it is intended for.

1.5 System Compatibility

The surge protector shall not interfere or restrict the normal operation of the electrical distribution system. It is undesirable for mains power supply protector to disrupt or corrupt the continuity of electrical supply and introduce any high earth leakage currents.

1.6 Alarm Indication

It is important that the surge protector has a properly indicated pre-failure warning, whilst still providing protection for the equipment. A Set of dedicated monitoring contacts shall be provided from the lightning and surge protection system for direct connection to the central monitoring system. The monitoring contacts shall be volt free with normally open and normally closed position for status monitoring of individual suppressor components.

1.7 Warranty Period

The surge protector unit shall have a written warranty of 5 years against any manufacturing defects and 2 year against direct lightning strike incident. A full manufacturer's certificate shall be obtained for the respective units of suppressor supplied. The surge suppressor must be purchased from the authorized agent to ensure 24 hours back-up service and replacement parts within the warranty period.

2 Product specification

The specifications below reflect the requirement and performance of Tercel International products or approved equivalent as recommended for this tender.

2.1 Main Switchboard Protection - to provide base level of protection for all circuits against induced surge on the incoming mains power supply

A three-phase surge divertor including neutral and ground protection, ISOSURGE 120kA 3ph 50Hz shall be installed at the Main Switchboard (MSB) to provide shunt protection for all loads fed from the MSB.

2.1.1 Technical Specification

The divertor shall meet all the specification requirements:

- Three stages iTMOV™ high energy protection with 120kA surge rating
- operating voltage to suit 415V AC, 50Hz system
- let through voltage of <800V for AS1768 Category B 3kA 8/20usec pulse
- let through voltage of <900V for AS1768 Category C 20kA 8/20usec pulse
- let through voltage of <1400V for AS1768 Category C 70kA 8/20usec pulse
- LED indicators monitoring MOV integrity for each phase
- opto-isolated alarm terminals for connection to external alarm, indicating divertor condition and power on/off
- standard DIN rail mount MCB profile, 2U wide - 101H x 35W x 76D (mm) per module
- screw terminals - maximum 10mm sq. cable

2.2 Sub Switchboard Protection - to provide a second level of Protection for all circuits against induced surge on the incoming mains power supply

A three-phase surge divertor including neutral and ground protection, ISOSURGE 50kA 3ph 50Hz shall be installed at the Main Switchboard (MSB) to provide shunt protection for all loads fed from the MSB.

2.2.1 Technical Specification

The divertor shall meet all the specification requirements:

- Three stages iTMOV™ high energy protection with 50kA surge rating
- operating voltage to suit 415V AC, 50Hz system
- let through voltage of <800V for AS1768 Category B 3kA 8/20usec pulse
- let through voltage of <1000V for AS1768 Category C 20kA 8/20usec pulse
- LED indicators monitoring MOV integrity for each phase
- opto-isolated alarm terminals for connection to external alarm, indicating divertor condition and power on/off
- standard DIN rail mount MCB profile, 2U wide - 101H x 35W x 76D (mm) per module
- screw terminals - maximum 10mm sq. cable

2.3 4 x 500kVA RPA UPS protection - to provide protection for the UPS which fed on this circuit

A three phase, multi-stage power series filter ISOPULSE rated at minimum 1000A continuous per phase with neutral protection c/w bypass system shall be installed on the power circuit feeding the UPS. The power filter shall be located in series with the supply feeding to the UPS.

2.3.1 Technical Specification

The power filter shall meet all the specification requirements:

- series filter's current rating of 100A continuous per phase, three phase with operating voltage to suit 415V AC
- series power filter with three stage protection consisting of MOV, low pass LC filter, MOV
- MOV protection with 70kA surge rating at front end of LC filter and 40kA surge rating MOV at rear end of LC filter
- protection modes must be transverse and common
- capacitor figuration in LC filter must be self-healing, polypropylene, 'Y' type to earth, protected by series fusing
- efficiency must be 99% and voltage drop less than or equal to 3V at full load
- leakage to earth must be less than or equal to 1.5mA
- let through voltage of less than 400V for AS1768 Category B 8/20usec pulse
- neon alarm indicating divertor condition and power on/off available on front panel of filter
- dimensions - 1940H x 915W x 320D (with enclosure)
- metal enclosure, powder coat (bright white) finish over zinc plate steel, IP54 rating

- Connections - MI2 threaded posts (Power) and 2.5mm² terminals (Alarm)

2.4 Plugable UPS, Server, Monitor, Card Access Control module, Fire Control Panel, 19" Rack power supply, Video Monitor/Recorder, Time Division Multiplexer, PA Amplifier and control module - to provide protection for the sensitive electronics equipment which fed on this circuit.

A single phase, multi-stage power filter ISOPULSE shall be installed on the power circuit feeding the sensitive electronics equipment. The filter shall be located in series with the supply from the 13A SSO to protect circuit feeding to the POS and UPS.

2.4.1 Technical Specification

The power filter shall meet all the specification requirements:

- series filter's current rating of 10A, single phase with operating voltage to suit 240V AC
- series power filter with three stage protection consisting of MOV, low pass LC filter, MOV
- MOV protection with 8kA surge rating at front end of LC filter end 8kA surge rating MOV at rear end of LC filter
- protection modes must be transverse and common
- capacitor figuration in LC filter must be self-healing, polypropylene, 'Y' type to earth, protected by series fusing
- efficiency must be 99% and voltage drop less than or equal to 3V at full load
- leakage to earth must be less than or equal to 1.5mA
- let through voltage of less than 400V for AS1768 Category B 8/20usec pulse
- neon alarm indicating divertor condition and power on/off available on front panel of filter
- dimensions - 270 mm x 100 mm x 65 mm for floor am wall mounting
- metal enclosure, powder coat (bright white) finish over zinc plate steel, IP54 rating
- 13Amp input plug socket with 1.5m cable length and fuses protection.
- 2/4 x 13Arnp Single socket Outlet shall be provided.

2.5 CCTV power protection – to protect power module inside CCTV against induced surges on external power circuits

A single phase, multi-stage power filter shall be installed on the 5A power circuits to the electronic power module inside CCTV.

2.5.1 Technical Specification

The power filter shall meet all the specification requirements:

- current rating of 5A single phase with operating voltage to suit 240 VAC, 50 Hz system or
- series power filter with three stage protection consisting of MOV (8kA surge rating), low pass LC filter, MOV (8kA surge rating)
- protection for both transverse and common mode disturbances
- capacitor figuration in LC filter must be self-healing, polypropylene, 'Y' type to earth, protected by series fusing
- efficiency must be 99% and voltage drop less than or equal to 3V at full load
- leakage to earth must be less than or equal to 1.5mA

- let through voltage <60W for AS1768 Category 6 3kA B120usec pulse for IL5H275
- dimensions - 80mm x 74mm x 25mm polyamide enclosure with integral DIN rail mount footing, screw terminals
- cable entry must be ensuring segregation of input cables from output cables

2.6 CCTV data line protection - to protect CCTV against induced surges on coaxial line

A coaxial cable surge protector each contains a fast response gas filled arrester shall be installed on the communication connected between the CCTV and Time Division Multiplexer. Both of the CCTV and Time Division Multiplexer shall be protected by individual coaxial surge protector separately. The module shall be installed as close as possible to the equipment.

2.6.1 Technical Specification

The protection module shall meet all the specification requirements:

- one stage protection consisting of fast response gas filled arrester rated at minimum 20kA
- protection for both transverse and common mode disturbances
- to suit coaxial signal cable - maximum working voltage (line to line) 90V DC
- surge withstand rating of 20kA for 8/20u/s pulse
- let through voltage for AS1768 Category B 6kV 1.2/50u/s, 3kA 8/20us pulse
- insertion loss shall be less than 2.0 dB at 2.5GHz
- maximum capacitance shall be 2.0pF
- insulation resistance shall be more than 1010
- characteristic impedance shall be 75 ohms with operating bandwidth within 2.5GHz
- dimensions 25mm x 25mm with max 57mm for length
- temperature range 0-45degC, 10% - 95% RH
- Casing shall be silver plated brass
- Connectors will be F/F or M/F

2.7 PABX and incoming telephone lines protection - to provide protection for telephone incoming lines to PABX and MDF

A multistage ISOKRONE krone plug-in multistage protection for 10 pairs telephone lines shall be installed on incoming telecommunications lines at the Main Distribution Frame (MDF), Intermediate Distribution Frame (IDF), Building Distributor (BD), Campus Distributor (CD), Floor Distributor (FD) and PABX.

The module shall be installed into Krone LSA* disconnect termination blocks with the 'LINE SIDE' side components facing the direction of the incoming surge.

2.7.1 Technical Specification

The protection module shell meets all the specification requirements:

- three stages protection consisting of gas arrester / series impedance / silicon avalanche diode (SAD) components mounted on single PCB rated at minimum 20kA.

- module to have Beryllium Copper Spring earth clips on each end with clear per spex cover to allow inspection of surge suppression components and PCB tracks
- protection for both transverse and common mode disturbances
- nominal DC breakdown 490V line to earth and 265V line to line
- surge rating 20kA a+b-e, 10kA a-b for 8/20u/s pulse
- let through voltage <80V for AS1768 Category B 3kA 8/20usec pulse
- AC discharge current a+b-e is 10A at 50Hz for 1s
- insulation resistance >5Meg ohms at 200VDC
- capacitance a-e, b-e <5pf, a-b <100pf
- loop resistance 16.4 ohms
- loop inductance 2uH
- insertion loss <0.5dB at 600 ohms, 100kHz and <3dB at 600 ohms, 20MHz
- dimensions 136mm long x 39mm from front of Krone* block when fully inserted x 200mm high - weight 80gms
- temperature range 0-45degC, 10%-95% RH
- tested to ACA TS001-1997, ACA TS002-1997, ASNZ3260 or approved equivalent

2.8 RS485 Data Line Protection for security card control system and PMCS - protect against induced surges on external data circuits

A single pair, hard-wire module with multiple stages of protection shall be installed on RS485 line feedback to control module and PLC, where DC isolation is required between signal line screen (shield) and the safety earth.

The module shall be installed as close as possible to the control module with the LINE side components facing the direction of the incoming surge.

2.8.1 Technical Specification

The protection module shall meet all the specification requirements:

- four stages protection consisting of gas arrester / series inductance / MOV / silicon avalanche components
- additional gas arrester between chassis and protection circuit to ensure 'floating earth' for noise free operation
- protection for both transverse and common mode disturbances
- overcurrent protection using PTCs
- maximum working voltage (line to line) 18V DC
- surge withstand rating of 20kA for 8/20u/s pulse
- let through voltage for AS1768 Category B 6kV 1.2/50u/s, 3kA 8/20us pulse - 22V (common mode)
- maximum loop resistance 20 ohms
- frequency response 3dB point > 1MHz
- dimensions 80mm x 74mm x 25mm, screw terminals 2.5mm sq. maximum
- universal DIN rail mounting
- temperature range 0-45degC, 10%-95% RH

Addressable Microprocessor Type Automatic Fire Alarm System

The contractor shall supply, install, commission and maintain an automatic addressable analogue microprocessor fire alarm system in accordance with the specifications and drawings. All main equipment shall be from the same manufacturer, this applies in particular to the detectors, control units and central operating equipment. The system shall comply with the requirements of BS 5839 and shall include but not limited to the following:

- Fire indicator board with text display, keyboard and printer
- Mimic panel with programmable LEDs
- Repeater panel with LCD display, keyboard and printer if specified
- Addressable field devices and bells / sounders
- Interface units for controlling and monitoring associated services

The system should be capable of modular expansion, networking and interfacing with advanced building monitoring systems.

FIRE ALARM CONTROL PANEL (Master, and Sub Panels)

The fire alarm control panel shall be constructed as a wall mounted unit to IP42 rating using 1.6mm thick sheet steel sections suitably reinforced. The panel shall be fitted with a lockable front door with a transparent viewing panel or alternatively in the absence of a door a key switch which disables the control keys.

The system shall be microprocessor based. All operating programs and data's for system configuration shall be held in updatable non-volatile memory (EEPROM), or shall be battery backed up on the board itself using batteries with a 10-year life span and 72 hours capacity. The control panel shall incorporate a real time memory log capable of storing up to a minimum of 255 events, including the time and date information.

The fire alarm panel shall incorporate a sequential polling system which polls each device individually and transmits or read information from it. The information is compared with all possible fire patterns in the software (algorithms) and a decision made as to the status of the device (pre-alarm, fire, short/open circuit fault, incorrect addressing, unauthorized device removal or exchange, detector contaminated or normal) and events annunciated. The System polling time shall not exceed 1 second for each complete scan of all devices attached. Upon receiving an alarm signal the panel shall enter a 2nd stage verification process, which shall consist of verifying if the alarm signal persists for the second scan, while simultaneously comparing the temperature and smoke levels of adjacent detectors. If the alarm persists during the 2nd scan or adjacent detectors indicate readings in the pre-alarm conditions the alarm shall be initiated.

The panel shall also check the self-test function results of the detectors during polling and display maintenance signal if these are out of range. When contamination causes a detector's sensitivity to shift, the panel shall recalibrate the device to compensate (i.e. adjust threshold levels). When contamination becomes excessive, the panel shall indicate a "detector maintenance required" signal. The alarm threshold of individual or group of detectors shall be programmable from the alarm panel. It should also be possible to link the threshold levels to the time of day to suit the occupancy.

All devices in the system shall have a unique address and a 32-character alpha-numeric label. The addresses shall be automatically assigned by the control panel during commissioning stage while the label and data entry for the devices is either through the host computer or keyboard in the control panel. The control panel shall be capable of zoning a group of detectors from various loops. The zoning shall be done using alpha-numeric designation (keyboard entry from control panel or from host computer) or geographically mapped (using interactive colour graphics software and host computer).

The system shall be capable of accommodating alterations/extensions without need for relabeling (i.e. allocation of address shall be independent of the physical arrangement in the loop). The labelling shall be stored in a non-erasable memory within the control panel. The address and label shall not change due to replacement of sensor heads or removal of other input/output devices. The panel shall be fully field programmable, with no special RAM burning equipment using the panel keyboard or a portable pc. Configuration data's shall be backed up on disk, with a copy retained by the contractor and one copy by the owner. Wiring shall be of return loop arrangement and the panel shall be able to be configured in multiple loops. The loops shall be capable of

accepting a minimum of 99 devices, which shall include fire detectors, break glass, contacts such as sprinkler flow switches (with delay timer incorporated), alarm sounders, interface for trip relays, solenoid valves and other evacuation/alarm systems. Faults on one loop should not affect the other loops.

Removal of any sensor head or device from its base shall not impair the function of other devices, or break the loop. Loop isolators shall be fitted on all addressable field devices to protect against single open or short circuit faults within the loop by isolating the faulty section of the loop. The fault and location shall be annunciated on the main panel. The addressable line and sounder circuit must be fully protected against short and open circuits. The alarm panel shall electrically supervise the zone circuits. The following shall be indicated as faults in the alarm panel, but shall not affect its operation.

1. Removal of any detector or disconnection of call points and other alarm devices from its circuit
2. Short circuit and/or disconnection of cables to alarm and detection zone circuits, failure of battery charging equipment, batteries and fire alarm devices (Sounders) external to the main fire alarm panel
3. Electrical earth fault of cables containing direct power source
4. Short circuit or disconnection of mains power supply
5. Cessation of any scanning or interrogating process within the control equipment.
6. Faults on any of the interfaced panels and associated communication cabling.

The panels shall be designed to annunciate visually and audibly a fire situation and the existence of fault in the system. The following facilities shall be provided.

1. Mains on Indicator (green LED)
2. Fault Annunciator (yellow LED)
3. Fire Annunciator (dual red LED)
4. Fire/Fault Buzzer
5. Zone/Loop Isolate Annunciator (yellow LED)
6. Evacuate push button
7. Sounder/Buzzer Silence push button with auto reset upon activation of a new alarm
8. Cancel Fault and Acknowledge Fault push button
9. Fuses (screwed on type)
10. Lamp Test push button
11. Reset push button
12. 2/4 line 40 Character Scrolling LCD display
13. 40 Character Thermal Printer
14. Key Board and Menu function Keys.
15. Fire Brigade Link Facility
16. Fire Brigade Link Indicator
17. Label (Manufacturer/Serial No./Date of manufacturer/ model No./Panel identification)

The panel shall incorporate a display which shall indicate the event type, alarm count, the zone label and device number/label in the event of a fire alarm. It must be possible to check device status as well as device type on the display. When the panel is in a normal condition the display shall indicate the time and date with an option of a system or building title. The control panel shall utilise a multitasking programmable software, which shall be capable of monitoring and controlling fire doors, smoke spill fans, dampers, alarm sounders, etc to suit the alarm event. It should also be possible to operate the remote devices by issuing commands from the fire alarm panel or central monitoring system. An RS232C or RS485 serial communications port shall be provided together with the communication Protocol software to enable the control unit to be connected to an external computer and printer. Provision must also be made for zonal fire outputs to switch external relays and indicators for mimic purposes.

A printer shall be incorporated into the panel for event logging onto a hard copy. All print text shall be field programmable without the need of special RAM burning equipment. Simple menu driven facilities shall be provided for the alteration of the stored program and for maintenance. These facilities shall be protected against unauthorised alterations by means of user defined multilevel access code. There shall be a minimum of 4 access levels (ie information, user operator, user engineer, specialist). The functions and operations of the system shall not depend on the programs stored on rotating disks or storage media using moving parts, or any other form of corruptible memory. When a CPU is used to record the events and/or generate graphics, this equipment is acceptable as an enhancement to the main fire alarm system only.

