



SBM BANK (MAURITIUS) LTD

BIDDING DOCUMENTS

for

***Upgrading Works in Gymnasium and Swimming
Pool, at SBM Park, La Vigie***

(Procurement Reference: PROC/NIR/FM/2025-043)

Address: Ground Floor, SBM Tower,
1 Queen Elizabeth II Avenue,
Port Louis

Telephone: 202 1610 / 202 3490 / 202 1175

DECEMBER 2025

TABLE OF CONTENTS

CONTENTS	PAGES
Section I - Instructions to Bidders	12 pages
Section II – Bidding Forms	
Form of Bid	6 pages
Form of Bid Security	1 page
Section III - Bill of Quantities	
Bill No.1 - Preliminaries and General Items	Pg 1.1 – Pg 1.40
Bill No.2 – Raised Floor in Gymnasium	Pg 2.1 – Pg 2.10
Bill No.3 – External Drainage	Pg 3.1 – Pg 3.3
Bill No.4 – MEP Works	Pg 1 – Pg 6
Bill No.5 - PC and Provisional Sums	Pg 5.1
Main Summary	Pg 1
Section IV - List of Tender Drawings & Specifications	
List of Tender Drawings	1 page
Specifications	
Standard Specifications	Pg 1 – Pg 57
Engineer’s Specifications	181 pages
Section V - Conditions of Contract	
General Conditions of Contract	Pg 1
Appendix to Conditions of Contract	Pg 1 – Pg 4
Particular Conditions of Contract	Pg 1 – Pg 30
Section VI - Contract Forms	6 Pages
ANNEX 1 – TENDER DRAWINGS	5 Pages

SECTION I
INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

A. Introduction

SBM Bank (Mauritius) Ltd hereinafter referred to as “SBM” or “the Employer” SBM is a well-established bank in Mauritius, forming part of SBM Holdings Ltd, the latter being listed on the Official Market of the Stock Exchange of Mauritius Ltd (SEM). SBM Bank (Mauritius) Ltd, the second largest bank in Mauritius, is the flagship company in the Group, with 43 branches and ambitions to grow internationally.

This is an Invitation to Bid (ITB) to carry out works set out in this ITB document. The purpose of this ITB is to set out sufficient information to enable a interested bidders to submit a proposal to carry out the works so as to meet the Employer’s requirements. This exercise aims at selecting a Contractor with proven track record, experience and capability for Upgrading Works in Gymnasium and Swimming Pool, at SBM Park, La Vigie.

In this context, bids are being invited from CIA(CIDB) registered and experienced Building Contractors, as approved by the Employer, having carried out works of similar nature for ***Upgrading Works in Gymnasium and Swimming Pool, at SBM Park, La Vigie*** bearing procurement reference ***PROC/NIR/FM/2025-043***. Bidder is informed that the works will be carried out in the SBM Park complex, which will remain operational. However, the Gymnasium will be closed during the upgrading works but the Swimming Pool shall remain operational.

The Employer is SBM Bank (Mauritius) Ltd, having:

- Address: Ground Floor, SBM Tower, 1 Queen Elizabeth II Avenue, Port-Louis
- Phone number: 202 1610/202 3490/202 1175
- Email address: sailendrakumar.booluck@sbmgroup.mu / nishalsing.ramnoruth@sbm.group.mu

The Bidder is advised to carefully read these instructions and to ensure that he has complied herewith in all respects when submitting his bid. Interested bidders are to notify the Employer in writing through the above email addresses of their interest such that they are notified of any addendums to the invitation to Bid (ITB) which will be uploaded on SBM website under Supplier Portal section.

B. Bid Documents

The bid documents comprise the following:

- Instructions to Bidders
- Forms of Bid and Appendices
- Bills of Quantities
- Structural Engineer’s Drawings
- Specifications

- Conditions of Contract (FIDIC 1999 – Red Book)

The Bidder should firstly check that he is in possession of a complete set of Bid Documents, as above, and by reference to index, collection and summary pages, he should ensure that all pages are in correct sequence and that none is missing. Any discrepancy or other irregularity should be notified to the Employer immediately for rectification. No liability will be admitted nor claimed, entertained in respect of incompleteness of the Bid Document, which should have been rectified in the manner, aforesaid described.

C. **Discrepancies**

If the Bidder finds any discrepancy in or divergence between any two or more of the Bid Documents, he shall immediately notify the Employer specifying the discrepancy or divergence. Such notification must be delivered to the Employer not later than 14 days prior to the date set for the submission of bids.

No liability will be admitted nor claim entertained in respect of errors, mistakes, discrepancies, or inconsistencies in the issue of the Bid Documents which should have been rectified in the manner aforesaid described.

D. **Pre Bid Meeting**

A Pre-Bid meeting shall take place at the following date, time and place:

- ***16th December 2025 at 14:00 hrs latest, at SBM Park, La Vigie, Mauritius***, as specified in the letter of invitation.

A site visit conducted by the Employer will be organized on the same date shortly after the Pre-Bid Meeting.

E. **Completion of Documents**

The Bidders shall print one copy of the Bidding Document (Instructions to Bidders, Form of Bid and Appendices and Bills of Quantities) and shall submit the bid duly priced and signed in original hard copy. The Bid Documents shall be completed in either blue or black ink. The Bidder shall price each item, cast each page, total the collection pages, the summary of the sections and the Main Summary of the Bill of Quantities and carry the total of the Main Summary to the Form of Bid. The Form of Bid, Appendices and Bills of Quantities shall be completed, signed, and dated in the spaces provided for this purpose. Any items left unpriced shall be deemed to be covered elsewhere in the bid sum.

There shall be no erasing or overwriting and any mistake which is corrected shall be initialled by the person signing the Bid.

In case of discrepancy, between the amount as per the Main Summary of the Bills and the amount stated in the Form of Bid, the amount as per the Main Summary

after correction of the arithmetical mistakes in accordance with Clause **(L)** shall take precedence.

No alterations shall be made in the Bid Documents by the Bidder other than those as directed by Addendum issued by the Employer. All Addendum issued in this respect shall be duly incorporated in the bid document. Should the Bidder fail to incorporate the Addendum, it shall be deemed to be included at no extra cost to the Employer. If the Bidder does not accept the incorporation of the Addendum, his bid shall be rejected. The bid shall comply entirely with the terms of the Bid Documents.

F. **Authority for signing of Bid**

The Bid shall be signed by an authorised representative of the company, firm or partnership and who is directly responsible for the due execution of such contracts.

G. **Instructions requiring Addendum**

Up to and including a date not later than **7 days** before the date set for the submission of bids, the Employer may issue Addenda to Bidders giving such clarifications and explanations as he may deem appropriate and/or amending the Bid Documents including, if it should be necessary in his judgement, revision of the submission date.

Each Addendum will be uploaded on SBM website under the Supplier Portal section and interested bidders would be notified accordingly via email in line with Section A above. Such Addendum shall become part of the Bid Documents and receipt thereof must be acknowledged immediately by signing and returning the Acknowledgement Form distributed with the Addendum.

No claim will be entertained in respect of errors, mistakes, or discrepancies in the issue of the Bid Documents which should have been rectified in the manner described.

H. **Submission of Bids**

The Bidder shall submit his Bid, duly priced and signed, comprising of the following financial and technical documents and duly filled in where necessary:

- Financial document
 - (1) Form of Bid and priced Bills of Quantities shall be in original and in hard copy. In addition, one soft copy should also be provided.
- Technical document
 - (2) Original of Bid Security (as per prescribed format)

- (3) Statement of Resources and Experience as per Clause “J” of the Instructions to Bidders.

The above Financial and Technical documents shall be submitted in separate sealed envelopes clearly marked “Technical Proposal” and “Financial Proposal”. Each envelope shall contain two (2) hard copies of the respective proposal, consisting of one (1) original and one (1) copy, and shall be properly labelled as such.

The two sealed envelopes shall then be placed together in one outer envelope, which shall be sealed and clearly marked “**BID FOR UPGRADING WORKS IN GYMNASIUM AND SWIMMING POOL, AT SBM PARK** (*Procurement Reference: PROC/NIR/FM/2025-043*)” on top left-hand corner and shall be addressed as follows:

**The Head of Procurement
Ground Floor, SBM Tower,
1 Queen Elizabeth II Avenue,
Port Louis**

Bids shall be deposited at the aforesaid office at the above address on

- **30th January 2026 at 14:00 hrs latest**, as specified in the letter of invitation.

The date and place for delivery of Bids may be deferred or changed by official notification through the issue of Addendum to all recipients of the Bid Documents. In addition, the inner envelope of the Bid shall indicate the name and address of the Bidder to enable the Bid to be returned unopened in case it is declared late or is otherwise unacceptable.

Bids received by Email, Telex, Telegraphic, or Bids received after the specified date and time, shall not be considered.

I. **Bid Security**

The Bid shall be accompanied by an **Original Bid Security** from an approved Commercial Bank for an amount of **Rs 25,000** in favour of and payable to the Employer. The Security shall be in the format enclosed herein. No Bid will be considered if it is not accompanied by an **Original Bid Security** in the form prescribed and secured as required. Any bid, which is not accompanied by an Original Bid Security will be summarily rejected. The Bid Security will be returned to the unsuccessful Bidders at the expiration of **120 calendar days** from the date of receipt of Bids or at such earlier time as a Bid shall have been accepted by the Employer. In the case of Bidder whose bid is accepted, the Bid Security will be

returned as soon as the Performance Guarantee has been duly entered into and executed.

The Bid Security shall be forfeited:

- (a) If the Bidder withdraws the Bid after Bid opening during the Bid period validity or
- (b) If the Bidder does not accept the correction of the Bid price in accordance with Clause **(L)** of the Instructions to Bidders or
- (c) If the successful Bidder fails to provide Performance Guarantee within 28 days of the days of the receipt of letter of acceptance of his Bid.