The menu driven functions shall include but not limited to the following minimum requirements: -

- Display all point log or that of selected zone or subsystem
- Display alarm summary (minimum of last 99 events)

-
- Lock out or unlock selected items
 - Display summary of locked out items
 - Assign time and date
 - Display points and associated datas
 - Enter or delete programmed on / off times
 - Modify time delays and alarm sounder modes
 - Activate / deactivate output relays controlling fire protection devices
 - summary of dirt levels in detectors and disconnected point list
 - Trend report of smoke levels and temperatures

The operation of the panel shall be continuously monitored. When the stored program be accidentally corrupted in such a way as to interfere with the correct operation of the system and/or in the event of failure, a fault warning shall be given which shall be automatically reset after the system has been restarted. The panel shall incorporate on line diagnostic software which regularly runs diagnostic tests up to chip level to reflect component failure. Under normal circumstance, where the response is a detector the time taken for scanning, interrogation, decision or other signal processing either within the control equipment or controlled by it, shall not delay the response by more than 10 seconds. Where the response is to the operation of manual call point, the delay shall not exceed 3 seconds. The delay due to the response from other interfaced fire alarm devices shall be to suit the connected device.

POWER SUPPLY

Each fire alarm Panel LED mimic panel and sub system shall operate on a 240V AC supply and on a 24V DC standby battery supply. The 240V AC supply shall be taken from the live side of the incoming public utilities supply or from the generator mains where available. The circuit protective device for the fire alarm system should be reserved for the purpose and its cover coloured red and labelled:

"FIRE ALARM SUPPLY: DO NOT SWITCH OFF."

"THIS SUPPLY REMAINS ALIVE WHEN THE MAIN SWITCH IS TURNED OFF"

The power supply should be extended to the fire alarm panel using fire resistant cable and terminated within the panel through a double pole switch. The power supply should be extended through an unswitched spur unit located adjacent to the fire alarm panel. The spur unit should be finished in red and labelled "Fire alarm supply - Do not switch off".

The batteries shall be sealed maintenance free nickel cadmium type of sufficient capacity to maintain the standing losses of the system together with the fault signal load resulting from mains failure for a continuous period of at least 24 hours or longer as stated in the bill of quantities/drawings. Thereafter the battery provided shall be able to supply the full emergency evacuation alarm load to operate all sounders, indicating lights, detectors, auxiliary systems etc for a period of at least 1/2 hour. The mains supply should be capable of supplying the maximum battery charging load and at the same time supply the full evacuation alarm load. Batteries shall have a label stating date of installation and expected life time expiry date which shall not be less than 4 years.

The charger shall be able to provide automatic boost and trickle charging. It shall be complete with a current limiter, voltage regulator, diode reverse polarity protection, overload protection and input/output fuse and necessary relays. The charger shall be capable of charging the fully discharged battery within 24 hours, by its normal charging method to a fully charged condition. Automatic control features shall be provided to ensure that the batteries are maintained and charged within the Limits Set by the battery manufacturers.

The operation of all equipment shall be inherently stable for voltages of $\pm 10\%$ of nominal voltage. A surge suppression device shall be provided on the incoming power supply line to protect against transient surges and electromagnetic interference. Calculations on the charger and battery selection shall be provided. Batteries shall be sized for a end voltage of 80% of system voltage or 1V/cell.

DETECTORS

All electronic circuits and devices in the detectors shall be hermetically sealed to protect from dust, dirt or humidity. All circuitry shall be protected against electrical transients and electromagnetic interference while the sensor element is protected against dust and vermin. The detectors shall be compensated for temperature,

humidity and barometric changes. The detector shall be of low profile, small footprint, aesthetically pleasing off white appearance.

The design of each detector shall consist of a terminal base with a plug and twist fix electronic module and replaceable or serviceable sensor element, should it become dirty. Bases should have cable terminals for the loop connection, connection of a remote LED, spur loop connection, or auxiliary contact terminals as required for the specified configuration. The base shall be common for point type, thermal and smoke detectors. The detector should incorporate an anti-tamper locking device which could be enabled if required. Each detector shall incorporate a red L.E.D. Indicator to annunciate alarm condition. The placement of the LED on the detector base should permit a wide viewing angle. The system shall provide for connection of a remote L.E.D. unit when necessary. The remote L.E.D. unit shall be minimum 3mm diameter, with a diffuse lens cover and mounted on a base plate, engraved with the wordings "Fire Alarm Activated" in red letters not less than 3mm high.

Detectors shall be loop wired and loop powered using a two-wire screened cable. The sensitivity of addressable detectors shall be individually adjustable from the control panel. Every detector base shall have a short circuit isolating device. It shall be possible to measure and display the detectors sensitivity at the control panel. The detector shall incorporate a identification code and self-test function, which shall be reported to the panel. If the detector is removed or the wrong type of detector is plugged in or the data returned is incompatible as compared to the database in the control panel, it must be annunciated at the control panel. The quiescent current shall be minimal and should not exceed 0.1mA

All detectors and devices should have a clear visual marker externally attached (Transfer tape or equivalent) stating the zone number followed by the point number eg:- **01 05** (ie Zone 01 and point 05). The visual marker should correspond with the diagrammatic representation and also the line identification form.

THERMAL DETECTOR

Thermal detectors shall comply with BS 5445 part 5 for installation in normal environments and BS 5445 part 8 for high ambient temperatures. Thermal detectors shall have rate-of-rise and fixed temperature detection characteristics and shall generally be of Grade 1 type. Grade 2 & 3 and fixed temperature thermal detectors shall used if specifically shown in the drawings.

The point type thermal detector shall utilize a thermistor sensing element, which provides close tolerance performance under all rates-of temperature rise condition. Linear detectors shall be of the integrating type. The detector should monitor the linear detecting element for open and short circuit faults and annunciate the same at the detector base.

SMOKE DETECTOR

The smoke detector shall be in accordance with BS 5445 part 7 and part 9. Photoelectric type detectors shall respond to visible smoke concentrations and shall consist of a light source in a labyrinth chamber, such that no direct light normally reaches the sensor, but the presence of smoke scatters the beam and activates the sensor. Alternatively, sensors based on the obscuration principle may be used.

The Ionization detector shall respond to the first traces of fire in the form of visible smoke or invisible products of combustion and shall be a dual chamber type. The radio-active source shall be less than 1 micro-curie of Americium 241, and shall comply with all atomic energy Agency requirements. Sensors for monitoring air flow shall be optical type and shall incorporate an airtight sampling housing and twin probes.

SOUNDERS (ALARM BELL / SIRENS)

The bell shall generally be 150mm diameter pressed steel dome shaped type. Sirens shall be pressed steel or high impact ABS. Sounder shall be substantially finished in red colour and shall be mounted at a height of 2250mm above finished floor level. Sounders installed externally shall be of weatherproof construction.

Bells shall sound at least 95 dB at 1m and sirens 100dB at 1m when activated. The contractor shall check the sound levels, which shall be 65dB or 5dB above the background noise all over the protected area, whichever is higher. Bells shall be connected to the loop using an addressable interphase unit. Electronic sounders shall be loop wired, loop signaled and addressable units. The frequency of the sound produced shall be clearly in the

audible range, somewhere nearby 1KHz. Sounders shall be configured and monitored by the alarm panel. The sounders shall operate individually or in sectorized groups as instructed by the alarm panel, totally independent of the way they have been physically connected to the loop.

The sounders shall be able to produce three different tones (alert with 1 sec on and 1 sec off, continuous tone for evacuate and a used defined tone for specialized events) that are totally in phase and hence clearly distinguished from one another. The output of all sounders shall be synchronized with one another. Sounder throughout the premises should be connected on at least 2 separate circuits to ensure that the failure of one circuit does not leave the system inoperable.

MANUAL CALL POINT

The call point shall be of the break glass type, with casing finished signal red. The lettering "Fire-Break Glass" shall be inscribed or printed on a thin plastic film laminated on the exterior surface of the glass. The call point shall be electrically compatible with the standard range of automatic detectors so that it can be connected directly into a addressable supervised two-wire zone. The call point shall comply to BS 5839 part 2. It shall be possible to test the Manual call point with the use of the test key provided and without breaking the glass or removing the cover.

Call points shall be flush mounted directly onto conduit junction boxes at a mounting height of 1400mm above finished floor level to the centre of the call point. Where call points require additional protection, they shall be supplied with a hinged transparent polycarbonate cover with the wordings "Lift cover before breaking glass". Call points exposed to the weather shall be provided with weather gaskets.

INTERFACE UNITS

Interface units shall be capable of either being used for an input to the fire alarm loop such as conventional zones of detectors, sprinkler system etc. or an output from the fire alarm panel to other site services such as lift homing signals, AHU trip signals, sound evacuation signals, etc. The type of voltfree contact (normally closed/normally open) with minimum 6A, 240v ac rating shall be as specified in the drawings/Bill of Quantities. The interface shall be a self-contained wall mounted unit which is loop powered. In multi-port interface units, each input/output shall have its own address. The address setting shall not be from the interface unit, but it shall be from the fire alarm panel itself. All inputs/outputs shall be fully monitored for open and short cable faults. LED's shall be provided on the interface unit base to indicate activation/ faults.

MISCELLANEOUS DEVICES

The system supplied should include in its standard range, accessories to facilitate a flexible configuration of the system. The accessories should include but not limited to the following:

1. Sounder-Sensor base combination with a common address.
2. Combination sensors with a thermal and smoke sensing element, and time zoning feature, which enable either or both sensors to be active in line with the user defined programming.
3. Beam sensor pair
4. Flame sensor
5. Xenon Beacon
6. Magnetic Door Release Unit

SILK SCREEN DIAGRAMMATIC LAYOUT PLAN

A silk screen diagrammatic layout plan shall be provided at each of the alarm panel locations. The silk screen shall cover the whole building on a 1:500 scale, or otherwise as mentioned in the bill of quantities. The silk screen shall clearly identify the location of all the fire protection detectors, devices, escape routes and individual alarm zones, which shall be coloured and numbered for easy identification. The diagrammatic layout should also include a legend to identify the various devices, emergency call telephone number and service call telephone number.

LED MIMIC PANEL

Since the addressable fire alarm panel is capable of identifying every address, the LED mimic panel if specified need only have LED indicators for each zone. The system shall illuminate an entire section or area that is on fire at the mimic panel. The construction of the diagrammatic panel shall be similar to that described above in the section "Silk Screen".

The mimic panel shall also incorporate LED's for indication of mains failure, battery failure, status of standby generators, low water levels in fire tanks, status of fire pumps, status of smoke spill fans etc. The mimic panel shall be fully supervised by the control panel. The control panel shall monitor for the cable faults (short and/or open circuits) and loss of communication between them. Under Fire condition, the word "FIRE" shall be indicated on the mimic panel. Lamp test facility shall be provided at the mimic panel. The mimic panel shall contain an integral battery back-up with capacity similar to the requirements of the main alarm panel.

REPEATER PANEL

The repeater panel shall display all the messages and information of the system. It should include text display, a printer and keyboard. The repeater panel acts similar to a parallel display unit of the main panel. The repeater panel shall have basic and essential controls, i.e. evacuate, start sounders/bells and stop sounders/bells push buttons. The repeater panel shall also have the function keys and keyboard to operate the system menus and to enable and disable the devices. The repeater panels shall be monitored by the main panel. In addition, the main panel shall supervise the wiring to the repeater panel and the loss of communication between them. The repeater panel shall have integral battery back-up with capacity similar to the requirements of the main alarm panel.

WIRING

All internal wiring shall be fire resistant screened cables to BS 6387 with minimum categorization AWX or SWX or equivalent cable in accordance to the manufacturers requirements and run in conduit. Underground cabling shall utilize PVC/SWA/PVC multicore control cables to BS 6346. All wiring shall be in accordance to the requirement of the specification detailed in the section "CABLING" and in accordance with BS 7671 "IEE wiring regulations.

Fire alarm cabling shall be run in its own containment and shall be segregated from other services. Containment transversing external walls and floors shall be effectively sealed using a non-setting compound to ensure water tightness. Containment transversing a fire rated compartment shall be fire sealed to the same rating as the compartment wall. Containment transversing floors shall in addition be provided with a 50 mm high watertight curb. Conduits shall preferably be run in the structure or in the wall with minimum 12mm plaster cover. all conduit supports shall be of metallic construction. Containment which are run surface or subject to mechanical damage or exposed to the weather shall be of metallic construction. Conduits which are embedded in the structure or plaster may be pvc conduit.

Cables shall generally be routed as shown in the drawings and through routes of low fire risk. Conduit/trunking entry from a non-air-conditioned space to a conditioned space shall be sealed using silicon or equivalent compound to prevent the egress of fresh air and resulting condensation. Conduit entries to detectors and devices shall be provided with a seal to prevent egress of moisture, dirt and dust. All exposed conduit/trunking for the fire alarm system shall be painted signed red or identified with the words "fire" at 3m intervals. Cables shall generally be 1.5 sq mm for detector circuits and 2.5 sq mm for alarm circuits unless otherwise shown in the drawings. Cables and route selected should limit the voltage drop to less than 10% of nominal voltage. Zone wiring shall generally be in a closed loop arrangement (class a)

All cable tails at detectors, devices and control panels shall be identified by means of numbered ferrules in accordance with the cable schedule. (ie zone number and device number). Cable tails shall be appropriately glanded or sealed to suit the type of cable installed. Where the outer insulation of screened cables is removed, heat shrinkable irradiated polyolefin tubing shall be used. All indication and stimulation signals between other services & the fire alarm panel shall be supplied installed and terminated by the fire services contractor. All necessary interfacing relays shall also be provided.

OPERATION UNDER FIRE SITUATION

Upon activation of any smoke detector, thermal detector, manual call point, flow switch, or FM200 system, or other fire inputs, the fire alarm system shall initiate the following operations:

1. Indication at the fire alarm panel and mimic panel of the zones and detectors which are activated.
2. Initiate the buzzer within the fire alarm panel and then after 15 seconds initiate the alarm. This time delay shall be continuously adjustable between 0 to 30 seconds. Initiate a signal to the audio evacuation system to broadcast the evacuation message after one minute of continuous bell ringing.
3. Tripping of air conditioning equipment at the zone on fire and activation of pressurization, smoke extract fans, pre-action sprinklers, audio evacuation system and other fire protection related systems.
4. Activation of the lift fire mode of operation and lift homing
5. Transmit signal to central fire station, system printer and other panels networked.

A single stage alarm system shall activate all sounding devices continuously on activation of any alarms. For a two-stage alarm system the following sequence shall be adopted.

1. The alarm sounders on the zone on fire shall sound continuously and those on the adjoining zones, shall sound intermittently (1 sec on and 1 sec off) to indicate alert condition.
2. After 2 minutes the alarm on the zones on fire and the adjoining zones, shall sound continuously and all other zones intermittent.

Where an audio evacuation or PA system is provided the emergency paging signal shall silence the alarm sounders for the duration of the voice message. The activation of the alarm sounder should also activate relays to silence background music and other non-essential sound reinforcement systems.

INSPECTION TESTING AND COMMISSIONING

The tests to be carried out shall include but not limited to :

1. Insulation test of wiring using a 500V megger before devices are connected.
2. Earth continuity tests
3. Visual inspection of the system to ensure compliance with the specifications
4. Dynamic testing of each detector/device and sounder for correct operation installation
5. Operation of ancillary equipment and linkage to fire department,
6. Verification that the software meets design intents and specifications

SPARES AND TOOLS

A stock of 10% of manual call point glasses, 10% of indicator panel lamps, 2 nos bells/sounders and 4 nos smoke detectors and 4 nos thermal detectors shall be provided and located within the fire alarm panel or in a lockable cabinet beside the fire alarm panel. The contractor should also supply any special tools required for routine maintenance of the system (ie Detector removal tool, break glass activation key, programming tools etc)

PAPERWORK

The following paperwork are to be maintained at site adjacent to the control panel or in the control room:-

1. Log book
2. User operation manual and AS installed drawings
3. Cable/line identification form, commissioning checklist and test records.
4. Maintenance schedules and emergency contact numbers
5. Programming data input in hardcopy and disk format
6. Component and equipment list and source of spares

BAS/BMS INTERFACE

When a BAS/BMS is interfaced with fire alarm panel, it shall only monitor and display the fire status/information. The BAS/BMS system shall not control the fire alarm panel. The interface shall be through RS232 or equivalent communication port. The contractor supplying the fire alarm panel shall provide all the necessary cabling/interface connection and all necessary interfacing software.

PORTABLE FIRE EXTINGUISHERS AND FIRE BLANKET

Portable fire extinguisher and fire blanket to the approval of Local Fire Services Department shall be supplied and installed by this Sub-Contractor. The number and types of extinguishers and fire blanket are as shown on the drawings. The extinguishers and fire blanket shall be hung or hook or securely placed on brackets fastened to wall, partition or column in a suitable conspicuous and accessible position. Cost of the brackets shall be included in the tender price. All extinguishers should be installed at height of 1m from the floor level to the handle, unless otherwise indicated.

ABC DRY POWDER FIRE EXTINGUISHER

The dry powder shall be a safe and versatile extinguishing medium ideally suited for high risk environments. The dry powder medium shall be non-conductor of electricity. The head cap shall be corrosive resistant and shall ensure ultimate fluidisation of the powder prior to commencement of discharge. The powder extinguishers shall be designed and constructed in accordance with BS5423.

CO₂ EXTINGUISHERS

This shall be an efficient fire extinguishing medium. It shall smother flames and reduce the oxygen content of air around the fire, thus ensuring extinction. It shall be non-conductive and effective against fires in electrical plant. The extinguisher casing shall be of aluminium alloy with a swivel horn applicator. The CO₂ extinguisher shall be designed and constructed in accordance with BS5423.

Water CO₂ EXTINGUISHERS

This shall have a long life operating efficiency. A special protective coating to prevent corrosion to the containers made of polyethylene base coating shall be applied. The extinguisher bodies shall be prefabricated from steel sheets which are preformed and welded together. The neck rims shall be machined copper plated steel components welded into position on the tops of the extinguisher bodies. Caps shall be of Lexan and hoses shall be of pvc with moulded polycarbonate nozzle.

FIRE BLANKETS

Fire blankets shall be in accordance with BS6575 and shall be made of woven glass fibre giving them a rough surface providing stability. They shall be designed to enable simple storage of the blanket, the container shall be non-corrosive, rigid self-extinguishing white plastic. Instruction on usage should be provided on the cover.

TELEPHONE MANHOLES AND DUCTS

The telephone ducting installation shall be executed in accordance with Tel Bru requirements and their guidelines document for provision of telecommunication facilities.

EXCAVATION OF TRENCHES

Trenches shall be kept as straight as possible and shall be excavated to approved formation and dimensions and shall generally be 750mm deep. Trenches shall have vertical sides and are to be timbered and sheeted where necessary to prevent subsidence. The excavation of trenches shall include by way of amplification but not of limitation, all timbering, pumping and bailing required and the provision for all necessary labour, plant, tools, additional soil, fuel and motive power for such purpose and the cost of this service and of the expendable materials shall be included. Before the ducts are laid, the bottom of the trench is to be punned down and filled with sand bedding to a thickness of 75mm. After the ducts are laid, the first 75mm depth of cover backfill shall consist of sand or sifted soil.

Backfilling and reinstatement of open trenches shall then be immediately carried out, a green coloured PVC service identification tape of 150 mm width (0.1 mm thick) shall then be placed about 300 mm above the ducts for the entire length of the duct. The wording on the tape should read "Awat-Kabel Tel Bru di bawah". Excavation of trenches shall be carried out to suit the programme of duct installation work at that location and only enough ground shall be opened such that duct laying and backfilling may proceed without delay and trenches are not left open for long periods. After all ducts have been laid, the trenches shall be refilled in 150mm layers, each layer being well rammed and consolidated.

The surface of refilled trenches shall be temporarily reinstated and maintained in a thoroughly safe condition until complete consolidation of the soil is achieved. Necessary backfill material shall be supplied for the replacement of unsuitable excavation material and the cost of this material together with the backfilling and reinstatement deemed is to be included in the works.

DUCT LAYING/ PVC DUCTS

The line of duct shall be kept as straight as possible. Where ducts are cut, the inside edges of cut ducts shall be thoroughly rounded off before installation. On completion of the duct line between any two jointing chamber or sites thereof a cylindrical brush connected to the following end of a mandrel shall be passed twice through each "way" to clean the duct and to remove any foreign matter which may have entered. The contractor shall supply labour needed for the testing operations.

All tests shall be carried out in the presence of the Engineer and if any obstruction or other defect be discovered, it shall be rectified and the duct retested. A plug shall be inserted at the ends of each "way" in a line of ducts until the length has been tested and passed. To ensure the alignment of the ducts, a working mandrel 450 mm in length and 80 mm in diameter shall be drawn through as the ducts are laid. These ducts are to be supplied in 6 metre lengths. These ducts should be stored away from the direct rays of the sun, as they tend to deteriorate and go out of shape. Solvent cement should be used for the joint. PVC ducts shall be in accordance with BS 3505 class "B".

ENCASING IN CONCRETE

The method of encasing ducts in concrete is the layer-by-layer method where each duct is completely surrounded by concrete. The following procedure shall be adopted:

- i) Open trench to require length. Minimum opening is approximately 1½ times length of conduits being used.
- ii) Place a 50 mm thick bed of concrete on the trench floor.

- iii) In unstable ground or locations where high security is required, place a wire mesh vertically on either side of nest of ducts. The concrete when poured should fully cover the reinforcement which shall be a 150 x 150 x 6 mm dia welded mesh.
- iv) Install a layer of conduits along the trench keeping them evenly spaced by using wooden combs at intervals of 2 metre.
- v) Place a layer of concrete over the conduits and compact in so as to fill the spaces between the conduits by using an approved wooden tool. Provide an approximate 50mm cover above the conduits to form a bed for the second layer.
- vi) Repeat the process for the next and subsequent layer of conduits, raising the spacing comb as each layer is completed.
- vii) UNDER NO CIRCUMSTANCES shall any batch of concrete be off-loaded from wheel barrow, bucket, dumper, chute or similar equipment, directly onto the assembled duct nest. It should first be off-loaded onto suitable boards prior to placing around the ducts. Spades or shovels used for placing must not be pushed into the placed concrete.

Rigid PVC conduits may be bent to avoid obstacles or to negotiate curves. The conduit may be cold bent around stakes for radii above 10 metre. To provide favourable cable hauling conditions the bend radii should be as large as possible.

MANHOLES AND JOINTS BOXES

The type of manholes and joint boxes used shall be as shown on the layout drawings. The manholes should be constructed in accordance with Tel Bru standard drawings. Where the duct capacity of any proposed manhole is not fully utilised the space shall be fitted with dummy ducts for future duct growth by laying initially at standard depth. The dummy ducts shall be sealed with 150 mm cement mortar inside the chamber wall.

TELEPHONE TRUNKING AND CABLING

The entire work on the telephone system shall be in confirmation with the latest JTB specification guide lines for the provision of telecommunication facilities.

DISTRIBUTION BOXES

Distribution boxes shall be supplied to Brunei Telekoms specification. The contractor shall install the distribution box at locations as shown on the drawings. Each distribution box shall be provided with the following:

- a. A traffalite label identifying the DB and area served.
- b. A reduced size laminated drawing (A4 size) of the schematic drawing and layout drawing affixed besides the distribution board.

Termination of the cables at the distribution box would be executed by sub-contractor/technicians registered/approved by Brunei Telekoms. The contractor is required to identify and terminate the cables.

CABLING

Cables shall be supplied to Brunei Telekoms specification. The contractor shall supply and install the cables as shown on the drawings and as per the specifications. Cables shall be installed in conduits or trunkings in one continuous length. Cable installation in trunking/conduits/tray or ducts shall be as specified in the section "Cabling". All conduits/ trunking/trays/ ducts and accessories shall be supplied by the contractor. The material supplied and installation shall be in confirming with JTB specification for cable distribution system.

All cables shall be identified at either end by numbered plastic ferrules. Submain cable in trunkings and on tray shall be identified at 10 metre intervals by means of a stamped copper sheet wrapped around the cable. Cables installed within ducts shall be identified as above at each manhole.

WALL/FLOOR SOCKET OUTLETS/ EARTHING

All telephone socket outlets shall be supplied to Brunei Telekom specification. The contractor shall take delivery and install the socket outlets according to Jabatan Telekom's requirement. The sub-contractor shall provide earthing of values less than 1 ohm at the MDF and to be extended to every telephone DB's of earthing less than 3 ohms. The size of the ground wire (green) shall be 4mm² and shall be pulled from MDF at PABX room, to every telephone DB's. The telephone earthing system must be separated from the Electrical earthing system.

TESTING

All cables shall be tested for insulation resistance and continuity.

MAINTENANCE AND TRAINING OF ELECTRICAL SYSTEM

MAINTENANCE DURING THE WARRANTY PERIOD

The sub-contractor shall guarantee against fault or defect, all materials and work as set out in this specification for the duration of the defect's liability period. The sub-contractor shall at his own expense pay for spare parts, and other items necessary for the operation of the system. The maintenance shall consist of all required servicing of the plant installed including attention to emergency call.

The Engineer may issue the Certificate of Practical Completion at his discretion provided that: -

- a) All required testing has been completed and approved.
- b) All adjustment to equipment which may be necessary to ensure satisfactory operation have been made.
- c) All operation instruction, wiring diagrams and layouts have been received.
- d) A maintenance schedule setting out the proposed programmed of maintenance inspections and servicing together with advice of arrangements of prompt attention to emergency call has been submitted and approved by the Engineer.

At the beginning of the Maintenance Period, the sub- contractor shall provide a log book which shall be lodged with a person nominated by the Engineer. The log book shall remain at the site and shall be used to accurately record all service calls whether emergency or routine, setting out the work performed the date, the duration of each visit, the repair or adjustment made.

TRAINING

The sub-contractor shall provide the services of a suitably qualified operator for a period of two (2) days during the Defects Liability Period as and when nominated by the Engineer. The operator shall be required to train the employer's services personnel on all aspects of the operation and maintenance of the installation.

SERVICE CONTRACT

The Owner shall have the option to enter into an annual service contract, after the sub-contractor has fulfilled the obligations of maintenance during the warranty period. The service contract shall include emergency service and regular maintenance. The cost of spare parts and materials shall be charged to the Owner in the case of "non-comprehensive" coverage, and covered by the Contractor in the case of "comprehensive coverage".

MAINTENANCE SCHEDULE

The following is intended to indicate the items, where applicable, requiring inspection and attention during weekly, monthly and yearly maintenance service. A detailed list shall be prepared by the contractor based on the equipment manufactures recommended maintenance schedule.

Switchboards, Distribution Boards and Control Panels

a. Service to be performed every two weeks

- 1.Clean the switch rooms and switchboard.
- 2.Replace blown indicating lamps
- 3.Inspect switchboard for any faults, overheating, contactor hum and replace/repair faulty parts
- 4.Verify proper operation of control circuits, change over ATS, etc.

b. Service to be performed every 6 months

- 1.Check tightness of all bolts on the busbar
- 2.Verify earth continuity and earth resistance
- 3.Verify settings of protection devices
- 4.Clean ACB contacts

Light Fittings and Accessories

- a. Clean diffusers at time of handover and at the end of the defect's liability period
- b. Replace bulbs, control gear, fuses etc on a daily basis as the need arise
- c. Replace faulty/damaged accessories
- d. Verify functioning of emergency lights and exit lights on a monthly basis and replace faulty parts.

AIR CONDITIONING & MECHANICAL VENTILATION INSTALLATION

1 SERVICING AND MAINTENANCE

1.1 General

The works covered by this Section is for the supply of all materials, tools, apparatus, equipment and appliances, labour and necessary incidentals for the servicing and maintenance of all the systems and ancillary plant, machineries and equipment supplied and installed under this Sub-contract during the Maintenance Period as well as for the future servicing and maintenance thereof after the expiry of the Maintenance Period.

All works to be performed under this Section shall be in accordance with the best commercial, technical and engineering practice, and must be strictly in accordance with this Specification.

During the Maintenance Period, the Sub-contractor shall replace and/or repair all defective plants, machineries and equipment and installations or any parts thereof entirely free of charge to the Employer whenever directed by the Architect if such repairs or replacements are necessitated by reason of defective design, materials or workmanship or parts thereof replaced during the Maintenance Period shall carry a fresh warranty for a period of twelve (12) months or the balance of the Maintenance Period whichever is the longer with effect from the date of replacement or completion of repair thereof.

For servicing and maintenance after the Maintenance Period, all labour costs involved in the carrying out of servicing, maintenance, replacement and/or repair of defective parts or items and the costs of supplying consumable materials (as listed hereinafter), incidental materials and of using tools, apparatus, equipment or appliances required for carrying out such tasks, shall be deemed to have been Included in the prices quoted for future servicing and maintenance after the Maintenance Period.

1.2 Workmanship and Materials

The works described hereunder shall be performed by workmen skilled in the servicing, maintenance and repair (or replacement) of the plant, machinery, equipment of all types supplied and installed under this Sub-contract, and shall be executed in accordance with the best commercial and technical (or engineering) practice.

All materials to be supplied in connection with the Works under this Section shall be new and unused, and shall generally be of the best quality as regards manufacture and performance.

1.3 Supervision

The Sub-contractor shall have a Supervisor in charge of the servicing, maintenance and repair (or replacement) works required to be carried out under this Specification. For works which required by the local laws and regulations to be performed by personnel who is licensed or registered with the relevant local regulating bodies, the Supervisor as proposed by the Sub-Contractor shall deem to have the appropriate licence or registration. This Supervisor shall also be fully competent in supervising the servicing, maintenance and repair (or replacement) of plant, machinery, equipment of all types, and shall be in direct employ of the Sub-Contractor and acceptable to the Employer.

1.4 Scope of Work

All plant, machineries and equipment comprising the complete systems and ancillary equipment supplied and installed under this Sub-Contract shall be serviced and maintained strictly in accordance with the requirements/recommendations stipulated by all the plant and equipment manufacturers as well as in compliance with all by-laws, rules, regulations and requirements of the Local Authorities and shall also satisfy all appropriate Singapore and British Standards including all relevant Codes of Practice. The Sub-Contract includes the preparation of comprehensive servicing and maintenance schedule to meet these requirements for the entire Works, during and after the expiry of the Maintenance Period; this schedule shall be submitted to the Architect for review after the award of the Sub-Contract. The Architect's reviewed schedule shall be included and form an integral part of the Operating and Maintenance Instructions and Parts List specified elsewhere in this Sub-Contract.

The Sub-Contractor shall be contractually bound to advise the Employer of any defects or deterioration in any part of the equipment/materials observed during the routine inspection and servicing, and shall repair such defects if required to do so by the Employer.

The Sub-contractor shall include the services of a Registered Professional Engineer and/or Licensed Electrical Worker/Licensed Plumber, as required by the Local Authorities to take complete charge of the entire works and all costs connected herewith including fees payable to the Authorities are deemed to have been included in the Sub-Contract and in the Maintenance Prices submitted.

1.5 Regular Servicing and Maintenance

1.5.1 General

The Sub-Contractor shall inspect and service all plant, machineries, equipment and installations supplied and installed by him (irrespective of whether or not there are specifically listed in this Section) at least once a month, except when otherwise directed by the Employer.

During every regular inspection, he shall:

- 1.5.1.1 Check the performance of the complete air-conditioning system, including adjusting various controls as and when technically necessary.*
- 1.5.1.2 Instructed the Employer's operators who are responsible for the operation of the system with regards to the correct method of operation and the proper maintenance procedure.*
- 1.5.1.3 Report in writing to the Employer any defects discovered, coming to light or observed in any part of the Air-Conditioning Systems. Such report shall state fully the cause(s) of such defect(s) and shall include an estimate of the cost of repairs required.*
- 1.5.1.4 Record in the log book for each element of the system kept by the Employer particulars of all maintenance or repair works carried out and initial all entries in the log book.*
- 1.5.1.5 Report in writing to the Employer all works carried out in accordance with the Servicing and Maintenance Schedules as specified.*

The minimum items of work to be performed by the Sub-Contractor at each regular monthly inspection and servicing of all the plant, machineries and equipment, are detailed in the Schedules hereinafter stated.

1.5.2 Schedule for Refrigeration Equipment

Inspection and servicing of refrigerant equipment shall include all refrigerant compressors and components in chillers, direct-expansion units, water-cooled packaged units, after-coolers, etc.

The following minimum items of work shall be performed by the Sub-Contractor at least once a month:

- 1.5.2.1 Check all seals and pipe lines for leaks, and rectify as and when necessary.*
- 1.5.2.2 Check all refrigerant and oil levels, and charge refrigerant and oil into refrigerant systems as and when necessary.*
- 1.5.2.3 Check the tension of all belt drives, and adjust as and when necessary.*
- 1.5.2.4 Check the proper functioning of all refrigerant controls and clean, adjust and lubricate as and when necessary.*
- 1.5.2.5 Check the proper functioning of all safety devices, and clean, adjust and lubricate as and when necessary.*
- 1.5.2.6 Check the suction and discharge pressures of all refrigerant compressors, and if the pressures are found abnormal, trace the faults and rectify them as and when necessary.*
- 1.5.2.7 Check all bolts and nuts for tightness, and tighten them as and when necessary.*

1.5.3 Schedule of Pumps

The inspection and servicing of pumps shall include all water pumps, chemical pumps, water treatment pumps, condensate water pumps, etc. The following minimum items of work shall be performed by the Sub-Contractor at least once a month:

- 1.5.3.1 Check all seals, glands and pipe lines for leaks, and rectify as and when necessary.*
- 1.5.3.2 Re-pack and adjust pump glands as and when necessary. All nuts on the packing gland should be tightened uniformly.*
- 1.5.3.3 Check all pump bearings and lubricate with oil or grease as and when necessary.*
- 1.5.3.4 Check the alignment and condition of all rubber couplings between pumps and drive motors, and rectify as and when necessary.*
- 1.5.3.5 Check the tension of all belt drives, and adjust as and when necessary.*

1.5.4 Schedule for Blowers, Fans, etc.

The inspection and servicing of blowers, fans, etc. shall include all fan pulleys, fan bearings, air filters, dampers and other accessories of ventilation equipment and installations, air handling units, packaged units, cooling towers, etc. The following minimum items of work shall be performed by the Sub-Contractor at least once a month:

- 1.5.4.1 Check all fan bearings, and lubricate with grease as and when necessary.*
- 1.5.4.2 Check the tension of ail belt drives, and adjust as and when necessary.*
- 1.5.4.3 Check all air filters, and clean or change filters as and when necessary.*
- 1.5.4.4 Check the operation of all dampers, automatic multi-blade face and by-pass dampers, and clean, adjust and lubricate as and when necessary.*
- 1.5.4.5 Check all bolts and nuts for tightness, and tighten as and when necessary.*

1.5.5 Schedule for Water Coils, Water Valves, etc.

The inspection and servicing of water coils and water valves, etc. shall include ail such coils and valves, pans, trays, drains and other accessories in chillers, air handling units, water-cooled packaged units, etc. The following minimum items of work shall be performed by the Sub-contractor at least once a month:

- 1.5.5.1 Check all water coils, seals and pipe lines for leaks and rectify as and when necessary.*
- 1.5.5.2 Blow out all dirt pockets, drip legs, strainers, and other points arranged for blow-off of water from the system.*
- 1.5.5.3 Purge air from all water coifs.*
- 1.5.5.4 Check the operation of automatic water regulating valves, and clean, adjust and lubricate as and when necessary.*
- 1.5.5.5 Check all pans, trays and drains.*

1.5.6 Schedule for Cooling Towers and Water Treatment Systems

The inspection and servicing of cooling towers and water treatment systems shall include all parts and components thereof. The following minimum items of work shall be performed by the Sub-Contractor at least once a month:

- 1.5.6.1** *Check all fans as in Schedule for Blowers, Fans, etc.*
- 1.5.6.2** *Clean all water screens.*
- 1.5.6.3** *Drain, clean and flush out the water basins of cooling towers.*
- 1.5.6.4** *Check and adjust float valves as and when necessary.*
- 1.5.6.5** *Check all pumps as in Schedule of Pumps.*
- 1.5.6.6** *Carry out analysis of condenser water and check all components of the water treatment systems and top-up chemicals.*

In addition, the regular servicing and maintenance of cooling towers and water treatment system shall comply with the Code of Practice for the Control of Legionella Bacteria in Air-Conditioning Cooling Towers in Singapore, published by the Ministry of the Environment.