J. **Statement of Resources and Experience**

The Bidder must provide in a separate Memorandum with his Bid the following information and documentation. **Non submission of the required information and documentation may result in disqualification of the Bid.**

J.1 **Company Background & Experience**

- (i) Company's Administration and Technical Structure and Organigram.
- (ii) Valid registration certificate with the CIA(CIDB) under the grade that will enable the contractor to perform the works quoted for.
- (iii) have the legal capacity to enter into a contract to execute the works;
- (iv) not be insolvent, in receivership, bankrupt, subject to legal proceedings for any of these circumstances or in the process of being wound up; and
- (v) not have had your business activities suspended;
- (vi) not have a conflict of interest in relation to this procurement requirement;
- (vii) have a Business Registration Card; and
- (viii) not be under a disqualification or debarment sanction.
- (ix) Not be under a declaration of ineligibility by the Government of Mauritius in accordance with applicable laws at the date of the deadline for bid submission or appearing on the ineligibility list of African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development, Inter-American Development Bank Group and World Bank Group.
- (x) Experience in two (2 Nos.) projects in works of a similar nature over the last 10 years, each project having a value not less than **MUR 15.00 million**. Similar nature shall mean upgrading works in an existing building of

minimum 350m², comprised of concrete works including interior finishes and minor civil/drainage works.

- (xi) Experience in two (2 Nos.) projects comprised of renovation to floorings and interior finishes or the like, over the last 10 years. (Bidder may submit experience of any proposed Specialist Subcontractor).

J.2 Resources

- (a) Bidder shall have the following minimum financial resources:
 - (i) Minimum amount of liquid assets and/or credit facilities net of other contractual commitments of the Bidder of **MUR 2.00 million**. The details of liquid assets and/or credit facilities may be submitted by the Bidder's Auditor or Bank.
 - (ii) Have made profit at least two years over the last five years, from financial year end of December 2024 to end of December 2020. The requirement of profit must be certified by the bidder's Auditor.
 - (iii) Have had at least an average turnover of **MUR 30.00 million** per annum over the last 5 years. The average turnover must be certified by the Bidder's Auditor, based on financial year end of December 2024 to December 2020.
- (b) Qualified key English Speaking Personnel (Supervisory and Technical Staff) with Names and details of CV) who will be deployed for the Project.
 - (i) One **Contract Manager**, who need to be holder of a Degree in Civil Engineer, or any construction related field having minimum of 10 years general experience in Building works and with a minimum of 5 years in Concrete works, who shall overview the overall execution of the Works. The Contract Manager must demonstrate that he has at least supervised two (2 Nos.) projects in works of similar nature.
 - (ii) One **Site Agent** on a full-time basis, who need to be a holder of at least a Diploma in Civil Engineering, or any construction related field, or a "Brevet de Technicien", having 10 years' general construction experience and has supervised the construction works of at least one (1 No.) project in works of similar nature, to be responsible for quality assurance and quality control.
 - (iii) One **M&E Coordinator**, who needs to be holder of a Diploma or Certificate in Building Services Engineering or a "Brevet de Technicien" in MEP services or equivalent and have minimum 10 years' experience in Building Services Engineering. The M&E Coordinator must demonstrate that they have worked on one (1 No.) project of a similar nature.

- (iv) One **Health & Safety Officer** on a part-time basis, who must be registered with the Ministry of Labour, Industrial Relations & Employment and have minimum 10 years' experience of working at heights.
- (c) Plant & Equipment (in good working condition indicating year purchase, capacity etc) that will be deployed for the project.
 - (i) Minimum 150 m² scaffolding for minimum height of 8.00m.
 - (ii) 10 Nos. Safety and Security Kits in compliance with the prevailing Health and Safety Regulations for workers and personnel.
 - (iii) 1 No. Pneumatic excavator (manual type).

J.3 Additional Information Required

- a) Quality Assurance System, Methodology of quality control procedures structured submission, quality check, quality audit, standard forms, material approval form.
- b) Proposed experienced subcontractors stating trades to be subcontracted.
- c) Programme of Works, with time management, activity period, float period, milestone dates and interfaced activities of various trades.

K. Modification to Bid

No bidder shall have the right to withdraw, modify or correct his bid and or the substance of his bid after it has been delivered to the Employer. The Employer may ask any Bidder for a clarification of his bid.

Nevertheless, no Bidder will be permitted to alter his bid price and or the substance of his bid after the bids have been submitted. However, clarifications which do not change the bid price and or the substance of his bid may be accepted.

L. Arithmetical Errors in Bids and Adjustment

Provided that the bid is substantially responsive, the Employer shall correct arithmetical errors on the following basis:

- (a) if there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of the Employer there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected;

(b) if there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail, and the total shall be corrected; and

(c) if there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.

M. **Fixed price Bids**

Bidders are required to submit Fixed Price Bid **exclusive of Value Added Tax (VAT)** whereby the Contract Price would not be adjusted for any increase or decrease in cost of materials, labour, transport, overheads, exchange rates, custom duties, freight, fuel and for changes due to Statutory Regulations and or Standings and the like and for any other matters affecting the cost of execution of the Contract except for the **VAT**. Bidders are informed that all rates and prices shall be **exclusive of VAT** and the Bid shall also be **exclusive of VAT**. The amount of **VAT** at the applicable rate shall be reimbursed to the appointed Contractor as per Payment Certificates, supported by original VAT invoices.

N. **Alternative Bids**

Alternative Bids are not permitted.

O. **Bid Expenses and Documents**

The Employer will not be responsible for or pay for expenses or losses which may be incurred by any Bidder in the preparation of the bid or in visiting the site in connection therewith.

All recipients of the Bid Documents, whether they submit a Bid or not, shall treat the Bid Documents as private and confidential.

Copyright of the Bid Documents prepared by the Quantity Surveyor is reserved to the Quantity Surveyor.

P. **Noncompliance with instructions**

Any bid not complying with the foregoing instructions may not be considered. The Employer is not bound to assign any reason whatsoever for the rejection of a bid or any bid.

Q. **Incomplete Bids**

Bidder must submit bids for the whole of the works based on the Instructions to Bidders, Drawings, Conditions of Contract, Bills of Quantities and Specifications. Bids submitted for separate section only or bids which are incomplete will not be considered.

R. Validity of Bid

Bids submitted by Bidders shall be valid for a period of **Ninety days (90)** from the date set for the submission of bids. Such prices shall remain effective and irrevocable during this period.

S. Criteria for the Award of the Contract

The selection of the Contractor for the works will be economically the most advantageous evaluated bid assessed on:

- (1) The bid found to be most responsive to the bid documents.
- (2) The bid who has offered the most advantageous bid on the basis of:
 - (a) The price
 - (b) The reliability of the bidder meeting time limits and specifications
 - (c) Conformity and compliance by the bidder in terms of financial standing, quality, technical competence, performance standard and efficiency and statement of resources and experience.
 - (d) Reliability of the Bidder's subcontractors
 - (e) Overall value for money

T. Acceptance and rejection of Bids

The Employer reserves the right to accept or reject any bid and annul the bidding process and reject all bids at any time prior to the award of the Contract, without thereby incurring any liability to any bidder or without having any obligation to inform the bidders of the ground of Employer's action.

Unless or until a formal agreement is prepared and executed, the bid together with the written acceptance of the Employer, shall constitute a binding Contract between the Employer and the Bidder.

Any bid which is not accompanied by a Bid Security will be summarily rejected.

U. Instructions to Bidders

The Instructions to Bidders shall form part of the Contract.

V. Other conditions

1. The Employer will not be liable to give any explanation or reason whatsoever for the rejection, splitting and/or cancelling of this tender exercise.
2. The Employer shall also not be liable to any prospective bidder for any expenses, disbursement or prejudice arising out of, as a result of the cancellation, rejection, splitting of the present Invitation to Bid.
3. The Employer reserves the right, at any time and at its discretion, to accept or reject bids, to pursue negotiations with any number of bidders, or to withdraw from negotiations at any time.
4. The Employer reserves the right to change any aspect of, or terminate, the ITB or selection procedure at any time.
5. The Employer shall not be bound to accept any Proposal or award, or to enter into any contract whatsoever as a result of the ITB.
6. The Employer reserves the right to not accept the lowest or any bid and shall not have to assign any reason for the rejection of the proposal. The Employer also reserves the right to annul the bidding process and reject all bids, even the lowest, at any time prior to award of contract without thereby incurring any liability towards any bidder and any obligation to inform any bidder of the grounds for the Employer's action.
7. The Employer may ask for such further information, guarantees and/or documents it shall deem necessary in relation to any bid at any time and any such further information, guarantee and/or document may be used at any point to evaluate a bid.
8. The Employer may, at its discretion, waive any of the conditions and requirements set out in this ITB in respect of any or all of the bidders. Bidders shall be evaluated on the overall merits of their bids and successful bidders may not have satisfied all conditions and requirements and may not offer the most attractive financial terms.
9. All bids shall constitute an offer that cannot be amended after date of submission (unless requested by the Employer).
10. Nothing contained in this ITB, nor any other communication made by or on behalf of the Employer or its representatives, shall constitute an offer capable of becoming a contract between the Employer and any prospective bidder for the supply of all or part of the works (except for the formal award of the contract made in writing by the Employer). The bidder's receipt of this ITB does not imply the existence of a contract or commitment by or with the Employer for any purpose, and the bidder should note that this ITB may not result in the award of any business and is not intended to create legally binding relations.

11. The information contained in this ITB is subject to updating and amendment in the future and is necessarily selective. It does not purport to contain all the information which the bidders may require. The Employer does not make any representation or warranty as to the accuracy or completeness or otherwise of this ITB or the reasonableness of any assumptions on which this document may be based. All information supplied by the Employer to bidders, including that contained in this ITB, is subject to the bidders' own due diligence. The Employer accepts no liability to bidders whatsoever and however arising and whether resulting from the use of this ITB, or any omissions from or deficiencies in this document. The exclusions in this section do not extend to any fraudulent misrepresentation made by or on behalf of the Employer.
12. All costs incurred by bidders in connection with participation in this ITB, including without limitation preparation of the bid, shall be borne by the bidder, and the Employer shall not in any circumstances be liable for any such costs, including if the ITB process is terminated or varied in any way by the Bank.
13. Without prejudice to any civil remedies available to the Employer and without prejudice to any criminal liability (which such conduct by bidders may attract), if the Employer considers, in its absolute discretion, that there has been collusion between any of the bidders to this ITB, the relevant bidders may be disqualified. The Employer's decision in this matter shall be final.
14. Each bidder warrants and undertakes to the Employer that all information provided, and representations made to the Employer during the selection procedure (including, without limitation, all information and representations contained in the bid) are true, accurate and not misleading. If, after submitting its bid, there is any change in the bidder's circumstances which may substantively affect such information or representations made to the Employer, then the bidder shall promptly notify the Employer in writing setting out the relevant details in full. If the Employer considers that any bidder is or is likely to be in breach of this warranty, then the Employer shall be entitled to withdraw from any further co-operation with the bidder without any requirement to give notice, without any liability to such bidder, and without prejudice to its rights and/or remedies arising under law.
15. Misrepresentation of any fact during the ITB process, inaccurate or misleading information in whatever form shared by a bidder(s) with the Employer, will lead to the disqualification of the bidder(s) without prejudice to other actions that the Employer may take.
16. Each bidder acknowledges that all intellectual property rights of the Employer remain the sole and exclusive property of the Employer. Furthermore, any materials provided by the Employer to bidders shall belong and/or accrue exclusively to the Employer.

17. Each bidder undertakes and warrants that its bid is original and does not infringe the rights of any third parties.
18. Each bidder acknowledges that on any occasion on which the Employer exercises its discretion (whether express or implied), the exercise of the discretion is sole, absolute and unfettered.
19. This ITB, any negotiations and any subsequent agreement formed as a result will be subject to the laws of Mauritius and both parties shall be required to submit to the exclusive jurisdiction of the courts of Mauritius.
20. In consideration of the Employer receiving and reviewing the bids, bidders confirm and warrant that they have read, understood and accepted the terms and conditions set out in this ITB, which takes precedence over any provisions contained in the bid or other communications.

SECTION II
BIDDING FORMS

FORM OF BID

SBM BANK (MAURITIUS) LTD
UPGRADING WORKS IN GYMNASIUM AND SWIMMING POOL,
AT SBM PARK, LA VIGIE
(Procurement Reference: PROC/NIR/FM/2025-043)

FORM OF BID

The Head of Procurement
Ground Floor, SBM Tower,
1 Queen Elizabeth II Avenue,
Port Louis

Sir,

1. Having examined the Bid Documents incorporating Instructions to Bidders, the Drawings, Conditions of Contract, Specifications and Bill of Quantities and Appendices thereto and addenda Nos. for the execution of the abovementioned works, we, the undersigned, offer to carry out, complete and maintain the whole of the said Works in conformity with the said Bid Documents incorporating Instructions to Bidders, Drawings, Specifications, Conditions of Contract and Bills of Quantities and Appendices thereto and Addenda Nos for the fixed sum of (Mauritian Rupees (MUR) **exclusive of Value Added Tax** or such other sums as may be ascertained in accordance with the said Conditions of Contract.
2. We undertake if our Bid is accepted, to commence the works within **14 days** after the Contractor receives the Letter of Acceptance or within **7 days** from handing of site, whichever is later, and to complete and deliver the whole of the works comprised in the Contract within the time stipulated in the Contract calculated from the last days of the aforesaid period in which the Works are to be commenced.
3. If our Bid is accepted, we shall obtain within **28 days** of receipt of the Letter of Acceptance the Performance Guarantee (as per prescribed format) to be jointly and severally bound with us in a sum representing **15 per cent** of the Contract Sum for the due performance of the Contract under the terms of a Performance Guarantee in the form appended thereto.

1. We agree to abide by his Bid for the period of **90 days** from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
2. As security for the due performance of the undertakings and obligations of this Bid, we submit herewith an **Original Bid Security** in the amount of **Rupees Twenty-Five Thousand (MUR 25,000)** drawn in your favour and valid for **One Hundred and Twenty (120) days** from the date set for the receiving of Bids.
3. Unless and until a formal agreement is prepared and executed, this bid together with your written acceptance thereof shall constitute a binding contract between us and shall be deemed for all purpose to the Contract Agreement.
4. We understand that you are not bound to accept the lowest or any bid you may receive, you shall not assign any reason whatsoever for the rejection of any bid and that you will not defray any expense incurred by us in bidding.

Dated this Day of 2026

Signature:

Name:

In the capacity of:

Duly authorised to sign bids for and on behalf of:

.....

ITEM	CLAUSE	DATA
Employer's name and address	1.1.2.2 & 1.3	SBM Bank (Mauritius) Ltd 1, Queen Elizabeth II Avenue, Port Louis
Contractor's name and address	1.1.2.3 & 1.3	Name Address (To be decided)
Engineer's name and address	1.1.2.4 & 1.3	<u>Servansingh Jadav and Partners Consulting Engineers Ltd of</u> 7,Remy Ollier Street, Beau Bassin as ' Project Coordinator and Civil and Structural Engineers '
Employer's Personnel – (Sub-Consultants appointed by the Engineer)	1.1.2.6	Sub-Consultants appointed by the Engineer: <u>1. Chuttur & Partners Ltd of</u> Level 4, Editions Le Printemps Bldg., Club Road, Vacoas as ' Quantity Surveyors ' <u>2. Profive Ltd of</u> Level 5, Hyvec Business Park, Lot 15A3, Wall St, Cybercity, Ebene as ' MEP Engineers '
Employer's Personnel – (Consultants appointed by the Employer)	1.1.2.6	N/A
Time for Completion of the works	1.1.3.3	154 Calendar Days
Defects Notification Period	1.1.3.7	365 days
Electronic transmission systems	1.3	Electronic mails and facsimiles
Governing Law	1.4	Republic of Mauritius
Ruling Language	1.4	English
Language for communications	1.4	English
Time for the Parties entering into a Contract Agreement	1.6	Twenty-Eight (28) days from date of receipt of Contract Agreement
Time for access to the site	2.1	Within Fourteen (14) days from date of Letter of Acceptance.
Engineer's Duties and Authority	3.1	All variations with cost implication greater than MUR 25,000 shall require approval of the Employer.

ITEM	CLAUSE	DATA
Amount of Performance Security	4.2	The performance security will be in the form of a performance bond in the amount of Fifteen per cent (15%) of the Accepted Contract Amount including VAT in Mauritian Rupees.
Normal working hours	6.5	In compliance with the Workers' Rights Act 2019 and with any latest Regulations and subject to Client's Approval.
Commencement of works	8.1	Within 14 days after the Contractor receives the Letter of Acceptance or within 7 days from handing over of site whichever is later
Programme	8.3	Within 7 days after the commencement of works.
Delay damages for the works	8.7 & 14.15 (b)	MUR 25,000 per calendar day
Maximum amount of delay damages	8.7	Limited to 10% of accepted Contract Amount
Clause 8.9 Consequences of suspension – Sub clause (b) Payment of any such cost, which shall be included in the contract price	8.9	Delete Sub-Clause 8.9 (b) in its entirety
Completion of Outstanding work and Remedying Defects (Time to Complete Outstanding work)	11.1 (a)	35 days
Completion of Outstanding work and Remedying Defects (Penalty for failure Time to Complete any Outstanding work/Defects)	11.1 (a)	MUR 5,000 per day
Completion of Outstanding work and Remedying Defects (Time to remedy defects or damage)	11.1 (b)	35 days
Completion of Outstanding work and Remedying Defects (Penalty for failure to remedy any Defects or damage)	11.1 (b)	MUR 5,000 per day
Adjustment for changes in cost	13.8	No escalation on Contract Amount shall be permitted.
Advance payment	14.2	Fifteen per cent (15%) of the Accepted Contract Amount, excluding Provisional and Contingency Sum, in Mauritian Rupees against Bank Guarantee.

ITEM	CLAUSE	DATA
Start repayment of advance payment, Repayment amortization of advance payment	14.2 (a) 14.2 (b)	(i) The Advance shall be released only after obtaining an unconditional bank Guarantee from an approved local commercial bank for the amount of advance to be released and valid for the contract period. (ii) It shall be ensured that at any point of time, Bank Guarantee is available for the amount of outstanding advance. (iii) The recovery shall commence after value of works, including value of materials on/off site and variations, has reached Ten per cent (10%) of the accepted Contract Amount, excluding, Provisional and Contingency Sums but including Variations. The recovery of the advance payment shall be based on the percentage of work completed to total value of works. The entire amount together shall be recovered by the time Eighty per cent (80%) of the work is completed.
Percentage of retention	14.3	Ten per cent (10%) of the Accepted Contract Amount including value of Materials on/off site and Variations.
Limit of Retention Money	14.3	Ten per cent (10%) of the Accepted Contract Amount and Variations.
Plant and Materials for payment when shipped en route for site	14.5 (b)	Not applicable
Plant and Materials for payment	14.5 (c)	Eighty per cent (80%) of Cost of Resilient flooring (multi-use sport flooring) as approved by the Engineer, upon submission of Cession of Rights, identification labels, insurance cover for storage areas and subject to Conditions stated. Retention will be held on value of Resilient Flooring certified.
Minimum amount of Interim Payment Certificates	14.6	Ten per cent (10%) of the Accepted Contract Amount
Delayed Payment	14.8	Simple interest as specified by Central Bank plus 3%
Currency/Currencies of payment	14.15	MUR (Mauritian Rupees)
Periods for submission of insurance: Evidence of insurance and Relevant policies	18.1	Fourteen (14) days from date of issue of letter of acceptance.
Insurance of works and Contractor equipment	18.2	Contract Price + 15% for Consultant fees, including VAT.
Minimum amount of deductible for insurance of the employer's risks	18.2 (d)	All liability under this contract is in the scope of Contractor

ITEM	CLAUSE	DATA
Insurance against value of existing premises Insurance against Injury to Persons and Damage to Property	18.3	(i) Minimum amount of Value of Existing Building for Insurance Purpose - MUR 50.00 Million (ii) Minimum amount of third party insurance - MUR 20.00 Million amount of each occurrence. Number of occurrences – unlimited.
Insurance for Contractor Personnel and Employer's Representative and Consultants	18.4	Loss and damage of Construction plant & Equipment - MUR 200,000.00
		Contractor's workforce - MUR 5.00 Million
		Contractor's site personnel - MUR 5.00 Million
		Employer's Representatives and dedicated personnel - MUR 5.00 Million
		Consultants – Engineer and other Subconsultants - MUR 5.00 Million
Appointment of the Dispute Adjudication Board	20.2	Delete the Sub clause 20.2 in its entirety
Failure to agree Dispute Adjudication Board	20.3	Delete the Sub clause 20.3 in its entirety
Arbitration	20.6	Arbitration Law – Law of Republic of Mauritius.