1.5.7 Schedule for Air Compressors and Pneumatic Systems

The inspection and servicing of air compressors and pneumatic systems shall include all parts and components thereof. The following minimum items of work shall be performed by the Sub-Contractor at least once a month:

- 1.5.7.1** *Check all valves, actuators, seals, joints and pipe lines for leaks, and rectify as and when necessary.*
- 1.5.7.2** *Check oil levels and change oil in compressor systems as and when necessary.*
- 1.5.7.3** *Check the tension of all belt drives, and adjust as and when necessary.*
- 1.5.7.4** *Check the operation of all pneumatic controls and safety devices, and clean, adjust and lubricate as and when necessary.*
- 1.5.7.5** *Blow out all dirt pockets, drip legs, filters and other points arranged for blow-off of oil from the system.*
- 1.5.7.6** *Check all bolts and nuts for tightness, and tighten as and when necessary.*

1.5.8 Schedule for Water Tanks

The inspection and servicing of water tanks shall include all chilled water storage tanks, chilled water expansion tanks, cooling tower water storage tanks, condensate water tanks, etc.

At each monthly inspection and servicing, the Sub-Contractor shall inspect all water tanks and drain, clean and flush out the tanks as and when necessary.

1.5.9 Schedule for Electrical Equipment

The inspection and servicing of electrical equipment shall include all electric motors, starters, contactors, relays, control gears, control panels, alarm panels, supervisory data panels, sub-panels, etc., whether complete by themselves or as components of other systems. The following minimum items of work shall be performed by the Sub-Contractor at least once a month:

1.5.9.1 *Inspect all electric motors, and*

- Check all motor bearings, and lubricate with grease as and when necessary.
- Check carbon brushes and slip rings of all motors and clean as and when necessary. Renew carbon brushes as and when necessary.
- Check safety devices fitted to all motors, and clean, adjust and lubricate as and when necessary.

1.5.9.2 *Inspect and check the routine operation of all electrical starters, electrical control gears, and ancillary electrical apparatus, and*

- Clean, adjust and lubricate all bearings, pivots and other moving parts as and when necessary.
- Clean or renew electric contactors as and when necessary.
- Renew electric fuses as and when necessary.

1.5.9.3 *Inspect and check the routine operation of all automatic control gears and relays and*

- Clean, adjust and lubricate all bearings, pivots and other moving parts as and when necessary.
- Clean or renew electric contactors as and when necessary.
- Renew electric fuses as and when necessary.

1.5.9.4 *Inspect all control panels, alarm panels, supervisory data panels, sub-panels, etc. and*

- Check the routine operation of all contactors, MCCBs, relays, ELCBs, time switches, etc.
- Clean and adjust pivots and other moving parts or relays, contactors, time switches.
- Tighten all connections, joints, terminations, etc.
- Replace blown indicating lamps.
- Test the earth resistance value of the main earthing system.
- Clean all panels.
- Check battery voltage and terminals,
- Top up battery water as and when necessary.
- Test all indicating lamps and alarm circuits.

1.5.9.5 *Check and adjust all float switches, limit switches, time switches, sequence controllers, etc.*

1.6 **Additional Servicing and Maintenance**

In addition to the regular monthly inspection and servicing, the Sub-Contractor shall also perform the following items of work:

Every 3 months, check and analyses the oil and refrigerant of all water chilling units and replace the oil and refrigerant if necessary.

1.6.1 Every 3 months, check and balance outside air quantities for all air handling units.

1.6.2 Every 4 months, check and clean all cooling coils.

1.6.3 Every 6 months, check and clean all strainers on pipework's.

1.6.4 Every 6 months, check and clean the VAV boxes mechanism.

1.6.5 Every 12 months, check and balance water flow rates for all equipment.

Notwithstanding the period of 12 months mentioned therein, the works specified under these two Clauses shall be carried out before the expiry of the Maintenance Period or the expiry of the future servicing and maintenance contract if such works had previously been carried out more than 6 months before the expiry.

1.6.6 Every 12 months, overhaul all water chilling units including inspection and cleaning of heat exchanger tubes of condenser and chiller.

Notwithstanding the period of 12 months mentioned therein, the works specified under these two Clauses shall be carried out before the expiry of the Maintenance Period or the expiry of the future servicing and maintenance contract if such works had previously been carried out more than 6 months before the expiry.

1.7 Consumable Materials

The Sub-contractor shall supply the following consumable materials as and when required:

All oil and grease required for lubrication of compressors, fan bearings, motor bearings, pivots and other moving parts. All refrigerant required to replace refrigerant losses in the systems.

1.7.1 All carbon brushes required to replace worn brushes in electric motors.

1.7.2 All electric contact points required to replace worn electric contact points in switch gears, motor starter gears, electric control gears and electric relays.

1.7.3 All electric fuses required to replace blown fuses.

1.7.4 All cotton waste, soap detergent and other cleaning materials required for cleaning purposes.

The costs of these consumable materials shall not be charged separately by the Sub-Contractor but shall be included in the Sub-Contract as well as the price quoted for future servicing and maintenance after the Maintenance Period.

LIFT SERVICES
(SPECIFICATIONS)

SPECIFICATION FOR PASSENGER LIFT INSTALLATION

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
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SECTION 5	Electrical Work	(Refer to Elect'l Specs)
SECTION 6	Site Tests	LT&C/1 - LT&C/1

SECTION 1 - GENERAL REQUIREMENTS

1.00 GENERAL

The Tenderer shall have visited the site and to include all incidental costs in the installation of lifts in his tender.

1.01 SCOPE OF WORKS

The works shall generally include but shall not be limited to the followings:-

- Supply, delivery to site, installation, wiring, testing and commissioning, handing over the whole of the Lift Installation to the satisfaction and approval of the Lift Engineer and the Factories and shall strictly comply to all the requirements as specified further in this specification and in accordance with the details shown in the Tender Drawings.
- Installing the equipment in strict accordance with the manufacturer's recommendations and should the recommendation of the manufacturer involve modification on the existing structure or should the installation of the equipment requires any modification on the existing structure, the Tenderer shall make mention of such modification explicitly and to include the cost of such modification in his tender. No claim of such modification shall be entertained after the award of the Tender.
- Preparing all drawings required for submissions to the authorities, arranging with the authorities for inspection and testing and obtaining the necessary approval for the operation of the lift system.

All tenders shall be deemed to have included all the works mentioned above and no qualification whatsoever shall be made in the tender to exclude any of the works described above. Failure of the tenderer to comply with this section shall render the tender to be rejected.

1.02 LIFT MOTOR ROOM

The lift motor rooms are located directly above the lift shafts.

1.03 CODE OF PRACTICE AND STANDARDS

The lifts shall be constructed and installed strictly in accordance with the requirements stated in the following publication:

- a) The latest edition of the British Standard Specifications for Electric Lifts - B.S. 2655, Part 1, 2 and 3.
- b) Singapore Code of Practice (1979).
 - The Fire Feature System of the lift shall comply with the latest requirements of the local Fire Authority and other related Authorities.

- **END OF SECTION 1** -

SECTION 2 - LIFT MACHINERY

2.00 GENERAL

The lift machinery located in the Lift Motor Rooms shall be provided and installed complete with hoisting machines, motors and motor traction sets, microprocessor units, control equipment, cables and cable anchorages and associated wirings as detailed in the specification.

2.01 HOISTING MACHINES

The lift machine for the lift shall be of geared traction type for speed 60 m/min of approved design and shall include an alternating current motor, ferro-molybdenum sheave and electromechanical brake, all mounted on a cast iron or steel bedplate unless otherwise specified. The worm gear shall be provided with roller bearings to take the end thrust and roller bearings shall be furnished for the sheave shaft to ensure alignment. All the bearing shall be of the roller type and shall be dust-proof and provided with adequate means of lubrication. The brake pulleys and traction sheaves on the motor armature spindles shall be designed to minimise torsional stress in the main shaft.

The hoisting motor shall be of one speed, alternating current reversible type with high starting torque and low starting current, particularly designed for lift service.

The construction of all lift machines shall conform generally with Clause 19 B.S. 2655 : Part 1 viz :

- a) The factor of safety used in the design of the lift machine shall be not less than 10 for cast iron, cast steel or other materials.
- b) No friction gearing shall be used for connecting the main driving gear to the sheave or drum.
- c) Provision shall be made on lift machine for the lift for manual raising and lowering of the lift car in an emergency.
- d) The lift machine shall be provided with a brake that is mechanically spring applied and electrically released. The brake shall be capable of bringing the lift car to rest under maximum conditions of load and speed and maintaining it stationary when loaded to 125% of its rated capacity. No brakes shall be released in normal operation unless power is applied to the lift motor. When springs are used to apply the brake shoes, such springs shall be in impression and adequately supported. Brakes of the lift shall have at least two brake shoe with renewable linings. No earth fault, short circuit or residual magnetism shall prevent the brake from being applied or cause it to be released when the power supply to the lift machines. Vibration mountings shall be provided with each traction machine, if required.

2.02 CONTROL SYSTEMS

The control system shall be of A.C. variable voltage variable frequency type complete with rectifier, frequency inverter, velocity transducer, current feedback, pulse width modulation control unit, logic control unit and microprocessor based operation control unit.

A.C. power shall be converted to D.C. power by a converter and then inverted by control signals from an inverter to A.C. power with its current and supply frequency to the A.C. motor

controlled simultaneously by means of a Pulse Width Modulation control unit such that the lift's performance conforms closely to the ideal speed pattern. The control system with the Pulse Width Modulation unit shall optimize the frequency and voltage of power supplied for maximum efficiency of operation. A microprocessor based operation control unit shall be provided to accurately control the inverter's varying frequency from 0 to the required point, raise the power factor to almost 100%, minimize the reactive power and reduce motor heat release.

The control system shall be designed such as to include a speed regulator, acceleration control, selector and loading control which shall be entirely automatic and shall ensure smooth, jerk free starting, acceleration, running, deceleration and stopping of each car. Suitable load weighing device to ensure smooth starting shall be provided to form part of feedback loop in control system if required.

Direct current brake shall be provided. It shall be spring applied and electrically released and shall be capable of providing smooth stops under variable loads.

The lift shall be equipped with an automatic stopping device to bring the cars to rest at the terminal landings. Final limit switches shall be provided in the lift shaft to stop the car and to prevent normal operation should it travel beyond the operational zone.

In addition, an automatic self-levelling feature shall be provided that will bring the car exactly to the floor landings. This device shall correct for over-travel and rope stretch and shall keep the car level and at the correct landing position irrespectively of the load in the car. Under no circumstances shall jerking in any feature of the normal car operation be tolerated, special attention being expected to be given to this requirement.

2.03 EQUIPMENT PANELS

Power receiving panels, starter panels, control, selector cabinets and relay panels for the lift shall be provided and installed where applicable in the lift motor rooms. These panels shall be of approved design, and located in sheet steel, robust, vermin, insect and dust proofed cabinets which shall be provided with double length swing doors of metal construction complete with hinges, and locking devices. The rear of all cabinets shall be provided with similar, but perforated doors with vermin proofing to allow adequate heat dissipation and ease of access to the equipment located therein. All cabinets shall be thoroughly clean, free of rust, treated with a rust inhibitor such as phosphatic coating, and painted with red lead primer, undercoat and top coat of approved paint.

The panels shall include all necessary isolating switches, contactors, indicating lamps, meters, busbars, sealing glands anti-condensation cubicle heaters complete with indicating lamp and switch, relay and other necessary items of equipment whether specified herein or not and suitable for indoor service in an ambient temperature of up to 40 deg with 100% R.H. at maximum temperature permitted by the relevant B.S. specification.

Special attention shall be given to insulation and finish to all items and no linseed oil varnish, presspahn, fibre or hygroscopic materials shall be used in any position and components shall have a tropical finish including electro-tinning of non-ferrous parts and vacuum impregnation of operating coils.

All cables inside control panels shall be adequately colour coded using PVC sleeves of appropriate colour to denote the phase of electric supply.

All switches and contacts shall be of the heavy duty type designed especially for lift installations and should be capable of handling 150 starts per hour.

The panels shall be factory assembled and tested before delivery to site in suitable sizes for installation in the lift motor rooms.

2.04 POWER FACTOR CORRECTION

Power factor correction capacitors shall be provided as required to correct the power factor of all motors to 0.85 lagging or better when the lift is travelling upwards with rated load.

The capacitors shall be installed preferable within the starter or control panels, but consideration will be given to separately mounted capacitors provided that full dimensioned details are provided with the Tender.

2.05 GUIDE RAIL AND FASTENINGS

Accurately planned tee section shall be provided as guide rails for the car. These tees shall be erected plumb and fastened securely to the hoistway framing by heavy steel brackets. The guide rails contact of these plates and the back of the guide rails ends shall be accurately machined to form smooth joints. The ends of all guides shall be tongued and grooved to provide matched joints.

The guides shall be sufficient strength and rigidity to withstand all stresses which may be associated with loading operation.

Car guide rails shall be at least 24 kg/m sections. The selection of rail sections shall take into consideration of the sectional modulus and sufficient area to withstand compressive forces due to safety application.

The guides shall be held by clips of suitable design to their fastenings by through bolts or by clips of such at any rotary movement of the clip will not release the guide. Guide brackets shall be bolted to the beam or structure steelwork. Wood or fibre block or plugs shall be of metal. It is to note that guide brackets are not allowed to be grouted into the wall.

Sliding-type guide shoes shall be fitted. The guide shoes shall be of the self aligning, adjustable type with removable linings. The sliding guide shoes for the counterweight may be of the fixed type.

2.06 BUFFERS

Buffers of the spring type or oil type to the Authorities' requirement shall be installed under the car. Pipe struts and steadiers for buffers shall be provided if required.

They shall be designed to provide a smooth retardation of not more than 1.8m (5.9 feet) per second when subjected to the total impact of a fully load lift travelling at the governor tripping speed.

For oil buffers, means shall be provided for ascertaining that there is an adequate supply of oil in the buffers, and the construction shall ensure that any oil displaced during the operation is contained within the buffer. The buffers shall be self-resetting.

2.07 TERMINAL SLOW-DOWN

Terminal slow-down switches shall be supplied and fixed at both, top and bottom terminals. If for any reason, the normal electrical slow-down fails to operate, these switches shall be come operative and stop the lift at terminal floors.

2.08 LEVELLING DEVICE

The lift shall be provided with an automatic levelling device which will bring the car to a stop within 3 mm of the landing level regardless of load or direction of travel. Landing level will be maintained within the levelling zone irrespective of the hoistway doors being opened or closed.

2.09 SAFETY DEVICE

Safety devices shall be provided in accordance with the current Factories and Machinery Act and Regulations and Rules.

An emergency stop switch shall be located in the pit. Any and/or all other safety devices required, whether mentioned specifically or not, which shall be required by Local Codes, Regulations and/or Codes now in force or brought into force prior to the commissioning of the lift on this project shall be fitted into the lift.

2.10 CAR STALL PROTECTIVE CIRCUIT

A protective circuit shall be provided which will stop the motor and the pump and return the car, while travelling up, does not reach its designated landing with a predetermined time interval. This circuit shall permit exist from the elevator until the trouble has been corrected.

2.11 POWER FAILURE PROTECTION

Reverse phase protection relay shall be provided.

Automatic landing device.

Should power failure occur under normal operation, car shall put into operation with sequence as follows :-

- a) Car stops to the nearest floor when power failure occurs.
- b) Emergency lamp and exhaust fan is turned on in car.
- c) Sensing program in control circuit checks if car is within specified zone of landing.
- d) If car is within specified zone of landing, door opens for passengers getting off.
- e) If car is outside the zone of landing, car descends at low speed 2 - 10 m/min, stops at nearest landing and door opens for passengers getting off.

2.12 OVERLOADING

A floor switch operated by a floating floor supported by springs, shall be provided for the prevention of overloading in the lift.

When the weight of passengers exceeds the capacity of the lift, the motor and car doors ceased from operating until the excess load is removed.

- END OF SECTION 2 -

SECTION 3 - LIFT CAR

3.00 GENERAL

The Contractor shall provide and install lifts car complete with anti-rust protected roof, car enclosures, doors and all accessories. The lift car shall not include any open work panels, except ventilating panels within a height of 8 feet from the car floor. The apertures in any open work in the car roof shall be designed such as to reject a 1-inch diameter sphere.

The car enclosures for the lift capable of carrying passengers shall be of steel and capable of withstanding a thrust of 75 lbs applied normally by a flat or well-round object at any part without permanent deformation and shall be so secured to the car frame and car platform that it cannot work loose or become displace in ordinary service.

The lift car shall be located in the shaft such that when levelled at lift landing with the doors open, it is impossible for an object to become trapped between car platform and the lift landing while the car is within the landing zone.