Signature of Contractor:

Date:

FORM OF BID SECURITY

FORM OF BID SECURITY (BANK GUARANTEE)

.....*Bank's Name and Address of issuing Branch or Office*.....

Beneficiary:*Name and Address of Beneficiary*

Date:

BID GUARANTEE No.:

We have been informed that*name of the Bidder*..... (hereinafter called "the Bidder") has submitted to you its bid dated..... (hereinafter called "the Bid") for the **Upgrading Works in Gymnasium and Swimming Pool, at SBM Park, La Vigie (Procurement Reference: PROC/NIR/FM/2025-043).**

Furthermore, we understand that, according to your conditions, bids must be supported by a bid security.

On the request of the Beneficiary, we*name of Bank* hereby irrevocably undertake to pay you within five (5) days any sum or sums not exceeding in total an amount of*amount in figures*..... .(*.....amount in words.....*) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s) under the bid conditions, because the Bidder:

- (a) has modified or withdrawn its Bid after the deadline for submission of its bid during the period of bid validity specified by the Bidder in the Form of Bid; or
- (b) has refused to accept a correction of an error appearing on the face of the Bid; or
- (c) having been notified of the acceptance of its Bid by Beneficiary during the period of bid validity, (i) has failed or refused to sign the contract Form, if required, or (ii) has failed or refused to furnish the performance security, in accordance with the Instructions to Bidders.

This guarantee shall expire: (a) if the Bidder is the successful bidder, upon our receipt of copies of the contract signed by the Bidder and the performance security issued to you upon the instruction of the Bidder; or (b) if the Bidder is not the successful bidder, upon the earlier of (i) our receipt of a copy of your notification to the Bidder of the name of the successful bidder; or (ii) thirty days after the expiration of the Bidder's Bid.

Consequently, any demand for payment under this guarantee must be received by us at the office on or before*Bidder to insert date*.....

.....*Bank's seal and authorized signature(s)*.....

SECTION III
BILL OF QUANTITIES

BILL NO.1
PRELIMINARIES & GENERAL ITEMS

ITEM	DESCRIPTION	AMOUNT (MUR)
	<p><u>BILL NO 1 -PRELIMINARIES AND GENERAL REQUIREMENTS</u></p> <p><u>Generally</u></p> <p>The Contractor shall be deemed to have allowed for the provision of all preliminaries listed out in this Bill for the proper completion of the Works to the complete satisfaction of the Engineer.</p> <p>In the event of the lump sum only being inserted in respect of the Preliminaries, the Contractor may be required to provide an itemised breakdown of the amount so included.</p> <p>Payment for Preliminaries and General Items shall be generally based on the progress of works/value of work executed. The total amount of the Preliminaries and General Items shall be deemed to allow for the completion of the whole of the works. Should there be any items priced as frontloaded, the Engineer shall review the same to reflect the scope of the works.</p> <p>Items are listed below for convenience of pricing. However, the Contractor is responsible for ensuring all costs are included in conformity with the Conditions of Contract, whether or not an item is given.</p>	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)								
	<p><u>Definitions</u></p> <p>In these documents and in the contract documents as defined, the following words and expression shall have the meanings hereby assigned to them except where the context otherwise required:</p> <table><tr><th>Words</th><th>Definition</th></tr><tr><td>Contractor</td><td>The person or firm or company whose tender has been accepted by the Employer and the legal successors in title to such person or firm or company but not (except with the consent of the Employer) any assignee of such person or firm or company.</td></tr><tr><td>Works</td><td>The Works as described and as shown in the Contract Documents and any such further drawings, or instructions as may from time to time be given to the Contractor by the Engineer / Project Coordinator and any variations authorised under the Contract; and shall include all or any portion of the work, materials and articles, wherever the same are being manufactured or prepared, which are to be incorporated in the Works and whether the same may be on site or off site.</td></tr><tr><td>Site</td><td>Shall mean the places provided by the Employer where the Works are to be executed and any other places as may be specifically designated in the Contract as forming part of the Site.</td></tr></table>	Words	Definition	Contractor	The person or firm or company whose tender has been accepted by the Employer and the legal successors in title to such person or firm or company but not (except with the consent of the Employer) any assignee of such person or firm or company.	Works	The Works as described and as shown in the Contract Documents and any such further drawings, or instructions as may from time to time be given to the Contractor by the Engineer / Project Coordinator and any variations authorised under the Contract; and shall include all or any portion of the work, materials and articles, wherever the same are being manufactured or prepared, which are to be incorporated in the Works and whether the same may be on site or off site.	Site	Shall mean the places provided by the Employer where the Works are to be executed and any other places as may be specifically designated in the Contract as forming part of the Site.	
Words	Definition									
Contractor	The person or firm or company whose tender has been accepted by the Employer and the legal successors in title to such person or firm or company but not (except with the consent of the Employer) any assignee of such person or firm or company.									
Works	The Works as described and as shown in the Contract Documents and any such further drawings, or instructions as may from time to time be given to the Contractor by the Engineer / Project Coordinator and any variations authorised under the Contract; and shall include all or any portion of the work, materials and articles, wherever the same are being manufactured or prepared, which are to be incorporated in the Works and whether the same may be on site or off site.									
Site	Shall mean the places provided by the Employer where the Works are to be executed and any other places as may be specifically designated in the Contract as forming part of the Site.									
	Carried to Collection									