All internal finishes of lift car must be approved by the S.O./Engineer in writing before ordering is proceeded with. If possible, actual samples of the materials to be used are to be submitted for approval. However, consideration will be given to well illustrated and detailed descriptive leaflets together with a view of similar finishes on lift installations in Negara Brunei darussalam or this part of the world.

3.01 CAR FRAME

The passenger car shall be carried in a steel sufficiently rigid to withstand the operation of the safety gear without permanent deformation to the car frame. The safety factor for these frames shall be of not less than five (5).

At least four renewable guide shoes, or guide shoes with renewable linings or sets of roller guides shall be provided, two at the top and two at the bottom of the car frame. These guides shall be held in contact with the guide rail surfaces by means of adjustable cushioning devices and in case of roller guides, these shall run or dry, unlubricated guide rails.

The support frame of lift core shall carry rubber pads upon which the car platform shall rest. Where the upper part of the car is braced to the frame, additional rubber pads shall be provided to form an effective isolating cushion between the car and the steel frame.

3.02 CAR PLATFORM

Car platform shall be of framed construction. The platform for the passenger/fireman's lift shall be designed on the basis of the contract load being evenly distribution. The platforms shall consist of a structural steel frame and a substantial timber floor, approved by Jabatan Bomba.

The underside of the timber flooring shall be fire-proofed by means of sheet steels coated with an approved fire proofing material.

Lift car kick plates (skirting) for the passenger lift shall be of stainless steel with hairline finish.

For the purpose of design, the minimum factors of safety shall be five (5) for steel and eight (8) for timber.

3.03 FLOOR FINISH

The lift cars floor shall be finished with 3/16" thick heavy-duty PVC tiles or marble/granite and the colour of the tiles shall be decided by the S.O./Engineer.

3.04 CAR WALLS

The wall of the lift car shall be etched mirror or hairline stainless steel finish as required.

3.05 SUSPENDED CEILINGS

Ceilings for the car shall be para-lite louvres and shall be injection moulded with a primary aluminium undercoat with highly specular vacuum metalized and incapsulated in a protective acrylic lacquer coating. The cell dimensions shall be 1 1/2" x 1 1/2" x 1" and shall provide 45 x 45 shielding.

The height of the ceiling shall not be less than 2.4m.

3.06 ILLUMINATION

The lift car shall be illuminated by 4 x 40 watts fluorescent lighting fittings of approved type.

3.07 VENTILATION

The lift car shall be provided with exhaust fan located at the canopy level with vents and recessed base of approved type.

3.08 EMERGENCY EXITS

Emergency exit shall be provided in the lift car under this Contract. The exits shall be in the roof of the lift car and panels for top openings shall not open inwards, be clear of any apparatus mounted above the roof of the lift car and be held by suitable fasteners that can be opened from outside the lift car and not from inside.

Panel for all emergency exits shall be provided with an electric switch which will prevent operation of the lift when the panel is open. Emergency exits located on side walls of lift cars will not be permitted.

3.09 CAR POSITION INDICATOR

One horizontal type of approved design electrically operated car position indicator shall be installed above the car entrance inside the car.

Digital indicator shall be installed.

3.10 CAPACITY PLATE

A capacity plate showing the contract load of the lift shall be fitted in the lift car in a conspicuous position. The contract load shall be shown in kilogram (kg) and in number of persons.

3.12 DOOR

The door shall be formed of at least 16-gauge stainless steel with welded joints, of flush construction and shall contained suitable materials for sound deadening. The door shall be reinforced, provided with keyways for interlocks. It shall be thoroughly cleaned, free of rust and treated with a rust inhibitor prior to painting.

Every landing door shall be provided with an electro-mechanical interlock which will prevent the lift from being started or kept in motion unless all landing doors are closed, and the interlock contacts made.

Door for the passenger/fireman's lifts shall be of two-panelled automatic centre opening type, designed to fill an opening and operated by ACVVVF. All landing doors shall be of etched mirror stainless steel finish to the approval of the S.O./Engineer.

3.12 DOOR HANGERS AND TRACKS

Both car and landing doors shall be fitted with sheave type door hangers. The sheave wheels shall be tyred with a sound reducing material and shall rotate on a grease packed precision ball bearing. The up thrust of the door shall be taken by a roller mounted on a hanger and arranged to ride on the underside of the hanger track.

The roller shall be mounted on an eccentric stud to provide for adjustment. The hanger tracks shall be of either formed cold rolled steel or cold drawn steel of heavy section with surfaces shaped to conform to the tread of the hanger sheaves and rollers. Suitable means shall be used to transmit motion from one door panel to the other.

3.13 MANUAL OPENING

Provision shall be made to open manually every power operated landing door in the event of failure of power supply, at any landing at which the car is standing. The apparatus shall be so arranged that in case of interruption of failure of electricity supply, the doors can be opened by hand from within the car.

3.14 DOOR OPERATORS

The VVVF door operator with operating mechanism, linkages and switches to give adjustable or variable speed of door operation, and shall be adjusted to ensure the smoothest, fastest opening and closing possible.

The car and landing door shall operate simultaneously and quietly while the elevator is levelling and shall close either after the expiration of a time interval, or when the 'DOOR CLOSE' button is pressed by an attendant manually operating the lift.

3.15 DOOR PROTECTIVE DEVICE

A mechanical door safety edge of anodized aluminium extending the full height of the entrance shall be provided for the car door to protect passengers entering or leaving the car. Should the door be closing while passengers are still entering or leaving the car, the safety edge on the car door panel, on touching the passenger, shall cause the door to re-open immediately to prevent crushing the passenger. The doors shall re-closed immediately thereafter.

3.16 CAR OPERATING PANELS

One car operating panels shall be installed on one side of the front panels. Each panel shall be of stainless steel with mirror front and shall contain the following indicators and controls:-

- a) An 'ALARM' button which, when pressed, shall cause a battery-operated alarm bell to sound in the lift corridor on the main floor.
- b) An 'Up' arrow direction with green light when illuminated and a 'DOWN' arrow direction indicator with red light when illuminated to shown direction at which the lift car is travelling. Alternatively, these lights could be incorporated on the car operating panel mounted on the right side front return panel of each lift.
- c) One row of round recessed conventional micro-movement call registered type floor dispatching touch buttons bearing lettering and numerals for designed stopping floors.

- d) A 'DOOR OPEN' button which, when pressed, shall cause the closing doors to re-open, or when continuously pressed, shall kept the doors open.
- e) A 'DOOR CLOSE' button which, when pressed, shall cause the doors to close to shorten the door open time.
- f) An 'OVERLOAD' indicating light shall be provided on tope of the car operating panel.
- g) A 3- position switch whereby the ventilation fan speed can be set at either 'high speed' or 'low speed' or be switched off as required.
- h) A car light switch where the lift car light can be switched on or off.
- i) A 'DOOR' switch whereby the door operation can be switched off. It is intended that this particular switch shall be used when it is desired that the door be kept open over prolong intervals for loading and unloading purposes.
- j) Slow-speed or hand operation for service and maintenance purposes whereby the lift can be made to travel at the standard reduced servicing speed of approximately 50 fpm. Item (f) to (h) being intended for use by the Lift Attendant during the 'ATTENDANT' operations with 'ATTENDANT SWITCH', to bring the lift to the desired floor level without answering the Hall Call Button, shall be located together in a recessed switch cabinet with a sliding cover which shall form part of and be intergral with the car operating panel. The cover of this recessed switch cabinet shall be of stainless steel with hairline finish similar to the face-plate of the car operation panel, and shall be provided with a lock. It is intended that once the switches have been set to fully automatic operation, only those buttons which are essential shall be exposed to the passengers, with other switches as described above for the 'ATTENDANT' or 'SLOW SPEED SERVICE' operations well removed from the public and made in accessible to them.

3.17 MAINTENANCE PANEL

A panel to include an emergency stop switch, a door controller switch and a maintenance Fully Automatic/Service speed selection switch and shall be provided on the top of the car. The emergency stop switch shall prevent the car from being operated while the switch is open. The door controller switch shall prevent the door from being operated during testing and adjustment. The fully Automatic/Service speed selection switch shall ensure that while the servicemen are standing on top of the lift car servicing or adjusting the equipment, the lift cannot be switched to full speed operation accidentally by someone in the lift car, thus endangering the servicemen on the car top.

3.18 INTERCOM UNITS

A cabinet or panel incorporating an approved type two-way intercom slave unit shall be installed above the car control panel inside car operating panel in each lift and one unit at lift lobby ground floor. These units shall be connected to an approved convenient point in the motor room where connection shall be made to the master units in the lift motor room and security room at ground floor. The faceplate shall be engraved to read 'LIFT INTERCOM BOX'.

- END OF SECTION 3 -

SECTION 5 - SAFETY EQUIPMENT AND EARTHING

5.00 General

In addition to the safety equipment previously mentioned, the Contractor shall provide and install such equipment associate with the lift installation as shall provided the safest transportation available. This equipment shall include speed governors, safety gear, fire alarm control and fireman switch. All metalwork excepting conductors, in exposed positions which may be liable to become electrically charged, shall be effectively bonded and earthed.

5.01 SPEED

A centrifugal type speed governor shall be provided for each lift with a tripping speed set in accordance with B.S. 2655 : Part 1 and the ASE Code. The electrical contacts actuated by the over- speed action of the governor shall cut off electricity supply to the traction equipment prior to the mechanical tripping of the governor.

5.02 SAFETY GEAR

The lift car shall be provided with a flexible guide clamp type safety gear, in accordance with B.S. 2655, mounted on the bottom member of the car frame. This gear shall be arranged to stop the car gradually whenever excessive descending speed is attained, and means shall be provided to cut off electricity supply to the traction equipment, and apply the brake prior to the application of the safety gear.

5.03 FIRE EMERGENCY

In the event of a fire alarm operation in the building or the Fireman's switch being operated, the lift shall travel immediately to the Ground Floor irrespective of any car or hall calls registered and shall park with the door open until the systems has been reset by the Fire Department. All necessary equipment to bring the lift down shall be provided under this Contract.

5.04 FIREMAN'S SWITCH

An approved Fireman's Switch shall be provided in addition to this protection to provide a similar condition to the above mentioned, manually, and shall be located as required by the Fire Department.

5.05 EARTHING

An earthing system comprising cables, conduit and copper tape earth connectors necessary to bond permanently and effectively to the main earthing system of the building all non-current carrying metal shall be supplied, erected and connected under this section of the Specification.

The requirements for earthing shall be as detailed in Section D of the 14th Edition of the I.E.E. Regulations. The earth connections for all sections of the installation shall be electrically continuous throughout.

Joint shall be tinned riveted and soldered. All connections to electrical apparatus shall be made by a bolted connection in a visible and accessible position.

A 1-inch by 1/8 inch annealed copper tape earth tape will be installed between the building main earth bar and the switchboards in the passenger lift motor rooms by others. All other earthing necessary shall be carried out under this Contract.

Earthing connections shall be run in approved positions and fixed in an symmetrical line using Furze No.44 gunmetal saddles of appropriate size for securing tapes at intervals not exceeding 3 feet, and the copper tapes shall be supplied in long unbroken lengths to avoid unnecessary jointing.

The earthing system including measuring, marking off, cutting, fitting and erection, supply of necessary clamps and rag bolts complete with all fixing screws and rivets for fixing and jointing of the copper tape including the necessary lugs, consumable stores and the use of jointers tools.

- END OF SECTION 5 -

SECTION 6 - SITE TESTS

COMMISSIONING TESTS

The complete installation or any part thereof shall be tested, both before and after being connected up to the requirement of the S.O./Engineer.

The Contractor shall be responsible for all electrical tests at the Site and shall be represented by a capable S.O./Engineer during the whole of the period required for the tests.

All materials and equipment supplied or erected under this Contract which fail the tests shall be replaced or rectified at once by the Contractor without cost to the purchaser and the tests shall be repeated.

All tests shall be conducted in the presence of, and to the satisfaction of the S.O./Engineer. The Contractor shall supply all necessary instruments, apparatus, connection, skilled and unskilled labour required for tests to the satisfaction of the S.O./Engineer, the cost of so doing shall be included in the Contract Price.

The Contractor shall make accurate records of all tests and shall furnish test certificates and schedule of the results in an approval form. Four copies of such schedules and of each test certificate will be required.

Any circuit or section of the installation failing to reach the required for acceptance shall be made good by the Contractor without cost to the Purchases.

The minimum of site tests to be carried out shall be as follows:-

- a) Insulation resistance test to earth for all power and control cables to permit compliance with the 14th Edition of the I.E.E. Regulations for the Electrical Equipment of Building.
- b) Earth continuity tests for each circuit of the installation to ensure that the impedance of the earth fault loop is such as to permit compliance with the requirements of Section D of the 14th Edition of the I.E.E. Regulations for the Electrical Equipment of Buildings.

A suitable instruments is the Ferranti Phase - Earth Loop Impedance Tester (Model 2) and the Contractor shall employ such an instrument of or other approved or equal type.

- c) Tests to determine that motor, brakes, control equipment and door locking devices function correctly for the lifts.
- d) Tests to determine that the lift car will raise and lower the contract load.
- e) Tests to determine that the lift car will attain the contract speed.
- f) Tests to determine that the safety gear will stop the lift car when loaded with the contract loads. Overspeed tests shall be made with ropes attached and all electrical apparatus operative except the overspeed switches on the governor for the lifts.
- g) Tests on the Fireman's Lift.

- END OF SECTION 6 -

MECHANICAL
(SCHEDULE OF TECHNICAL DATA)

ITEM TECHNICAL PARTICULARS

Ducted DX Single Split System

AHU-1/CU-1

AHU-2/CU-2

LOCATION:

CHANCERY

CHANCERY

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Unit Cap. (at 35°C Condenser Air Temp)	:	_____	_____
e	Suction Temp. (°C)	:	_____	_____
f	No. of Refrigerant Circuits	:	_____	_____
g	Type of Refrigerant	:	_____	_____
h	No. of Compressors	:	_____	_____
i	Unit Step %	:	_____	_____
j	Compressor H.P.	:	_____	_____
k	Compressor Type	:	_____	_____
l	Compressor Speed	:	_____	_____
m	Vibration Isolation Make/Type	:	_____	_____
n	Fan Blade Protective Coating	:	_____	_____
o	Type of Casing Protective Coating	:	_____	_____
p	Full Load Current	:	_____	_____
q	Overall Dimension (L x W x H)	:	_____	_____
r	Operating Weight	:	_____	_____
s	Delivery (months)	:	_____	_____
t	Minimum Space required (L x W)	:	_____	_____
u	V/ph/Hz	:	_____	_____
v	Minimum Capacity (Available with Hot Gas Bypass)	:	_____	_____

ITEM TECHNICAL PARTICULARS

Variable Refrigerant Flow System

VRF-CG1

VRF-CG2

LOCATION:

CHANCERY

CHANCERY

a	Manufacturer	: _____	_____
b	Make/Country of Origin	: _____	_____
c	Model No.	: _____	_____
d	Unit Cap. (at 35°C Condenser Air Temp)	: _____	_____
e	Suction Temp. (°C)	: _____	_____
f	No. of Refrigerant Circuits	: _____	_____
g	Type of Refrigerant	: _____	_____
h	No. of Compressors	: _____	_____
i	Unit Step %	: _____	_____
j	Compressor H.P.	: _____	_____
k	Compressor Type	: _____	_____
l	Compressor Speed	: _____	_____
m	Vibration Isolation Make/Type	: _____	_____
n	Fan Blade Protective Coating	: _____	_____
o	Type of Casing Protective Coating	: _____	_____
p	Full Load Current	: _____	_____
q	Overall Dimension (L x W x H)	: _____	_____
r	Operating Weight	: _____	_____
s	Delivery (months)	: _____	_____
t	Minimum Space required (L x W)	: _____	_____
u	V/ph/Hz	: _____	_____
v	Minimum Capacity (Available with Hot Gas Bypass)	: _____	_____

ITEM TECHNICAL PARTICULARS**Variable Refrigerant Flow System****VRF-CF1
CHANCERY****VRF-CF2
CHANCERY****LOCATION:**

a	Manufacturer	: _____	_____
b	Make/Country of Origin	: _____	_____
c	Model No.	: _____	_____
d	Unit Cap. (at 35°C Condenser Air Temp)	: _____	_____
e	Suction Temp. (°C)	: _____	_____
f	No. of Refrigerant Circuits	: _____	_____
g	Type of Refrigerant	: _____	_____
h	No. of Compressors	: _____	_____
i	Unit Step %	: _____	_____
j	Compressor H.P.	: _____	_____
k	Compressor Type	: _____	_____
l	Compressor Speed	: _____	_____
m	Vibration Isolation Make/Type	: _____	_____
n	Fan Blade Protective Coating	: _____	_____
o	Type of Casing Protective Coating	: _____	_____
p	Full Load Current	: _____	_____
q	Overall Dimension (L x W x H)	: _____	_____
r	Operating Weight	: _____	_____
s	Delivery (months)	: _____	_____
t	Minimum Space required (L x W)	: _____	_____
u	V/ph/Hz	: _____	_____
v	Minimum Capacity (Available with Hot Gas Bypass)	: _____	_____

ITEM TECHNICAL PARTICULARS

Variable Refrigerant Flow System

LOCATION:

**VRF-RG1
RESIDENCE**

**VRF-RG2
RESIDENCE**

a	Manufacturer	: _____	_____
b	Make/Country of Origin	: _____	_____
c	Model No.	: _____	_____
d	Unit Cap. (at 35°C Condenser Air Temp)	: _____	_____
e	Suction Temp. (°C)	: _____	_____
f	No. of Refrigerant Circuits	: _____	_____
g	Type of Refrigerant	: _____	_____
h	No. of Compressors	: _____	_____
i	Unit Step %	: _____	_____
j	Compressor H.P.	: _____	_____
k	Compressor Type	: _____	_____
l	Compressor Speed	: _____	_____
m	Vibration Isolation Make/Type	: _____	_____
n	Fan Blade Protective Coating	: _____	_____
o	Type of Casing Protective Coating	: _____	_____
p	Full Load Current	: _____	_____
q	Overall Dimension (L x W x H)	: _____	_____
r	Operating Weight	: _____	_____
s	Delivery (months)	: _____	_____
t	Minimum Space required (L x W)	: _____	_____
u	V/ph/Hz	: _____	_____
v	Minimum Capacity (Available with Hot Gas Bypass)	: _____	_____

ITEM TECHNICAL PARTICULARS

Variable Refrigerant Flow System

VRF-RF1

LOCATION:

RESIDENCE

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Unit Cap. (at 35°C Condenser Air Temp)	:	_____	_____
e	Suction Temp. (°C)	:	_____	_____
f	No. of Refrigerant Circuits	:	_____	_____
g	Type of Refrigerant	:	_____	_____
h	No. of Compressors	:	_____	_____
i	Unit Step %	:	_____	_____
j	Compressor H.P.	:	_____	_____
k	Compressor Type	:	_____	_____
l	Compressor Speed	:	_____	_____
m	Vibration Isolation Make/Type	:	_____	_____
n	Fan Blade Protective Coating	:	_____	_____
o	Type of Casing Protective Coating	:	_____	_____
p	Full Load Current	:	_____	_____
q	Overall Dimension (L x W x H)	:	_____	_____
r	Operating Weight	:	_____	_____
s	Delivery (months)	:	_____	_____
t	Minimum Space required (L x W)	:	_____	_____
u	V/ph/Hz	:	_____	_____
v	Minimum Capacity (Available with Hot Gas Bypass)	:	_____	_____

ITEM TECHNICAL PARTICULARS

INVERTER TYPE FAN COIL UNITS

LOCATION:

**FCU-R1 TO R4
RESIDENCE**

**FCU-R5
RESIDENCE**

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

INVERTER TYPE FAN COIL UNITS

LOCATION:

**FCU-G1 & G2
RESIDENCE**

**FCU-G3 & G4
RESIDENCE**

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

INVERTER TYPE FAN COIL UNITS

LOCATION:

**FCU-G5
RESIDENCE**

**FCU-G6
RESIDENCE**

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

ITEM TECHNICAL PARTICULARS

INVERTER TYPE FAN COIL UNITS

LOCATION:

**FCU-G7
RESIDENCE**

**FCU-F1 & F2
RESIDENCE**

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

INVERTER TYPE FAN COIL UNITS

LOCATION:

**FCU-F3
RESIDENCE**

**FCU-F4
RESIDENCE**

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

INVERTER TYPE FAN COIL UNITS

LOCATION:

**FCU-F5
RESIDENCE**

**FCU-F6
RESIDENCE**

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

ITEM TECHNICAL PARTICULARS

INVERTER TYPE FAN COIL UNITS
LOCATION:

FCU-F7
RESIDENCE

FCU-(G1.1, G1.2, & G1.11)
CHANCERY

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

INVERTER TYPE FAN COIL UNITS
LOCATION:

FCU-G1.3
CHANCERY

FCU-G1.4 & FCU-G1.5
CHANCERY

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

INVERTER TYPE FAN COIL UNITS
LOCATION:

FCU-G1.6
CHANCERY

FCU-G1.7
CHANCERY

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

ITEM TECHNICAL PARTICULARS

INVERTER TYPE FAN COIL UNITS

LOCATION:

**FCU-G1.8
CHANCERY**

**FCU-G1.9
CHANCERY**

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

INVERTER TYPE FAN COIL UNITS

LOCATION:

**FCU-G1.10
CHANCERY**

**FCU-G2.1
CHANCERY**

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

INVERTER TYPE FAN COIL UNITS

LOCATION:

**FCU-G2.2
CHANCERY**

**FCU-G2.3
CHANCERY**

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

ITEM TECHNICAL PARTICULARS

INVERTER TYPE FAN COIL UNITS
LOCATION:

FCU-G2.4
CHANCERY

FCU-G2.5 & FCU-G2.6
CHANCERY

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

INVERTER TYPE FAN COIL UNITS
LOCATION:

FCU-G2.7
CHANCERY

FCU-G2.8
CHANCERY

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

INVERTER TYPE FAN COIL UNITS
LOCATION:

FCU-F1.1
CHANCERY

FCU-F1.2 & FCU-F1.3
CHANCERY

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

ITEM TECHNICAL PARTICULARS

INVERTER TYPE FAN COIL UNITS

LOCATION:

**FCU-F1.4
CHANCERY**

**FCU-F1.5
CHANCERY**

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

INVERTER TYPE FAN COIL UNITS

LOCATION:

**FCU-F1.6
CHANCERY**

**FCU-F1.7 & FCU-1.9
CHANCERY**

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

INVERTER TYPE FAN COIL UNITS

LOCATION:

**FCU-F1.8
CHANCERY**

**FCU-F1.10 & FCU-1.11
CHANCERY**

a	Manufacturer	:	_____	_____
b	Make/Country of Origin	:	_____	_____
c	Model No.	:	_____	_____
d	Cooling Capacity	:	_____	_____
e	Sensible Capacity	:	_____	_____
f	Air Flow Rate	:	_____	_____
g	Full Load Current	:	_____	_____
h	Overall Dimension (L xW x H)	:	_____	_____

ITEM TECHNICAL PARTICULARS

INVERTER TYPE FAN COIL UNITS
LOCATION:

FCU-F1.12
CHANCERY

FCU-F2.1
CHANCERY

- | | | | | |
|---|------------------------------|---|-------|-------|
| a | Manufacturer | : | _____ | _____ |
| b | Make/Country of Origin | : | _____ | _____ |
| c | Model No. | : | _____ | _____ |
| d | Cooling Capacity | : | _____ | _____ |
| e | Sensible Capacity | : | _____ | _____ |
| f | Air Flow Rate | : | _____ | _____ |
| g | Full Load Current | : | _____ | _____ |
| h | Overall Dimension (L xW x H) | : | _____ | _____ |

INVERTER TYPE FAN COIL UNITS
LOCATION:

FCU-F2.2
CHANCERY

FCU-F2.3
CHANCERY

- | | | | | |
|---|------------------------------|---|-------|-------|
| a | Manufacturer | : | _____ | _____ |
| b | Make/Country of Origin | : | _____ | _____ |
| c | Model No. | : | _____ | _____ |
| d | Cooling Capacity | : | _____ | _____ |
| e | Sensible Capacity | : | _____ | _____ |
| f | Air Flow Rate | : | _____ | _____ |
| g | Full Load Current | : | _____ | _____ |
| h | Overall Dimension (L xW x H) | : | _____ | _____ |

INVERTER TYPE FAN COIL UNITS
LOCATION:

FCU-F2.4 & FCU-F2.5
CHANCERY

FCU-F2.4 & FCU-F2.5
CHANCERY

- | | | | | |
|---|------------------------------|---|-------|-------|
| a | Manufacturer | : | _____ | _____ |
| b | Make/Country of Origin | : | _____ | _____ |
| c | Model No. | : | _____ | _____ |
| d | Cooling Capacity | : | _____ | _____ |
| e | Sensible Capacity | : | _____ | _____ |
| f | Air Flow Rate | : | _____ | _____ |
| g | Full Load Current | : | _____ | _____ |
| h | Overall Dimension (L xW x H) | : | _____ | _____ |

ITEM TECHNICAL PARTICULARS

INVERTER TYPE FAN COIL UNITS
LOCATION:

FCU-F2.6
CHANCERY

FCU-F2.7 & FCU-F2.8
CHANCERY

a	Manufacturer	: _____	_____
b	Make/Country of Origin	: _____	_____
c	Model No.	: _____	_____
d	Cooling Capacity	: _____	_____
e	Sensible Capacity	: _____	_____
f	Air Flow Rate	: _____	_____
g	Full Load Current	: _____	_____
h	Overall Dimension (L xW x H)	: _____	_____

INVERTER TYPE FAN COIL UNITS
LOCATION:

FCU-F2.9
CHANCERY

FCU (2.6KW)
NRG/RG

a	Manufacturer	: _____	_____
b	Make/Country of Origin	: _____	_____
c	Model No.	: _____	_____
d	Cooling Capacity	: _____	_____
e	Sensible Capacity	: _____	_____
f	Air Flow Rate	: _____	_____
g	Full Load Current	: _____	_____
h	Overall Dimension (L xW x H)	: _____	_____

INVERTER TYPE FAN COIL UNITS
LOCATION:

FCU (3.9KW)
NRG/RG

FCU (5.2KW)
NRG

a	Manufacturer	: _____	_____
b	Make/Country of Origin	: _____	_____
c	Model No.	: _____	_____
d	Cooling Capacity	: _____	_____
e	Sensible Capacity	: _____	_____
f	Air Flow Rate	: _____	_____
g	Full Load Current	: _____	_____
h	Overall Dimension (L xW x H)	: _____	_____

ITEM TECHNICAL PARTICULARS

INVERTER TYPE FAN COIL UNITS

FCU (6.5KW)

FCU (7.8KW)

LOCATION:

NRG/RG

RG

- | | | | | |
|---|------------------------------|---|-------|-------|
| a | Manufacturer | : | _____ | _____ |
| b | Make/Country of Origin | : | _____ | _____ |
| c | Model No. | : | _____ | _____ |
| d | Cooling Capacity | : | _____ | _____ |
| e | Sensible Capacity | : | _____ | _____ |
| f | Air Flow Rate | : | _____ | _____ |
| g | Full Load Current | : | _____ | _____ |
| h | Overall Dimension (L xW x H) | : | _____ | _____ |

INVERTER TYPE FAN COIL UNITS

FCU (9.7KW)

LOCATION:

NRG

- | | | | | |
|---|------------------------------|---|-------|-------|
| a | Manufacturer | : | _____ | _____ |
| b | Make/Country of Origin | : | _____ | _____ |
| c | Model No. | : | _____ | _____ |
| d | Cooling Capacity | : | _____ | _____ |
| e | Sensible Capacity | : | _____ | _____ |
| f | Air Flow Rate | : | _____ | _____ |
| g | Full Load Current | : | _____ | _____ |
| h | Overall Dimension (L xW x H) | : | _____ | _____ |

Ductwork and Accessories

- | | | | |
|---|-------------------------------|---|-------|
| a | Manufacturer | : | _____ |
| b | Country Of Origin | : | _____ |
| c | Type/material/thickness | : | _____ |
| d | Type of joint/sealant | : | _____ |
| e | Material use for bolts & nuts | : | _____ |

SMOKE DETECTOR (DUCT MOUNT TYPE)

- | | | | |
|---|-------------------|---|-------|
| a | Manufacturer | : | _____ |
| b | Country of Origin | : | _____ |
| c | Model No. | : | _____ |

ITEM TECHNICAL PARTICULARS

AIR DIFFUSION

DIFFUSER

GRILLES

DAMPER (OVD)

a	Manufacture	: _____	_____	_____
b	Country of Origin	: _____	_____	_____
c	Material	: _____	_____	_____
d	Gauge/thickness	: _____	_____	_____
e	Finishes	: _____	_____	_____
f	Relevant Standards	: _____	_____	_____

LAD PLENUM BOX

a	Manufacture	: _____
b	Country of Origin	: _____
c	Material	: _____
d	Gauge/thickness	: _____
e.	Insulation (Material&Density-Kg/cu.m.)	: _____

FRESH AIR LOUVER

a	Manufacture	: _____
b	Country of Origin	: _____
c	Material	: _____
d	Gauge/thickness	: _____
e	Finishes	: _____
f	Relevant Standards	: _____

ITEM TECHNICAL PARTICULARS

Piping Material

- a **Piping Material** : _____
- a Make/Country : _____
- b B.S. Specification : _____
- c Class : _____
- d Type : _____
- e Working Pressure : _____

Air Relief Valve

- a Manufacturer : _____
- b Country of Origin : _____
- c Make and Model : _____
- d Max. Working Pressure : _____

Water Tank

- a Manufacturer : _____
- b Country of origin : _____
- c Type of material/thickness : _____
- d Material use for bolts & nuts : _____
- e Type of float valve : _____
- f Relevant standard : _____

Domestic Water Pumpset

- a Manufacturer : _____
- b Local Agent : _____
- c Type/Model : _____
- d Casing Material : _____
- e Shaft Material : _____
- f Flow Rate (cmh) /HEAD (Kpa) : _____
- g Pump characteristic : _____
- h Max. pressure at no flow (Kpa) : _____
- i Min. continuous flow (cubic metre per hour) : _____
- j F.O.C Approval : _____

ELECTRICAL
(SCHEDULE OF TECHNICAL DATA)

SCHEDULE OF TECHNICAL DATA

Description	Tender Specification	Equipment as Offered
<u>ELECTRICAL INSTALLATION</u>		
1. MAIN SWITCHBOARD		
a) Manufacturer Name :	From DES / ABCI vendor list	
b) Country of Manufacturer :		
2. SUB-SWITCHBOARDS & DISTRIBUTION BOARD		
a) Manufacturer Name :	From DES / ABCI vendor list	
b) Country of Manufacturer :		
3. AIR CIRCUIT BREAKER(ACB)		
a) Manufacturer Name :	From DES / ABCI vendor list	
b) Country of Manufacturer :		
4. MINIATURE CIRCUIT BREAKER(MCB)& MOULDED CASE CIRCUIT BREAKER(MCCB)		
a) Manufacturer Name :	From DES / ABCI vendor list	
b) Country of Manufacturer :		
5. EARTHING ACCESSORIES		
a) Manufacturer Name :	From DES / ABCI vendor list	
b) Country of Manufacturer :		
6. LOW VOLTAGE CABLES OF ALL SIZES		
a) Manufacturer Name :	LKH / SCM / Master Tec / Equivalent	
b) Country of Manufacturer :		
7. FIRE RESISTANCE CABLES		
a) Manufacturer Name :	Master Tec / Wilson / Tonn Cables / Equivalent	
b) Country of Manufacturer :		
8. NEOPRENE CABLES		
a) Manufacturer Name :	LKH / SCM / Master Tec / Equivalent	
b) Country of Manufacturer :		

SCHEDULE OF TECHNICAL DATA

Description	Tender Specification	Equipment as Offered
9. CABLE TRAY AND TRUNKING a) Manufacturer Name : b) Country of Manufacturer :	From DES / ABCI vendor list	
10. PVC CONDUITS & ACCESSORIES a) Manufacturer Name : b) Country of Manufacturer :	From DES / ABCI vendor list	
11. LIGHTNING PROTECTION SYSTEM & ACCESSORIES a) Manufacturer Name : b) Country of Manufacturer :	Furse / Heng / Unitech / Equivalent	
12. CABLE GLAND, CABLE LUGS ETC a) Manufacturer Name : b) Country of Manufacturer :	From DES / ABCI vendor list	
13. SWITCHES & SWITCH SOCKET OUTLETS a) Manufacturer Name : b) Country of Manufacturer :	Legrand / Schneider / T & J / MK / Clipsal	
14. SPN & TPN ISOLATOR a) Manufacturer Name : b) Country of Manufacturer :	Legrand / Schneider / T & J / MK / Clipsal	
15. STANDBY DIESEL GENERATOR SET a) Manufacturer Name : b) Country of Manufacturer :	From DES / ABCI vendor list	
16. 11KV/433V DISTRIBUTION TRANSFORMER a) Manufacturer Name : b) Country of Manufacturer :	From DES / ABCI vendor list	
17. 2R1T RING MAIN UNIT a) Manufacturer Name :	From DES / ABCI vendor list	

SCHEDULE OF TECHNICAL DATA

Description	Tender Specification	Equipment as Offered
b) Country of Manufacturer :		
18. 3C/185SQMM XLPE/LS/DSTA/PVC 11KV CABLE		
a) Manufacturer Name :	From DES / ABCI vendor list	
b) Country of Manufacturer :		
19. 3C/185SQMM 11KV CABLE JOINT KIT		
a) Manufacturer Name :	From DES / ABCI vendor list	
b) Country of Manufacturer :		
20. 3C/185SQMM 11KV CABLE TERMINATION KIT		
a) Manufacturer Name :	From DES / ABCI vendor list	
b) Country of Manufacturer :		

SCHEDULE OF TECHNICAL DATA

Description	Tender Specification	Equipment as Offered
<u>TELECOM, COMPUTER & MA TV SYSTEM</u>		
1. PABX SYSTEM		
a) Manufacturer Name :	Cisco / approved equivalent	
b) Country of Manufacturer :		
2. RG6 CO-AXIAL CABLE		
a) Manufacturer Name :	Beldon / Digital / Approved Equivalent	
b) Country of Manufacturer :		
3. CAT6 STP/UTP CABLE		
a) Manufacturer Name :	From Telbru vendor list	
b) Country of Manufacturer :		
4. NETWORK SWITCH, PATCH PANEL, CABLE MANAGEMENT SYSTEM, ETC		
a) Manufacturer Name :	Dell / Cisco / Telbru Approved equivalent	
b) Country of Manufacturer :		
5. FIBRE JOINT ENCLOSURES, FAT, ODF, MDF ETC		
a) Manufacturer Name :	Dell / Cisco / Telbru Approved equivalent	
b) Country of Manufacturer :		
6. FIBRE OPTIC CABLE FOR ALL SIZES		
a) Manufacturer Name :	From Telbru vendor list	
b) Country of Manufacturer :		
7. MA TV AMPLIFIERS, MULTISWITCH & TAP OFF		
a) Manufacturer Name :	Ikusi / Televes / Equivalent	
b) Country of Manufacturer :		