ITEM	DESCRIPTION	AMOUNT (MUR)
	<u>PRELIMINARY PARTICULARS</u>	
	Abbreviations	
A	In these documents the following abbreviations and terms shall have the meanings assigned to them respectively below:	
	BS British Standard	
	EN European Standard	
	MS Mauritius Standard	
	CP British' Standard Code of Practice	
	Cu m or m ³ Cubic metre	
	Sq. m or m ² Square metre	
	Lin m or m Linear metre	
	mm Millimetre	
	Nr Number	
	N Newton	
	kN Kilo newton	
	Kg Kilogram	
	(m/s) Measured separately elsewhere in these BOQs	
	n.e. Not exceeding	
	150-300mm or the similar expression, it is implied that the dimensions are equal to or exceeding the first figure stated and equal to or not exceeding the second figure stated.	
	"As described" or "as specified" Shall mean as described/specified in the Specifications and/or in these BOQs and/or in the Drawings.	
	Approved similar or approved equivalent Shall mean a substituted product that meets the required quality and performance standards of a named product and has been approved for substitution in writing by the Engineer.	
	"Quantity (ies) Provisional" Shall mean quantities under that respective section are not final and might be subject to remeasurement	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
Clause No	GENERAL CONDITIONS	
1	GENERAL PROVISIONS	
1	Definitions	
1.2	Interpretation	
1.3	Communications	
1.4	Law and Language	
1.5	Priority of Documents	
1.6	Contract Agreement	
1.7	Assignment	
1.8	Care and Supply of Documents	
1.9	Delayed Drawings or Instructions	
1.10	Employer's Use of Contractor Documents	
1.11	Contractor's Use of Employer's Documents	
1.12	Confidential Details	
1.13	Compliance with Laws	
1.14	Joint and Several Liability	
2	THE EMPLOYER	
2.1	Right of Access to the Site	
2.2	Permits, Licenses or Approvals	
2.3	Employer's Personnel	
2.4	Employer's Financial Arrangements	
2.5	Employer's Claims	
3	THE ENGINEER	
3.1	Engineer's Duties and Authority	
3.2	Delegation by the Engineer	
3.3	Instructions of the Engineer	
3.4	Replacement of the Engineer	
3.5	Determinations	
4	THE CONTRACTOR	
4.1	Contractor's General Obligations	
4.2	Performance Security	
4.3	Contractor's Representative	
4.4	Subcontractors	
4.5	Assignment of Benefit of Subcontract	
4.6	Co-operation	
4.7	Setting Out	
4.8	Safety Procedures	
4.9	Quality Assurance	
4.10	Site Data	
4.11	Sufficiency of the Accepted Contract Amount	
4.12	Unforeseeable Physical Conditions	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	THE CONTRACTOR (Cont.)	
4.13	Rights of Way and Facilities	
4.14	Avoidance of Interference	
4.15	Access Route	
4.16	Transport of Goods	
4.17	Contractor's Equipment	
4.18	Protection of the Environment	
4.19	Electricity, Water and Gas	
4.2	Employer's Equipment and Free-Issue Material	
4.21	Progress Reports	
4.22	Security of the Site	
4.23	Contractor's Operations on Site	
4.24	Fossils	
5	NOMINATED SUBCONTRACTORS	
5.1	Definition of "nominated Subcontractor"	
5.2	Objection to Nomination	
5.3	Payments to nominated Subcontractors	
5.4	Evidence of Payments	
6	STAFF AND LABOUR	
6.1	Engagement of Staff and Labour	
6.2	Rates of Wages and Conditions of Labour	
6.3	Persons in the Service of Employer	
6.4	Labour Laws	
6.5	Working Hours	
6.6	Facilities for Staff and Labour	
6.7	Health and Safety	
6.8	Contractor's Superintendence	
6.9	Contractor's Personnel	
6.1	Records of Contractor's Personnel and Equipment	
6.11	Disorderly Conduct	
6.12	Foreign Personnel	
6.13	Prohibition of Harmful Child Labour	
6.14	Employment Record of Workers	
6.15	Facilities for Staff and Workers	
6.16	Measures against Insect and Pest Nuisance	
6.17	Epidemics	
6.18	Burial of the dead	
6.19	Supply of Foodstuffs	
6.2	Supply of Water	
6.21	Alcoholic Liquor or Drugs	
6.22	Arms and Ammunition	
6.23	Festivals and Religious Customs	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
7	PLANT, MATERIALS AND WORKMANSHIP	
7.1	Manner of Execution	
7.2	Samples	
7.3	Inspection	
7.4	Testing	
7.5	Rejection	
7.6	Remedial Work	
7.7	Ownership of Plant and Materials	
7.8	Royalties	
7.9	Quality of Materials, Plant, Supplies and Workmanship	
7.10	Site Installations	
7.11	Plant and Material intended for the Workers	
8	COMMENCEMENT, DELAYS AND SUSPENSION	
8.1	Commencement of Works	
8.2	Time for Completion	
8.3	Programme	
8.4	Extension of Time for Completion	
8.5	Delays Caused by Authorities	
8.6	Rate of Progress	
8.7	Damages	
8.8	Suspension of Work	
8.9	Consequences of Suspension	
8.10	Payment for Plant and Materials in Event of Suspension	
8.11	Prolonged Suspension	
8.12	Resumption of Work	
9	TESTS ON COMPLETION	
9.1	Contractor's Obligations	
9.2	Delayed Tests	
9.3	Retesting	
9.4	Failure to Pass Tests on Completion	
9.5	Pre completion inspection	
10	EMPLOYER'S TAKING OVER	
10.1	Taking Over of the Works and Sections	
10.2	Taking Over of Parts of the Works	
10.3	Interference with Tests on Completion	
10.4	Surfaces Requiring Reinstatement	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
11	DEFECTS LIABILITY	
11.1	Completion of Outstanding Work and Remedying Defects	
11.2	Cost of Remedying Defects	
11.3	Extension of Defects Notification Period	
11.4	Failure to Remedy Defects	
11.5	Removal of Defective Work	
11.6	Further Tests	
11.7	Right of Access	
11.8	Contractor to Search	
11.9	Performance Certificate	
11.10	Unfulfilled Obligations	
11.11	Clearance of Site	
12	MEASUREMENT AND EVALUATION	
12.1	Works to be Measured	
12.2	Method of Measurement	
12.3	Evaluation	
12.4	Omissions	
13	VARIATIONS AND ADJUSTMENTS	
13.1	Right to Vary	
13.2	Value Engineering	
13.3	Variation Procedure	
13.4	Payment in Applicable Currencies	
13.5	Provisional Sums	
13.6	Daywork	
13.7	Adjustments for Changes in Legislation	
13.8	Adjustments for Changes in Cost	
14	CONTRACT PRICE AND PAYMENT	
14.1	The Contract Price	
14.2	Advance Payment	
14.3	Application for Interim Payment Certificates	
14.4	Schedule of Payments	
14.5	Plant and Materials intended for the Works	
14.6	Issue of Interim Payment Certificates	
14.7	Payment	
14.8	Delayed Payment	
14.9	Payment of Retention Money	
14.10	Statement at Completion	
14.11	Application for Final Payment Certificate	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	CONTRACT PRICE AND PAYMENT (Cont.)	
14.12	Discharge	
14.13	Issue of Final Payment Certificate	
14.14	Cessation of Employer's Liability	
14.15	Currencies of Payment	
14.16	Employer's Final Statement	
15	TERMINATION BY EMPLOYER	
15.1	Notice to Correct	
15.2	Termination by Employer	
15.3	Valuation at Date of Termination	
15.4	Payment after Termination	
15.5	Employer's Entitlement to Termination	
16	SUSPENSION AND TERMINATION BY CONTRACTOR	
16.1	Contractor's Entitlement to Suspend Work	
16.2	Termination by Contractor	
16.3	Cessation of Work and Removal of Contractor's Equipment	
16.4	Payment on Termination	
17	RISK AND RESPONSIBILITY	
17.1	Indemnities	
17.2	Contractor's Care of the Works	
17.3	Employer's Risks	
17.4	Consequences of Employer's Risks	
17.5	Intellectual and Industrial Property Rights	
17.6	Limitation of Liability	
18	INSURANCE	
18.1	General Requirements for Insurances	
18.2	Insurance for Works and Contractor's Equipment	
18.3	Insurance against Injury to Persons and Damage to Property	
18.4	Insurance for Contractor's Personnel	
18.5	Insurance for minimum value of the premises is in the sum of MUR 100.00 Million.	
	Contractor shall take insurance cover with Employer's insurance company namely SICOM.	
	Carried to Collection	

Carried to Collection

ITEM	DESCRIPTION	AMOUNT (MUR)
	PARTICULAR CONDITIONS	
1	General Provisions	
2	The Employer	
3	The Engineer	
4	The Contractor	
5	Nominated Subcontractors	
6	Staff and labour	
7	Plant, Materials and Workmanship	
8	Commencement, Delays and Suspension	
9	Tests on Completion	
10	Employer's Taking Over	
11	Defects Liability	
12	Measurement and Evaluation	
13	Variations and Adjustments	
14	Contract Price and Payment	
15	Termination by Employer	
16	Suspension and Termination by Contractor	
17	Risk and Responsibility	
18	Insurance	
19	Force Majeure	
20	Claims, Disputes and Arbitration	
21	Taxes	
	Carried to Collection	

ITEM	CLAUSE	DATA
Employer's name and address	1.1.2.2 & 1.3	SBM Bank (Mauritius) Ltd 1, Queen Elizabeth II Avenue, Port Louis
Contractor's name and address	1.1.2.3 & 1.3	Name Address (To be decided)
Engineer's name and address	1.1.2.4 & 1.3	<u>Servansingh Jadvav and Partners Consulting Engineers Ltd of</u> 7,Remy Ollier Street, Beau Bassin as ' Project Coordinator and Civil and Structural Engineers '
Employer's Personnel – (Sub-Consultants appointed by the Engineer)	1.1.2.6	Sub-Consultants appointed by the Engineer: <u>1. Chuttur & Partners Ltd of</u> Level 4, Editions Le Printemps Bldg., Club Road, Vacoas as ' Quantity Surveyors ' <u>2. Profive Ltd of</u> Level 5, Hyvec Business Park, Lot 15A3, Wall St, Cybercity, Ebene as ' MEP Engineers '
Employer's Personnel – (Consultants appointed by the Employer)	1.1.2.6	N/A
Time for Completion of the works	1.1.3.3	154 calendar days
Defects Notification Period	1.1.3.7	365 calendar days
Electronic transmission systems	1.3	Electronic mails and facsimiles
Governing Law	1.4	Republic of Mauritius
Ruling Language	1.4	English
Language for communications	1.4	English
Time for the Parties entering into a Contract Agreement	1.6	Twenty-Eight (28) days from date of receipt of Contract Agreement
Time for access to the site	2.1	Within Fourteen (14) days from date of Letter of Acceptance
Engineer's Duties and Authority	3.1	All variations with cost implication greater than MUR 25,000 shall require approval of the Employer.

ITEM	CLAUSE	DATA
Amount of Performance Security	4.2	The performance security will be in the form of a performance bond in the amount of Fifteen per cent (15%) of the Accepted Contract Amount including VAT in Mauritian Rupees
Normal working hours	6.5	In compliance with the Workers' Rights Act 2019 and with any latest applicable Regulations and subject to Client's Approval.
Commencement of works	8.1	Within 14 days after the Contractor receives the Letter of Acceptance or within 7 days from handing over of site, whichever is later.
Programme	8.3	Within 7 days after the commencement of works.
Delay damages for the works	8.7 & 14.15 (b)	MUR 25,000 per calendar day
Maximum amount of delay damages	8.7	Limited to 10% of accepted Contract Amount
Clause 8.9 Consequences of suspension – Sub clause (b) Payment of any such cost, which shall be included in the contract price	8.9	Delete Sub-Clause 8.9 (b) in its entirety
Completion of Outstanding work and Remedying Defects (Time to Complete Outstanding work)	11.1 (a)	35 days
Completion of Outstanding work and Remedying Defects (Penalty for failure Time to Complete any Outstanding work/Defects)	11.1 (a)	MUR 5,000 per day
Completion of Outstanding work and Remedying Defects (Time to remedy defects or damage)	11.1 (b)	35 days
Completion of Outstanding work and Remedying Defects (Penalty for failure to remedy any Defects or damage)	11.1 (b)	MUR 5,000 per day
Adjustment for changes in cost	13.8	No escalation on Contract Amount shall be permitted.
Advance payment	14.2	Fifteen per cent (15%) of the Accepted Contract Amount, excluding Provisional and Contingency Sum, in Mauritian Rupees against Bank Guarantee.

ITEM	CLAUSE	DATA
Start repayment of advance payment, Repayment amortization of advance payment	14.2 (a) 14.2 (b)	(i)The Advance shall be released only after obtaining an unconditional bank Guarantee from an approved local commercial bank for the amount of advance to be released and valid for the contract period. (ii) It shall be ensured that at any point of time, Bank Guarantee is available for the amount of outstanding advance. (iii) The recovery shall commence after value of works, including value of materials on/off site and variations, has reached Ten per cent (10%) of the accepted Contract Amount, excluding Provisional and Contingency Sums but including Variations. The recovery of the advance payment shall be based on the percentage of work completed to total value of works. The entire amount together shall be recovered by the time Eighty per cent (80%) of the work is completed.
Percentage of retention	14.3	Ten per cent (10%) of the Accepted Contract Amount including value of Materials on/off site and Variations.
Limit of Retention Money	14.3	Ten per cent (10%) of the Accepted Contract Amount and Variations.
Plant and Materials for payment when shipped en route for site	14.5 (b)	Not applicable
Plant and Materials for payment	14.5 (c)	Eighty per cent (80%) of Cost of Resilient flooring (multi-use sport flooring) as approved by the Engineer, upon submission of Cession of Rights, identification labels, insurance cover for storage areas and subject to Conditions stated. Retention will be held on value of Plant and Materials certified.
Minimum amount of Interim Payment Certificates	14.6	Ten per cent (10%) of the Accepted Contract Amount
Delayed Payment	14.8	Simple interest as specified by Central Bank plus 3%
Currency/Currencies of payment	14.15	MUR (Mauritian Rupees)
Periods for submission of insurance: Evidence of insurance and Relevant policies	18.1	Fourteen (14) days from date of issue of letter of acceptance.
Insurance of works and Contractor equipment	18.2	Contract Price + 15% for Consultant fees, including VAT

ITEM	CLAUSE	DATA
Minimum amount of deductible for insurance of the employer's risks	18.2 (d)	All liability under this contract is in the scope of Contractor
Insurance against value of existing premises Insurance against Injury to Persons and Damage to Property	18.3	(i) Minimum amount of Value of Existing Building for Insurance Purpose - MUR 50.00 Million (ii) Minimum amount of third party insurance - MUR 20.00 Million amount of each occurrence. Number of occurrences – unlimited.
Insurance for Contractor Personnel and Employer's Representative and Consultants	18.4	Loss and damage of Construction plant & Equipment - MUR 200,000.00
		Contractor's workforce - MUR 5.00 Million
		Contractor's site personnel - MUR 5.00 Million
		Employer's Representatives and dedicated personnel - MUR 5.00 Million
		Consultants – Engineer and other Subconsultants - MUR 5.00 Million
Appointment of the Dispute Adjudication Board	20.2	Delete the Sub clause 20.2 in its entirety
Failure to agree Dispute Adjudication Board	20.3	Delete the Sub clause 20.3 in its entirety
Arbitration	20.6	Arbitration Law – Law of Republic of Mauritius.

ITEM	DESCRIPTION	AMOUNT (MUR)
	<u>SPECIFICATION AND OTHER DOCUMENTS</u>	
	Generally	
A	In order to assist Tenderers, drawings are issued with the Tender Document. The drawings illustrate the scope of the work to be done. The Contractor will be deemed to have examined the site condition, the nature of surrounding areas, the protection of existing finishes, fittings, appliances, the preservation and protection of existing services and the like and to have ascertained their details and the nature of the works. Tenderers are informed that Works are generally upgrading works in the gymnasium comprised of demolition works, cutting existing floor and providing in situ drain with perforated pipes, raised concrete floor with new resilient sports flooring, new openings, painting internally and externally, new canopy, new ramps, new steps and external drainage works, comprised of French drains and concrete infilled manholes, and minor landscaping works around the gymnasium and swimming pool at SBM Park La Vigie. The SBM Park is a fully operational premises. Appointed Contractor must provide approved hoarding to prevent propagation of dust to the operational area. Site must be always kept clean and tidy on a daily basis with protection of existing finishes. <u>Any claim whatsoever made by the Contractor due to want of knowledge will not be entertained.</u>	
	Contract Bills	
B	The drawings which were used in the preparation of these Bills of Quantities are listed in the Appendix to these Bills.	
C	No unauthorised alteration in any of these Bills of Quantities is to be made by the bidder. Should any alteration, amendment, note or addition be made, it will not be recognised but the reading as printed will be adhered to. In the case of the bidder leaving unpriced any of the items in these Bills of Quantities, the bidder will be deemed to have considered that the rates of the remaining items are sufficient to enable him to perform the services and obligations described in the items not priced without extra charge.	
D	The Contractor shall, if requested by the Quantity Surveyor, provide fully detailed price build-ups for any rate inserted against the item of works in the Bills of Quantities for the purpose of establishing any new rates or prices for estimating variations/changes.	
E	The Contractor is advised that the quantities, sizes, etc., contained in these Bills of Quantities should not be used for the purpose of ordering materials without checking from the working drawings or from site, as no claim will be entertained for costs incurred in over-or-under-ordering of materials.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
A	All prices or rates inserted in these Bills of Quantities are to be fully inclusive prices or rates for the finished work described under the respective items and/or drawings, unless otherwise stated or unless there is a separate item for extra labour, cutting or waste and are to include for all materials, making, conveying, cartage, carriage and delivery, unloading, storing, unpacking, hoisting or conveying, setting, fixing, and building into position and labour of every description, cutting and waste, templates, patterns and models, plant, temporary works, return of packing, taxes, levies, custom duties, surcharges, establishment charges, overheads, costs of all nature, and all obligations arising out of the Conditions of Contract, the provisions of Materials and Workmanship bills, the provisions of the Preliminaries bills and the execution of the relevant work. Prices for plant, temporary works, services and other items provided shall include for the supply, maintenance, fuel, operating costs and subsequent removal and making good as necessary.	
B	The prices for all items shall where applicable include for all small quantities, short lengths and narrow widths. Where items are described as "Fix only" this shall be deemed to mean delivered on site but Contractors shall be responsible for, unloading on site, storing, unpacking, distributing to the required position on site, assembling and fixing, and returning packing cases to consignor if required.	
C	The Contractor shall be held solely responsible for and shall, at his own expense, rectify any errors arising out of incorrect interpretation of the Drawings, Specifications, Bills of Quantities or instructions.	
D	The Contractor shall note that no claims whatsoever will be allowed in respect of errors or omissions in pricing due to brevity of descriptions of items in the Bills of Quantities which are fully described when read in conjunction with the relevant requirements of the Bill of General requirements and Specifications and/or the Conditions of Contract and/or drawings.	
E	All descriptions of items (i.e. description associated with units and quantities) shall be deemed to be read in conjunction with their respective general headings and all levels of descriptions and headings are to be taken as mutually explanatory of one another.	
F	The Contractor is advised that the nature of this project is such that design may develop simultaneously as works are in progress and production of information will be issued accordingly. The Contractor acknowledges this nature of the project. The Contractor is informed that the rates and prices inserted in the bills of quantities as well as sums allowed in the bills will remain fixed and firm provided that the issue of information to the Contractor for the purpose of executing the works is maintained in line with agreed programme of work.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	Brief Scope of Works	
A	<p>The work comprises of rehabilitation of the existing metal roof coverings and associated works at the Multipurpose Gymnasium and Swimming Pool Complex, and sitting stand to football ground:</p> <ul style="list-style-type: none"> • Cut existing concrete floor and provide new in-situ underfloor drain, including subbase. • New 125mm thick concrete floor bed laid on existing floor including 6mm thick self-levelling screed (about 700 m²). • New synthetic sports flooring (about 700 m²). <p>Remove existing doors, raise lintel height and provide new doors in gymnasium,</p> <ul style="list-style-type: none"> • demolition of concrete canopy and provision of new canopy, demolition of concrete steps and ramps and provision of new steps and ramps. • Painting works internally (about 1,200 m²) and externally (about 1,600 m² including working at heights up to 15m. • French drain 600mm wide and depth n.e. 2.50m around gymnasium (about 115m) and swimming pool (about 82m), including concrete infilled block walls manholes. • Minor landscaping works comprised of relocation of trees, planting of grass and new trees and shrubs. 	