SCHEDULE OF TECHNICAL DATA

Description	Tender Specification	Equipment as Offered
<u>FIRE ALARM, PA SYSTEM & SECURITY SYSTEM</u>		
1. FIRE ALARM PANEL & MIMIC DIAGRAM a) Manufacturer Name : b) Country of Manufacturer :	Multron / approved equivalent	
2. SMOKE DETECTOR, HEAT DETECTOR, MANUAL BREAKGLASS, ALARM BELL a) Manufacturer Name : b) Country of Manufacturer :	Multron / approved equivalent	
3. FIRE EXTINGUISHER AND FIRE BLANKET a) Manufacturer Name : b) Country of Manufacturer :	SRI / approved equivalent	
4. PA SYSTEM a) Manufacturer Name : b) Country of Manufacturer :		
5. IP MINI DOME CAMERA a) Manufacturer Name : b) Country of Manufacturer :	Samsung / approved equivalent	
6. NETWORK SWITCH, PATCH PANEL, CABLE MANAGFMFNT SYSTEM, ETC. a) Manufacturer Name : b) Country of Manufacturer :	Dell / Cisco / Telbru Approved equivalent	

SCHEDULE OF TECHNICAL DATA - LIGHT FITTINGS

SI No.	Item No.	Tender Specification	Offered Items	
			Brand / Country of Origin	Model
1	F1	NVC NGLED5612-1 or DES / ABCI approved equivalent		
2	F2	NVC NWLED3544 or DES / ABCI approved equivalent		
3	F3	NVC NPTLED352 or DES / ABCI approved equivalent		
4	F4	NVC NFLED5012 or DES / ABCI approved equivalent		
5	F5	NVC NLED4203 or DES / ABCI approved equivalent		
6	F5B	NVC NLED4203 or DES / ABCI approved equivalent		
7	F6	Luminconnect HD-MD1201 or DES / ABCI approved equivalent		
8	F7	NVC NLED09506E-D or DES / ABCI approved equivalent		
9	F8	NVC NLLED9184M or DES / ABCI approved equivalent		
10	F9	Colours D8420-24- 52mm or DES / ABCI approved equivalent		
11	F10	NVC NDILLED9314E or DES / ABCI approved equivalent		
12	F11	NVC NLED105 or DES / ABCI approved equivalent		
13	F12	Colours D8420-24- 52mm or DES / ABCI approved equivalent		
14	F13	NVC NSLED4315 or DES / ABCI approved equivalent		
15	F14	NVC NWED5566 or DES / ABCI approved equivalent		
16	F15	NVC NPNLED4514/43W/66 or DES / ABCI approved equivalent		
17	F16	NVC NLED1807C/S or DES / ABCI approved equivalent		
18	F17	PHILIPS or DES / ABCI approved equivalent		
19	F18	NVC NDILLED9295/R15W or DES / ABCI approved equivalent		
20	F19	NVC 8113A or DES / ABCI approved equivalent		
21	F19B	NVC 8113A or DES / ABCI approved equivalent		
22	F19C	NVC 81132A or DES / ABCI approved equivalent		
23	F20A	Demilux Intevision 9060 A-1 or DES / ABCI approved equivalent		
24	F20B	Demilux Intevision 9060 A-1 or DES / ABCI approved equivalent		

SCHEDULE OF TECHNICAL DATA - LIGHT FITTINGS

SI No.	Item No.	Tender Specification	Offered Items	
			Brand / Country of Origin	Model
25	F21A	NVC 8112D matte gold shield cover or DES / ABCI approved equivalent		
26	F21B	NVC 8112D matte white shield cover or DES / ABCI approved equivalent		
27	F21C	PHILIPS or DES / ABCI approved equivalent		
28	F22	NVC NSPLED181W or DES / ABCI approved equivalent		
29	F23	NVC NLED9184MIR or DES / ABCI approved equivalent		
30	F24	Demilux Intevision MD9028R3IN1 or DES / ABCI approved equivalent		
31	F25A	Demilux Intevision 9063 1500 or DES / ABCI approved equivalent		
32	F25B	Demilux Intevision 9063 1200 or DES / ABCI approved equivalent		
33	F25C	Demilux Intevision 9063 1000 or DES / ABCI approved equivalent		
34	F25D	Demilux Intevision 9063 800 or DES / ABCI approved equivalent		
35	F26	Demilux Intevision MD9017B-300 or DES / ABCI approved equivalent		
36	F27	Demilux Intevision 9060 pendant A-1 or DES / ABCI approved equivalent		
37	F28	Demilux Intevision 9028 square with module B5 or DES / ABCI approved equivalent		
38	F29	Colours LES0FW or DES / ABCI approved equivalent		
39	F30	Colours LR70DD or DES / ABCI approved equivalent		
40	F31	Demilux Intevision MD9058-1200 or DES / ABCI approved equivalent		
41	F32	NVC NLED105 or DES / ABCI approved equivalent		
42	F33	NVC NWLED5572A or DES / ABCI approved equivalent		
43	F34	Demilux Intevision 9060 Line Down A-8 or DES / ABCI approved equivalent		
44	F35	Demilux Intevision 9072IN800 or DES / ABCI approved equivalent		
45	F36	Colours LS50G or DES / ABCI approved equivalent		
46	F37	Demilux Intevision 0549W2 20 or DES / ABCI approved equivalent		
47	F38	LUTEC CITY or DES / ABCI approved equivalent		
48	F39	Maxspid Minnie or DES / ABCI approved equivalent		

SCHEDULE OF TECHNICAL DATA - LIGHT FITTINGS

SI No.	Item No.	Tender Specification	Offered Items	
			Brand / Country of Origin	Model
49	F40	Maxspid Minnie or DES / ABCI approved equivalent		
50	F41	Maxspid Leder or DES / ABCI approved equivalent		

LIFT

(SCHEDULE OF TECHNICAL DATA)

TECHNICAL DATA

Description	Tender Specifications	Data of Equipment As Offered
I <u>GENERAL</u>		
1 Name of Manufacturer	: Tenderer to state	_____
2 Country of Origin	: Tenderer to state	_____
3 Travel or Rise	: Tenderer to state	_____
4 Floor to Floor Heights:-		
5 Overhead	: Tenderer to state	_____
6 Pit depth	: 1500 mm	_____
7 Hoistway Dimensions	: 2200 width x 1800 deep (mm)	_____
8 Structural Opening Size for Door	: Tenderer to state	_____
9 Total Height	: Tenderer to state	_____
10 Machine Room Size (WxDxH)	: Motor Roomless	_____
11 No. of Floors Served	: 2	_____
12 No. of Landing Openings/Stops	: 2	_____
13 Contract Speed	: 1.0 m/s	_____
14 Contract Load	: 1000 kg	_____
15 Passenger Capacity	: 13 persons	_____
16 Car Drive/Control System	: ACVVVF	_____
17 Operation System	: duplex	_____
18 Power Supply	: 415V(Nominal), 3ph, 50Hz	_____
19 Lighting Supply	: 240V(Nominal), 1ph, 50Hz	_____
20 Capacity of Power Supply	: 20 KVA/lift 63A Main isolator available	_____
21 Car Safety Gear	: Progressive Safety Gear	_____
22 Door type	: Center opening	_____
II <u>CAR DESIGN</u>		
1 Minimum Car Internal Height	: 2300mm	_____
2 Car Operating Panel	: brushed stainless steel panel with dot matrix indicator	_____
3 Ceiling	: Hairline Stainless Steel + Transparent Plate + Painted Steel + Down Lamp (LUXURY CABIN PACKAGE)	_____

Description	Tender Specifications	Data of Equipment As Offered
4 Lighting	: LED light	_____
5 Wall	: Mirror Finish + Titanium Hairline Stainless Steel	_____
6 Kickplates	: Hairline Stainless Steel	_____
7 Flooring	: Marble / Granite flooring	_____
8 Platform	: structural steel frame & substantial stainless steel floor	_____
9 Sills	: Extruded hard aluminium	_____
10 Entrance Columns	: brushed stainless steel	_____
11 Car Internal Dimension	: 1600 (W) x 1450 (D) x 2300 mm (H)	_____

III ENTRANCES AND SIGNAL FIXTURES

1 Entrances Design	: Narrow door jamb and landing doors of stainless steel sheet	_____
2 Landing Door & Finish	: Hairline Stainless Steel	_____
3 Minimum Door Height	: 2100mm	_____
4 Minimum Door Entrance Width	: 1000mm	_____
5 Hall Call Button (s)	: micro push buttons with brushed stainless steel finish	_____
6 Narrow Jamb	: Stainless Steel hairline	_____

IV LIFT PIT

1 Pit Ladder	: mild steel cat ladder	_____
2 Pit Safety Switch	: to provide at the lift pit to stop the lift	_____
3 Pit Lighting & Power	: to provide lighting and power	_____
4 Counterweight Screen	: to provide counterweight screen inside the hoistway	_____
5 Buffers		
a Manufacturer	: Tenderer to state	_____
b Country of Manufacture	: Tenderer to state	_____
c Type of Car Buffer	: Tenderer to state	_____
d Stroke of Car Buffer	: Tenderer to state	_____
e Max. Retardation of Car Buffer	: Tenderer to state	_____
f No. of Car Buffer	: Tenderer to state	_____
g Type of Counterweight Buffer	: Tenderer to state	_____
h Stoke of Counterweight	: Tenderer to state	_____

Description	Tender Specifications	Data of Equipment As Offered
i Max. Retardation of Counterweight Buffer	: Tenderer to state	_____
j No. of Counterweight Buffer	: Tenderer to state	_____
V <u>MACHINE ROOM EQUIPMENT</u>		
(A) Lift Controller		
1 Model	: Tenderer to state	_____
2 Manufacturer	: Tenderer to state	_____
3 Country of Manufacture	: Tenderer to state	_____
(B) Type of Control System		
: ACVVVF		
1 Make of Rectifier	: Tenderer to state	_____
2 Make of Inverter	: Tenderer to state	_____
3 Method of Controlling Frequency and Modulation	: Pulse width modulation unit	_____
(C) Traction Motor		
1 Make	: Tenderer to state	_____
2 Manufacturer	: Tenderer to state	_____
3 Country of Manufacturer	: Tenderer to state	_____
4 Type	: Gearless Machine	_____
5 Rated Voltage/Frequency	: 3 phase/415V/50Hz	_____
6 Class of Insulation	: F	_____
7 KW Rating	: Max.20 KW	_____
8 Type of Internal Overload Protection	: Tenderer to state	_____
9 Starting Current (No Load)	: Tenderer to state	_____
10 Normal Running Current	: Tenderer to state	_____
11 Max. Full Load Acceleration Current	: Tenderer to state	_____
12 Efficiency & Power Factor at:		
Full Load	: Tenderer to state	_____
Half Load	: Tenderer to state	_____
13 Power Isolator Rating Required	: Tenderer to state	_____
(D) Speed Governor Details		
1 Type	: Tenderer to state	_____

Description	Tender Specifications	Data of Equipment As Offered
2 Tripping Speed	: Tenderer to state	_____
3 Diameter of Governor Ropes	: Tenderer to state	_____
4 Stopping Distance	: Tenderer to state	_____
VI HOISTWAY EQUIPMENT		
1 Manufacturer	: Tenderer to state	_____
2 Country of Manufacturer	: Tenderer to state	_____
3 Construction	: Tenderer to state	_____
4 Safe Working Load	: Tenderer to state	_____
5 Actual Breaking Strength	: Tenderer to state	_____
6 No.of Ropes	: Tenderer to state	_____
VII STANDARD FEATURES		
1 Overload Non-start Device	: To install overload non-start device c/w visual light an audio buzzer at the car operating panel.	_____
2 Interphone	: To be located at ground floor in a concealed stainless steel operated enclosure flushed to the wall or surface mounted type in H.S.S Box	_____
3 Emergency Exit switch	: Safety limit switch to be provided for emergency exit door at the top in order to stop the lift when it is open.	_____
4 Socket Outlet and Lighting	: To provide 3 pin 13A switch socket outlet (3 sets) and lighting (3 sets) underneath car.	_____
5 Power Saver	: Automatic tun-off of car light, fan & other hall lantern indicators when there are no calls for a predetermined period of time.	_____
6 Emergency Battery Operated Power Supply ("EBOPS")	: To provide EVER-power "EBOPS" maintance free rechargeable battery or other standard accessories.	_____
VIII ADDITIONAL FEATURES		
1 Emergency Landing Device (ELD)	: System shall consist of adequate capacity Ni-Cad Rechargeable maintenance free battery.	_____
IX NOTICES		
1 Sign Boards/Notices	: To provide necessary sign board/notice. All notices shall be of screw/rivet type and case glueing is NOT allowed.	_____

TECHNICAL DATA

Description	Tender Specifications	Data of Equipment As Offered
I <u>GENERAL</u>		
1 Name of Manufacturer	: Tenderer to state	_____
2 Country of Origin	: Tenderer to state	_____
3 Travel or Rise	: Tenderer to state	_____
4 Floor to Floor Heights:-		
5 Overhead	: Tenderer to state	_____
6 Pit depth	: 1500 mm	_____
7 Hoistway Dimensions	: 2000 width x 1800 deep (mm)	_____
8 Structural Opening Size for Door	: Tenderer to state	_____
9 Total Height	: Tenderer to state	_____
10 Machine Room Size (WxDxH)	: Motor Roomless	_____
11 No. of Floors Served	: 4	_____
12 No. of Landing Openings/Stops	: 4	_____
13 Contract Speed	: 1.0 m/s	_____
14 Contract Load	: 750 kg	_____
15 Passenger Capacity	: 11 persons	_____
16 Car Drive/Control System	: ACVVVF	_____
17 Operation System	: duplex	_____
18 Power Supply	: 415V(Nominal), 3ph, 50Hz	_____
19 Lighting Supply	: 240V(Nominal), 1ph, 50Hz	_____
20 Capacity of Power Supply	: 20 KVA/lift 63A Main isolator available	_____
21 Car Safety Gear	: Progressive Safety Gear	_____
22 Door type	: Side opening	_____
II <u>CAR DESIGN</u>		
1 Minimum Car Internal Height	: 2300mm	_____
2 Car Operating Panel	: brushed stainless steel panel with dot matrix indicator	_____
3 Ceiling	: Hairline Stainless Steel + Transparent Plate + Painted Steel + Down Lamp (LUXURY CABIN PACKAGE)	_____

Description	Tender Specifications	Data of Equipment As Offered
4 Lighting	: LED light	_____
5 Wall	: Mirror Finish + Titanium Hairline Stainless Steel	_____
6 Kickplates	: Hairline Stainless Steel	_____
7 Flooring	: Marble / Granite flooring	_____
8 Platform	: structural steel frame & substantial stainless steel floor	_____
9 Sills	: Extruded hard aluminium	_____
10 Entrance Columns	: brushed stainless steel	_____
11 Car Internal Dimension	: 1400 (W) x 1450 (D) x 2300 mm (H)	_____

III ENTRANCES AND SIGNAL FIXTURES

1 Entrances Design	: Narrow door jamb and landing doors of stainless steel sheet	_____
2 Landing Door & Finish	: Hairline Stainless Steel	_____
3 Minimum Door Height	: 2100mm	_____
4 Minimum Door Entrance Width	: 800mm	_____
5 Hall Call Button (s)	: micro push buttons with brushed stainless steel finish	_____
6 Narrow Jamb	: Stainless Steel hairline	_____

IV LIFT PIT

1 Pit Ladder	: mild steel cat ladder	_____
2 Pit Safety Switch	: to provide at the lift pit to stop the lift	_____
3 Pit Lighting & Power	: to provide lighting and power	_____
4 Counterweight Screen	: to provide counterweight screen inside the hoistway	_____
5 Buffers		
a Manufacturer	: Tenderer to state	_____
b Country of Manufacture	: Tenderer to state	_____
c Type of Car Buffer	: Tenderer to state	_____
d Stroke of Car Buffer	: Tenderer to state	_____
e Max. Retardation of Car Buffer	: Tenderer to state	_____
f No. of Car Buffer	: Tenderer to state	_____
g Type of Counterweight Buffer	: Tenderer to state	_____
h Stoke of Counterweight	: Tenderer to state	_____

Description	Tender Specifications	Data of Equipment As Offered
i Max. Retardation of Counterweight Buffer	: Tenderer to state	_____
j No. of Counterweight Buffer	: Tenderer to state	_____
V MACHINE ROOM EQUIPMENT		
(A) Lift Controller		
1 Model	: Tenderer to state	_____
2 Manufacturer	: Tenderer to state	_____
3 Country of Manufacture	: Tenderer to state	_____
(B) Type of Control System : ACVVVF		
1 Make of Rectifier	: Tenderer to state	_____
2 Make of Inverter	: Tenderer to state	_____
3 Method of Controlling Frequency and Modulation	: Pulse width modulation unit	_____
(C) Traction Motor		
1 Make	: Tenderer to state	_____
2 Manufacturer	: Tenderer to state	_____
3 Country of Manufacturer	: Tenderer to state	_____
4 Type	: Gearless Machine	_____
5 Rated Voltage/Frequency	: 3 phase/415V/50Hz	_____
6 Class of Insulation	: F	_____
7 KW Rating	: Max.20 KW	_____
8 Type of Internal Overload Protection	: Tenderer to state	_____
9 Starting Current (No Load)	: Tenderer to state	_____
10 Normal Running Current	: Tenderer to state	_____
11 Max. Full Load Acceleration Current	: Tenderer to state	_____
12 Efficiency & Power Factor at: Full Load	: Tenderer to state	_____
Half Load	: Tenderer to state	_____
13 Power Isolator Rating Required	: Tenderer to state	_____
(D) Speed Governor Details		
1 Type	: Tenderer to state	_____