B	The total completion period shall be 154 calendar days.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
A	The building is fully operational, MEP fully operational services including light fittings. Bidder shall allow in the price for all requisite protection of the interior and exterior finishes, as and where required, and shall reinstate all damaged structures, finishes and the like to the entire satisfaction of the Engineer.	
B	Access for the work and protection of existing facilities and services shall be as per instructions and approval of the Engineer, as indicated on the Architect's drawings.	
C	Bidder shall along way ensure compliance with Occupational, Health and Safety Acts and are strictly adhered to in accordance with the prevailing Regulations and Acts.	
D	Dedicated area shall be handed to the Contractor, for Contractor's facilities, workshop, which must be duly hoarded and shall be reinstated on completion of the work.	
E	The Appointed Contractor shall ensure that all their workers including those of their Sub-Contractors have their Company apron and identification when deployed on site. Those workers will be treated as authorized workers. The other non authorized workers shall not be allowed access to the site.	
F	Power supply and water supply shall be provided by the Employer. The Contractor shall however cater for any shortcoming for adequacy of these services (if any) for the smooth running of the work. Contractor shall provide temporary meters, temporary network in safe condition and the charges for consumption of these Utilities shall be deducted on the Payment Certificates on monthly basis, until the work is tested and commissioned. The terms and conditions for the reimbursement shall be agreed. All these facilities shall be reinstated, on completion, to the Engineer's satisfaction.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	Pricing of Temporary Works	
A	Notwithstanding Sub-Clauses 12.1, 12.2 and 12.3 of the Conditions of Contract and anything contained in the Tender Documents, Lump Sum items shall be deemed to be priced on a "Lump Sum" basis to comply with the requirements of the contract and no adjustment will be made to the Contract Price irrespective of the scope and/or nature of the Temporary Works executed by the Contractor.	
	Shop Drawings	
B	The term " shop drawings " shall mean drawings, diagrams, schedules, performance charts, brochures, operating manuals and other data which are prepared by the Contractor or any Sub-contractor, manufacturer or supplier and which illustrate some portion of the work.	
C	The Contractor shall prepare, at his own expense, and shall submit two copies of shop drawings of works as described in the BOQs, and any MEP works which need to be temporarily shifted and reinstalled, with testing and commissioning, within fifteen days from the date of start of the work for each specific area, and setting out drawings, shop details and schedules to the Engineer for approval. No work shall be executed by the Contractor until the shop drawings are approved.	
D	The Engineer will take 5 working days, unless otherwise specified, to approve the shop drawings from date of submission. Subsequent shop drawings with remarks must be submitted within 2 working days to allow Engineer to give their approval, within 2 working days after submission.	
E	The Contractor shall submit 3 copies of as built drawings for carrying out snags, minor outstanding works, to enable the Engineer to issue Taking Over Certificate, along with their notice that the work has been completed and Taking Over Certificate may be issued.	
F	The Contractor shall present a complete schedule showing submission dates, for all trades and the scheduled dates, for approval of all drawings. The Contractor shall note that the Engineer and the Engineer's Representative require 5 days for checking from the date of the receipt of all shop drawings.	
G	All submissions shall be on dates as indicated in the above schedule and sufficiently in advance as no claim for extension to the contract time will be granted to the Contractor by reason of his failure in this respect. All cost and charges for submission of shop drawings and as built drawings shall be included in the tender price.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	<i>Shop Drawings (Cont.)</i>	
A	The Contractor shall submit one copy of technical literature and one original, and data specified in the BOQ and in the drawings and specifications to enable the Engineer for material approval in compliance with Contract provisions. The Contractor shall check all submissions for conformity with the contract drawings and specifications and correct any errors, omissions or deviations before forwarding to the Engineer, for approval.	
B	The Engineer's approval of any document or drawing does not in any way vary the Engineer's contractual obligations and liabilities to the owner or any other party, nor does it vary the contractual obligations and liabilities of the party submitting such document or drawing for approval.	
C	Corrections of shop drawings by the Engineer shall not change the scope of work. Should any such correction constitute a change of scope of work, the Contractor shall notify the Engineer in writing within not more than three calendar days of such change and shall not proceed with the fabrication until so authorized by the Engineer.	
D	Contractor shall submit as built drawings for all fabricated elements, M&E works and associated works, site works one month prior to completion of the works, to enable the Engineer to carry out list of snags on minor outstanding works prior to issue of Taking Over Certificate.	
E	Final Account shall be based on approved as built drawings.	
	Provisional Sums (If any)	
F	The words " Provisional Sums ", "Prime Cost" or the initial " P.C "(if any) is applied in the Schedules/Bill to works which are required to be carried out by a Nominated Sub-Contractor or to Goods or Materials which are required to be obtained from a Nominated Supplier and shall mean, unless otherwise stated in the said Schedules/Bills the net sum paid to the Nominated Sub-Contractor or Supplier after deducting all trade or other discounts for such goods. Such sums do not include the Contractor's profit and overhead charges, fixing or attendances.	
G	Nominated Sub-contractor, the Supplier or Sub-contractors shall be made responsible for any loss, damage or breakage and shall replace lost or damaged materials or goods at his own expense until ownership passes to the Contractor or the Employer from which the Contractor will be responsible.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	<i>Provisional Sums (Cont.)</i>	
A	The Contractor will be required to sign a receipt for all P.C. articles at the time of taking delivery thereof, as having received them in good order and condition. He will take delivery on site or as otherwise directed and will be required to load, transport to site, offload and provide safe storage and thereafter be responsible for any loss or damage and for replacement of any such loss or damage with materials to the satisfaction of the Engineer at his own cost and expense.	
B	The Contractor shall also ensure that all Nominated Sub-contractors and Nominated Suppliers warrant the Contractor that any such materials or goods and any subcontract works conform to the quality and standard specified.	
C	Where the work of Sub-contractors or Suppliers is subject to approval of drawings, details, calculations, etc., the Contractor shall take all necessary steps to ensure that they are submitted for approval in good time, so that there will be no delay in the execution of the Works.	
D	The Contractor's attendance on Sub-contractors shall be deemed to include for subcontractor's use of Temporary Works and facilities as per the FIDIC Conditions of Subcontract, if any and for also arranging with any Authority, public undertakings, nominated Sub-contractors and nominated suppliers at the time for commencement of their work on the site or manufacture and delivery of their goods and materials as appropriate, obtaining from them particulars of holes, mortises, chases, recesses, fixings and the like and supplying them with all dimensions and other information required for the proper execution of the Works.	
E	Before accepting any estimate in respect of materials or goods to be delivered to site by a nominated supplier or in respect of work to be executed by a nominated Sub-contractor, the Contractor must ensure that the conditions of the estimate conform with the conditions of the main contract and that the materials or goods can be delivered, or work can be executed so as not to conflict with the Contractor's work programme.	
	Carried to Collection	