Description	Tender Specifications	Data of Equipment As Offered
2 Tripping Speed	: Tenderer to state	<hr/>
3 Diameter of Governor Ropes	: Tenderer to state	<hr/>
4 Stopping Distance	: Tenderer to state	<hr/>
VI HOISTWAY EQUIPMENT		
1 Manufacturer	: Tenderer to state	<hr/>
2 Country of Manufacturer	: Tenderer to state	<hr/>
3 Construction	: Tenderer to state	<hr/>
4 Safe Working Load	: Tenderer to state	<hr/>
5 Actual Breaking Strength	: Tenderer to state	<hr/>
6 No.of Ropes	: Tenderer to state	<hr/>
VII STANDARD FEATURES		
1 Overload Non-start Device	: To install overload non-start device c/w visual light an audio buzzer at the car operating panel.	<hr/>
2 Interphone	: To be located at ground floor in a concealed stainless steel operated enclosure flushed to the wall or surface mounted type in H.S.S Box	<hr/>
3 Emergency Exit switch	: Safety limit switch to be provided for emergency exit door at the top in order to stop the lift when it is open.	<hr/>
4 Socket Outlet and Lighting	: To provide 3 pin 13A switch socket outlet (3 sets) and lighting (3 sets) underneath car.	<hr/>
5 Power Saver	: Automatic tun-off of car light, fan & other hall lantern indicators when there are no calls for a predetermined period of time.	<hr/>
6 Emergency Battery Operated Power Supply ("EBOPS")	: To provide EVER-power "EBOPS" maintance free rechargeable battery or other standard accessories.	<hr/>
VIII ADDITIONAL FEATURES		
1 Emergency Landing Device (ELD)	: System shall consist of adequate capacity Ni-Cad Rechargeable maintenance free battery.	<hr/>
IX NOTICES		
1 Sign Boards/Notices	: To provide necessary sign board/notice. All notices shall be of screw/rivet type and case glueing is NOT allowed.	<hr/>

LIST OF DRAWINGS

**PROPOSED HIGH COMMISSIONER'S RESIDENCES ON LOT 64081
FOR THE HIGH COMMISSION OF INDIA IN BRUNEI DARUSSALAM**

FOR TENDER – 25.09.19

LIST OF DRAWINGS

ITEM	DWG NO.	DESCRIPTION	SIZE	REV
1	LKA/RES/001/EL-100	LEGEND ELECTRICAL LIGHTING AND POWER	A1	-
2	LKA/RES/001/EL-101	EXTERNAL LIGHTING LAYOUT - SITE DEVELOPMENT PLAN AND LIGHTING & POWER LAYOUT FOR GUARD HOUSE	A1	-
3	LKA/RES/001/EL-201	LIGHTING LAYOUT – GROUND FLOOR PLAN	A1	-
4	LKA/RES/001/EL-202	LIGHTING LAYOUT – FIRST FLOOR PLAN	A1	-
5	LKA/RES/001/EP-201	POWER LAYOUT – GROUND FLOOR PLAN	A1	-
6	LKA/RES/001/EP-202	POWER LAYOUT – FIRST FLOOR PLAN	A1	-
7	LKA/RES/001/SL-301	SINGLE LINE DIAGRAMS - 1	A1	-
8	LKA/RES/001/SL-302	SINGLE LINE DIAGRAMS - 2	A1	-
9	LKA/RES/001/TEL-101	EXTERNAL TELEPHONE LAYOUT – SITE DEVELOPMENT PLAN	A1	-
10	LKA/RES/001/TEL-201	TELEPHONE LAYOUT – GROUND FLOOR PLAN	A1	-
11	LKA/RES/001/TEL-202	TELEPHONE LAYOUT – FIRST FLOOR PLAN	A1	-
12	LKA/RES/001/TEL-301	STANDARD DETAILS TELEPHONE FOOTWAY JUNCTION BOX NO. 3 (FJB-3)	A1	-
13	LKA/RES/001/SC-201	SECURITY SYSTEM LAYOUT – GROUND FLOOR PLAN AND SCHEMATIC DIAGRAM	A1	-
14	LKA/RES/001/TV-201	MATV LAYOUT – GROUND FLOOR PLAN	A1	-
15	LKA/RES/001/TV-202	MATV LAYOUT – FIRST FLOOR PLAN AND SCHEMATIC DIAGRAM	A1	-
16	LKA/RES/001/LP-201	LIGHTNING PROTECTION LAYOUT SITE DEVELOPMENT/ ROOF PLAN & DETAILS	A1	-
17	LKA/RES/001/AC-201	A/C & VENTILATION LAYOUT – GROUND FLOOR PLAN	A1	-
18	LKA/RES/001/AC-202	A/C & VENTILATION LAYOUT – FIRST FLOOR PLAN AND GUARD HOUSE	A1	-
19	LKA/RES/001/PL-101	WATER LAYOUT – SITE DEVELOPMENT PLAN	A1	-
20	LKA/RES/001/PL-201	WATER LAYOUT – GROUND FLOOR PLAN	A1	-
21	LKA/RES/001/PL-202	WATER LAYOUT – FIRST FLOOR PLAN AND GUARD HOUSE	A1	-
22	LKA/RES/001/PL-301	WATER SCHEMATIC & STANDARD DETAILS - 1	A1	-
23	LKA/RES/001/PL-302	STANDARD DETAILS - 2	A1	-
24	LKA/RES/001/PL-303	STANDARD DETAILS - 3	A1	-
25	LKA/RES/001/SN-201	SANITARY LAYOUT – SITE DEVELOPMENT PLAN / GROUND FLOOR PLAN	A1	-
26	LKA/RES/001/SN-202	SANITARY LAYOUT – FIRST FLOOR PLAN	A1	-
27	LKA/RES/001/SN-301	SANITARY SCHEMATIC DIAGRAMS	A1	-
28	LKA/RES/001/SN-302	MISCELLANEOUS DETAILS - 1	A1	-
29	LKA/RES/001/SN-303	MISCELLANEOUS DETAILS - 2	A1	-

**PROPOSED CHANCERY, STAFF RESIDENCE AND AUXILIARY FACILITIES BUILDING
ON LOT 62514 FOR THE HIGH COMMISSION OF INDIA BRUNEI DARUSSALAM**

FOR TENDER – 25.09.19

LIST OF DRAWINGS

ITEM	DWG NO.	DESCRIPTION	SIZE	REV
1	LKA/IND/001/LV-101	LV CABLE ROUTE LAYOUT – SITE DEVELOPMENT PLAN	A1	-
2	LKA/IND/001/EL-100	LEGEND ELECTRICAL LIGHTING AND POWER	A1	-
3	LKA/IND/001/EL-101	EXTERNAL LIGHTING LAYOUT - SITE DEVELOPMENT PLAN (PART 1 OF 2)	A1	-
4	LKA/IND/001/EL-102	EXTERNAL LIGHTING LAYOUT - SITE DEVELOPMENT PLAN (PART 2 OF 2)	A1	-
5	LKA/IND/001/EL-201	LIGHTING LAYOUT – GROUND FLOOR PLAN	A1	-
6	LKA/IND/001/EL-202	LIGHTING LAYOUT – FIRST FLOOR PLAN	A1	-
7	LKA/IND/001/EL-203	RESIDENCE HOUSE BLOCK A (NRG) LIGHTING LAYOUT FLOOR PLANS	A1	-
8	LKA/IND/001/EL-204	RESIDENCE HOUSE BLOCK B (RG) LIGHTING LAYOUT FLOOR PLANS	A1	-
9	LKA/IND/001/EP-201	POWER LAYOUT – GROUND FLOOR PLAN	A1	-
10	LKA/IND/001/EP-202	POWER LAYOUT – FIRST FLOOR PLAN	A1	-
11	LKA/IND/001/EP-203	RESIDENCE HOUSE BLOCK A (NRG) POWER LAYOUT FLOOR PLANS	A1	-
12	LKA/IND/001/EP-204	RESIDENCE HOUSE BLOCK B (RG) POWER LAYOUT FLOOR PLANS	A1	-
13	LKA/IND/001/SL-201	SINGLE LINE DIAGRAMS - 1	A1	-
14	LKA/IND/001/SL-202	SINGLE LINE DIAGRAMS - 2	A1	-
15	LKA/IND/001/SL-203	SINGLE LINE DIAGRAMS - 3	A1	-
16	LKA/IND/001/SL-204	SINGLE LINE DIAGRAMS - 4	A1	-
17	LKA/IND/001/SL-205	SINGLE LINE DIAGRAMS - 5	A1	-
18	LKA/IND/001/SL-206	SINGLE LINE DIAGRAMS - 6	A1	-
19	LKA/IND/001/SL-205	SINGLE LINE DIAGRAMS - 7	A1	-
20	LKA/IND/001/SL-206	SINGLE LINE DIAGRAMS - 8	A1	-
21	LKA/IND/001/SS-201	M&E PLANT ROOM PLAN, ELEVATIONS, SECTIONS AND DETAILS	A1	-
22	LKA/IND/001/SS-202	M&E PLANT ROOM, ROOF PLAN, SIGNAGES AND NOTES	A1	-
23	LKA/IND/001/LP-201	LIGHTNING PROTECTION LAYOUT – ROOF PLAN	A1	-
24	LKA/IND/001/LP-202	RESIDENCE HOUSE BLOCK A (NRG) & B (RG) LIGHTNING PROTECTION LAYOUT ROOF PLANS AND DETAILS	A1	-
25	LKA/IND/001/TEL-101	EXTERNAL TELEPHONE LAYOUT – SITE DEVELOPMENT PLAN	A1	-
26	LKA/IND/001/TEL-201	TELEPHONE & COMPUTER LAYOUT – GROUND FLOOR PLAN	A1	-
27	LKA/IND/001/TEL-202	TELEPHONE & COMPUTER LAYOUT – FIRST FLOOR PLAN AND SCHEMATIC DIAGRAM	A1	-
28	LKA/IND/001/TEL-203	RESIDENCE HOUSE BLOCK A (NRG) TELEPHONE LAYOUT – FLOOR PLANS	A1	-
29	LKA/IND/001/TEL-204	RESIDENCE HOUSE BLOCK B (RG) TELEPHONE LAYOUT – FLOOR PLANS AND SCHEMATIC DIAGRAM	A1	-

ITEM	DWG NO.	DESCRIPTION	SIZE	REV
30	LKA/IND/001/TEL-301	STANDARD DETAIL TELEPHONE FOOTWAY JUNCTION BOX NO. 3 (FJB-3)	A1	-
31	LKA/IND/001/AV-201	AUDIO VISUAL LAYOUT – GROUND FLOOR PLAN	A1	-
32	LKA/IND/001/MATV-201	MATV LAYOUT GROUND FLOOR PLAN	A1	-
33	LKA/IND/001/MATV-202	MATV LAYOUT FIRST FLOOR PLAN AND SCHEMATIC DIAGRAM	A1	-
34	LKA/IND/001/MATV-203	RESIDENCE HOUSE BLOCK A (NRG) MATV LAYOUT – FLOOR PLANS AND SCHEMATIC DIAGRAM	A1	-
35	LKA/IND/001/MATV-204	RESIDENCE HOUSE BLOCK B (RG) MATV LAYOUT – FLOOR PLANS AND SCHEMATIC DIAGRAM	A1	-
36	LKA/IND/001/SC-201	SECURITY SYSTEM LAYOUT - GROUND & FIRST FLOOR PLANS AND SCHEMATIC DIAGRAM	A1	-
37	LKA/IND/001/LF-201	LIFT INSTALLATION AND DETAILS	A1	-
38	LKA/IND/001/FA-201	FIRE ALARM LAYOUT – GROUND FLOOR PLAN	A1	-
39	LKA/IND/001/FA-202	FIRE ALARM LAYOUT – FIRST FLOOR PLAN AND SCHEMATIC DIAGRAM	A1	-
40	LKA/IND/001/FA-203	RESIDENCE HOUSE BLOCK A (NRG) FIRE ALARM LAYOUT FLOOR PLANS	A1	-
41	LKA/IND/001/FA-204	RESIDENCE HOUSE BLOCK B (RG) FIRE ALARM LAYOUT FLOOR PLANS	A1	-
42	LKA/IND/001/AC-201	A/C & VENTILATION LAYOUT – GROUND FLOOR PLAN	A1	-
43	LKA/IND/001/AC-202	A/C & VENTILATION LAYOUT – FIRST FLOOR PLAN	A1	-
44	LKA/IND/001/AC-203	A/C & VENTILATION LAYOUT – ROOF DECK PLAN	A1	-
45	LKA/IND/001/AC-204	RESIDENCE HOUSE BLOCK A (NRG) A/C & VENTILATION LAYOUT FLOOR PLANS	A1	-
46	LKA/IND/001/AC-205	RESIDENCE HOUSE BLOCK B (RG) A/C & VENTILATION LAYOUT FLOOR PLANS	A1	-
47	LKA/IND/001/AC-301	SCHEMATIC & MISCELLANEOUS DETAILS	A1	-
48	LKA/IND/001/AC-302	SECTION FOR SUPPLY AIR DUCT	A1	-
49	LKA/IND/001/FHR-201	FIRE HOSEREEL LAYOUT – GROUND & FIRST FLOOR PLANS	A1	-
50	LKA/IND/001/FHR-301	FIRE HOSEREEL SYSTEM EQUIPMENT & PIPING – ENLARGED PLAN AND EQUIPMENT SCHEDULES	A1	-
51	LKA/IND/001/FHR-302	FIRE HOSEREEL SYSTEM SCHEMATIC DIAGRAM AND MISCELLANEOUS DETAIL	A1	-
52	LKA/IND/001/PL-101	PLUMBING LAYOUT - SITE DEVELOPMENT PLAN	A1	-
53	LKA/IND/001/PL-201	PLUMBING LAYOUT - GROUND FLOOR PLAN PART 1 OF 2	A1	-
54	LKA/IND/001/PL-202	PLUMBING LAYOUT - GROUND FLOOR PLAN PART 2 OF 2	A1	-
55	LKA/IND/001/PL-203	PLUMBING LAYOUT GROUND, FIRST, SECOND & THIRD FLOOR PLAN RESIDENCE HOUSE BLOCK A (NRG)	A1	-
56	LKA/IND/001/PL-204	PLUMBING LAYOUT GROUND, FIRST & SECOND FLOOR PLAN RESIDENCE HOUSE BLOCK B (RG)	A1	-
57	LKA/IND/001/PL-205	PLUMBING LAYOUT FIRST FLOOR PLAN OF CHANCERY BUILDING	A1	-
58	LKA/IND/001/PL-301	PLUMBING SCHEMATIC DIAGRAM PART 1 OF 3 & DETAILS	A1	-
59	LKA/IND/001/PL-302	PLUMBING LAYOUT SCHEMATIC DIAGRAM PART 2 & 3	A1	-
60	LKA/IND/001/PL-303	DOMESTIC WATER SYSTEM EQUIPMENT & PIPING - ENLARGED PLAN & EQUIPMENT SCHEDULES	A1	-
61	LKA/IND/001/PL-304	MISCELLANEOUS DETAIL	A1	-

ITEM	DWG NO.	DESCRIPTION	SIZE	REV
62	LKA/IND/001/PL-305	MISCELLANEOUS DETAIL	A1	-
63	LKA/IND/001/PL-306	MISCELLANEOUS DETAIL	A1	-
64	LKA/IND/001/SN-101	SANITARY LAYOUT – SITE DEVELOPMENT PLAN	A1	-
65	LKA/IND/001/SN-201	SANITARY LAYOUT – GROUND FLOOR PLAN	A1	-
66	LKA/IND/001/SN-202	SANITARY LAYOUT – FIRST FLOOR PLAN, CONSULAR BLDG. AND GUARD HOUSE FLOOR PLANS	A1	-
67	LKA/IND/001/SN-203	SANITARY LAYOUT GROUND, FIRST & SECOND FLOOR PLAN RESIDENCE HOUSE BLOCK A (NRG)	A1	-
68	LKA/IND/001/SN-204	SANITARY LAYOUT THIRD FLOOR PLAN RESIDENCE HOUSE BLOCK 'A' (NRG) & GROUND FLOOR PLAN RESIDENCE BLOCK 'B' (RG)	A1	-
69	LKA/IND/001/SN-205	SANITARY LAYOUT FIRST & SECOND FLOOR PLAN RESIDENCE HOUSE BLOCK 'B' (RG)	A1	-
70	LKA/IND/001/SN-301	SEWER PROFILES - 1	A1	-
71	LKA/IND/001/SN-302	SEWER PROFILES - 2	A1	-
72	LKA/IND/001/SN-303	SANITARY SCHEMATIC DIAGRAMS - 1	A1	-
73	LKA/IND/001/SN-304	SANITARY SCHEMATIC DIAGRAMS - 2	A1	-
74	LKA/IND/001/SN-305	SANITARY SCHEMATIC DIAGRAMS - 3	A1	-
75	LKA/IND/001/SN-306	MISCELLANEOUS DETAIL - 1	A1	-
76	LKA/IND/001/SN-307	MISCELLANEOUS DETAIL - 2	A1	-



*High Commissioner of India
Brunei Darussalam*

**PROPOSED CHANCERY, HIGH COMMISSIONER'S
RESIDENCE, STAFF RESIDENCES AND
AUXILIARY FACILITIES BUILDINGS
FOR THE HIGH COMMISSION OF INDIA
BRUNEI DARUSSALAM**

TENDER DOCUMENT

ARKITEK REKAJAYA
Architects & Interior Designers

OTHMAN & ASSOCIATES
Civil & Structural Engineers

LKA KONSULT SDN BHD
Mechanical & Electrical Engineers

MRBC PARTNERSHIP
Quantity Surveyors

PTE159

January 2020

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INTERNAL FLOOR FINISHES	BQ/1 - BQ/3
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INTERNAL WALLS	BQ/1 - BQ/3
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- b. ELECTRICAL
- c. LIFT

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- a. MECHANICAL
- b. ELECTRICAL

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