1.22

ITEM	DESCRIPTION	AMOUNT (MUR)
	<u>OBLIGATIONS AND RESTRICTIONS IMPOSED BY THE EMPLOYER</u>	
	Working areas and Temporary Hoardings	
A	The working areas and space are shown on Engineer's drawing for the Project. The Contractor shall, as soon as possible after his arrival on site, erect hoarding with gates to the satisfaction of the Engineer. On completion of the works, the hoarding is to be dismantled and cleared away from site and reinstate and make good to all disturbed work to entire satisfaction of the Engineer. The tenderer is informed that appropriate hoarding needs to be provided along the whole of the allocated spaces, provide protection to gymnasium flooring as well as the swimming pool facilities as specified, and or protection of waterproofing, temporary protection to access to roof as specified, which shall be to Contractor's design, all to Engineer's satisfaction. Notwithstanding the aforesaid hoarding the Contractor shall ensure they are complying with the Occupational, Safety and Health Act 2005 or recent regulations in providing mechanism to measure, control and mitigate dust, noise, nuisance arising in the course of the work for the whole duration of the Contract. Contractor must allow all costs and charges in the tender price.	
B	Allocated areas shall be jointly surveyed by the Contractor and Consultants prior to starting the works, in order to establish the existing site conditions, specially the structure and finishes, so as the same can be kept as original as and where required, upon completion of works. The survey shall be prepared by the Contractor and shall be properly documented with photos and the likes.	
C	Construction materials and Contractor's facilities shall be generally located at the rear of the complex and located at parking areas, which must be duly hoarded. Ablution for Contractor's workers need to be provided and disposed to dedicated manhole, which needs to be always airtight.	
	<u>Area of operations</u>	
D	Provide for taking reasonable precautions to prevent workpeople, including those employed by Sub-contractors from encroaching or trespassing upon any part of the site or premises which are not affected by the Works and from trespassing upon adjoining and existing owner's property except where permission be granted to facilitate the carrying out of the Works. Loitering is not allowed. All workers shall wear a uniform to allow easy distinction.	
E	The Contractor shall be required to limit the construction activity, temporary buildings, storage or equipment and materials etc. within the boundaries of the area allocated to him.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	Access to Site	
A	The Contractor is to agree the points of access and egress with the Engineer in the premises, as specified elsewhere and is to include here or in his prices for building any temporary platform, protection of flooring or other means of gaining access to the work areas and make good and reinstate to the entire satisfaction of the Engineer all works disturbed.	
B	The Bidder shall demonstrate the movement of construction material, for executing the works, without causing any inconvenience to the smooth operation of the premises. In addition, the rest rooms (both gents and ladies) on the right wing facing the mountain, shall always be accessible, in safe and clean condition for public use and Client's use. The contractor shall demonstrate their prompt implementation of this process.	
C	The Appointed Contractor may erect a construction staircase, including forming platform on right wing at the exposed terrace for handling of materials, labour access, and the like for all construction activities. Contractor shall however protect existing roof waterproofing to avoid any water leakage below. On completion of the work, the Contractor shall make good to the allocated areas and surrounding to match existing finishes/status to the entire satisfaction of the Engineer. The Contractor may refer to Architect's hoarding plan in this respect. The roof terrace may be used to have access to the working areas at the first floor. All temporary works must be duly cleaned, and all existing structures and finishes reinstated to the original status to the entire satisfaction of the Consultants.	
	Site to be tidy	
D	The site shall be maintained in a neat, tidy and healthy condition and the Contractor shall remove all debris, waste and unwanted materials and other litter from the site from day to day or as directed by the Engineer and in compliance with the provisions of Occupational Safety and Health Act 2005 and or such recent standing regulations.	
E	The Contractor shall maintain access drive, parking areas, public road, pedestrian walkway clean and tidy free from mud, grit, droppings on daily basis.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	Master Programme	
A	The Contractor is to prepare and submit to the Engineer within 21 days from the issue of the letter of Acceptance three copies of the master programme on an A01 size. The programme shall include the planned monthly rates of progress between the programmed date for commencement and completion for all items of work for various stages of construction and for item under specialist subcontract trades including dates by which major drawings requiring approval will be submitted. The programme shall be in the form of a time and progress chart or a critical path network and shall also indicate the procurement of metal roof sheeting especially date of order and expected date of arrival on site and show a weekly schedule of labour and plant resources to be employed for each item of work of the programme. Contractor shall submit with the approved Programme of work the milestone date of start and date of completion for all elements and components and especially the replacement of roof coverings. In the event the progress of works experience delays, the Contractor must submit updated program of work, within 7 days from date of notice, indicating the means and measures to recoup this delay, in order the project is completed as per approved completion date.	
B	The Programme must also take into account the requirements of all major Sub-contractors, and persons employed or engaged upon the Works. The Contractor shall also submit short term monthly or weekly programmes as and when required by the Engineer.	
	Information required for Construction	
C	The Contractor shall within 14 days of instructions to commence, submit a proposed "Schedule of Information Required" indicating latest dates by which instructions, drawings and other information are required from the Engineer including instructions in connection with the nomination of suppliers and Sub-Contractors to enable him to comply with the programme.	
D	The schedule shall be related to the programme of works and shall not contain any requirements which are in the opinion of the Engineer unreasonable or premature and shall be updated as necessary during the construction period.	
	Protection of streams, canals and the like	
E	Provide for taking all precautions to ensure the efficient protection of all streams, canals and the like against pollution arising out of or by reasons of the execution of the works.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	Materials or objects of value found on site	
A	Any materials or objects of value and the like, found on site when removing the existing roofing and the like are to remain the property of the Employer under this Contract and shall only be sold or removed as the Engineer shall direct and access shall be allowed to any authorized person instructed to remove same.	
	<u>CONTRACTORS ADMINISTRATIVE ARRANGEMENTS</u>	
	Safety on site	
B	The Contractor shall take all necessary steps to ensure that the site is run in an orderly manner and that safety precautions are enforced to avoid accidents to the personnel of the Contractor and to other parties working on site and take all necessary measures for the safety of the public and property.	
	Contractor's Superintendent and Site Management	
	Contractor shall provide the following technical personnel for the proper site superintendence and site management:	
	<u>Contract Manager (In 1 no.)</u>	
C	The Contract Manager shall have at least a degree in any construction related field and have minimum 10 years of general experience in building works, minimum 5 years' experience as Contract Manager and, at least in two (2) projects in works of similar nature, as detailed in the Bidding Document and has general knowledge work in similar nature. The Contract Manager shall be fluent in English.	
D	The Contract Manager duties shall be to attend all site meetings, technical meetings and other meetings associated with works, as convened by the Consultants and shall be responsible for the due performance of his team on site. The Contract Manager shall be responsible for the preparation of the program of work and shall submit fortnightly Contractor's progress report, interpret the report and table progress of work against programme of work. The Contract Manager shall oversee coordination of subcontract works including any specialist works for their duly and timely completion. The Contract Manager shall be responsible for due implementation of Health and Safety procedures on the works especially for working at heights, including mitigation of dust, noise, in compliance with Health and Safety Act and or any standard regulations. The Contract Manager shall issue all official correspondences, statements and the like as per the provisions of the Contract.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	Contractor's Superintendent and Site Management (Cont.)	
	<u>Site Agent (In 1 No. - Full time based)</u>	
A	One Site Agent on a full-time basis, having at least a diploma or "Brevet de Technicien" in any construction related field and have 10 years' general construction experience. The Site Agent must demonstrate that he has supervised at least 2 projects in work of similar nature. The Site Agent will also be responsible for quality assurance and quality control.	
	<u>M&E Coordinator (In 1 no.-- Full time based)</u>	
B	One M&E coordinator having at least a diploma or certificate in Building Services Engineering or equivalent and should have minimum 10 years' experience in Building Services Engineering and handled at least two (2) projects of similar nature and be fluent in English.	
C	The M&E Coordinator shall demonstrate that he can overview the MEP existing facilities and assist the Engineer for temporary shifting and reinstallation of MEP services on completion of the concrete works. The M&E Coordinator shall be responsible for coordinating existing MEP services and ensure shop drawings are duly coordinated with structural drawings prior to execution and report any discrepancy the M&E Coordinator must shall prepare. The M&E quality and audit report which must be well structured, comprehensive, reflect progress of works on site and submitted on a fortnightly basis together with the Progress Report. The M&E Coordinator shall liaise with the Consultants in consultation with the M&E Engineers and Site Manager for the due performance of the mechanical and electrical installations and shall circulate minutes of meetings accordingly.	
	<u>Health and Safety Officer (Part time site based)</u>	
D	The Health and Safety Officer shall be registered person with the Ministry of labour, Human Resource Development and Training, having minimum 10 years' experience working at heights. The Health and Safety Officer shall ensure that all necessary measures and precautions are being implemented on site, in compliance with the standing Regulations and submit fortnightly reports.	
	<u>Additional Technical Personnel</u>	
E	Allow for any other technical personnel, as the Contractor may deem necessary, for the proper site superintendence and site management and completion of the project.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	Contractor's Superintendent and Site Management (Cont.)	
A	In the event the Contract Manager does not attend site meeting and site visit as convened without reasonable cause, an amount of MUR 25,000 per site meeting and or per site visit shall be deducted from the Contract price.	
B	In the event the Contractor shall not provide a Site Agent, an amount of MUR 40,000 per month per the said personnel shall be deducted from the Contract price.	
C	In the event the Contractor shall not provide M&E coordinator – MUR 25,000 per month per M&E coordinator shall be deducted from the Contract price.	
D	In the event the Contractor shall not provide Health and Safety Officer on the project an amount of MUR 25,000 monthly shall be deducted from the Contract price.	
E	The above deductions shall be to Engineer's approval and as recorded in the minutes of site meeting chaired by the Engineer's; and the records shall be deemed to be construed as notice and particulars in accordance with Subclause 2.5 of the Conditions of Contract.	
	Site Meetings	
F	Site Meetings shall be convened by the Engineer on fortnightly basis to monitor progress for proper management of the Contract and coordination of all parties. Contractor shall submit fortnightly Contractor Progress Report including Quality Report, with progress photo in 8 Nos printed copies and as well as in electronic version.	
G	In addition, Engineer shall convene official site visit on alternate fortnights, and such other meetings and visit for the proper smooth administration of the Contract. Contractor's superintends and site personnel shall be required to attend site meetings, site visits, as required by the Engineers.	
	Safeguarding of Works	
H	Safeguard the Works, materials and plant against damage or theft including providing all necessary watching and lighting for the security of the Works and the protection of the public and for the prevention of unauthorized access to adjoining and existing property from the site. Provide facilities for any security guard employed.	
	Transport for workpeople	
J	Provide for all expenses in connection with transport of workpeople to and from the site and around the site including traveling expenses and fares.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	Labour on-costs	
A	Provide for all costs in respect of all workpeople in compliance with Workers' Rights Act 2019 and any prevailing Regulations but not limited to the following: (a) National Pension Contributions, training levy and contribution to Employee's welfare fund and associated pensions. (b) Disbursements under the Sick Payments Scheme (c) Annual and Public Holidays (d) Traveling time, subsistence expenses and fares and all other like costs. (e) Non-productive time and other expenses in connection with overtime. (f) Shutdown on account of cyclone warnings or adverse weather conditions (g) Incentive and bonus payments (h) Severance pay and obligations and workmen's compensation Insurance (i) End of year bonus (j) Protective clothing and equipment (k) Any other disbursements arising from employment of labour, including complying with the provisions of Employment's' regulations.	
B	No payment will be made for any overtime incurred for the purpose of maintaining progress and for ensuring completion within the Contract period.	
C	All the requirements and health and safety facilities in accordance with all Regulations and Acts in respect to Covid-19	
	<u>CONSTRUCTION PLANT</u>	
	Plant	
D	Provide all plant and equipment necessary for the proper execution of the Works both mechanical plant and vehicles and non-mechanical plant and tools, including: - (a) Elevator/Wheel mounted mobile crane (b) Small plants and tools (c) Site transport (d) Plant and equipment for all other trades	
E	The Contractor shall allow for altering, adapting and maintaining all such plant as necessary and at or before completion clear away same from the building and site and make good all work disturbed.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	Scaffolding and Platform	
A	Provide all necessary scaffolding and platform for the proper and efficient execution and completion of the Works by all trades including that required by Subcontractors whether nominated or otherwise, especially for working at heights and in the attic of the roof.	
	<u>EMPLOYERS FACILITIES</u>	
	Temporary accommodation required by the Employer & Engineer	
B	Provide suitable office accommodation for the use of the Engineer and other Consultants and or the Employer's Representative, maintain throughout the duration of the Contract and clear away on completion and reinstate as required.	
C	The office shall be able to cater 15 people (sitting position) and clear headroom not less than 2.90 m, to Engineer's approval for holding meetings and shall be equipped with minimum a meeting table and chairs for about of 15 persons inclusive of Contractor's representatives and for other site works on regular basis. The whole of office shall be fully air conditioned or similar approved site office. The office shall always remain tidy and clean.	
D	Should the above facility not be provided as per the above description, deductions shall be applicable and shall be recorded in the minutes of site meeting chaired by the Engineer, and the records shall be deemed to be construed as notice and particulars in accordance with Subclause 2.5 of the Conditions of Contract.	
E	<u>Equipment to be provided by the Contractor on site:</u> - Measuring tapes and lasers. - Dumpy level in proper working order is to be provided on request for the use of the Engineer or his representative. - Dedicated Safety Equipment in compliance with Occupational Safety and Health Act 2005 and any latest Regulations, and in compliance with any COVID 19 Miscellaneous Act (specially when working at height).	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	<p><u>CONTRACTORS FACILITIES</u></p> <p>Contractor's use of buildings</p> <p>A The Contractor will not be permitted to use any part of the existing buildings for mess rooms, offices or other accommodation for workpeople employed on the site, unless instructed otherwise.</p> <p>Temporary Contractor's facilities</p> <p>B The Contractor shall provide a temporary office, store, sanitary accommodation, mess room etc. for all the workpeople employed under this Contract including Subcontractors and persons employed or engaged by the employer and provide lighting equipment and attendance. Such accommodation shall be to the approval of the Engineer and shall be of a standard and size suitable for the number of work people employed. Temporary soil and waste network shall be connected to Employer's existing manhole which must always be watertight.</p> <p><u>SUNDRY AND GENERAL ITEMS</u></p> <p>Protecting the Works</p> <p>C The Contractor shall be entirely responsible for the security of all the works, stores, materials, plant, personnel, etc., both his own and Sub- contractors' and shall provide necessary watching, lighting, barriers, hoardings and other precautions necessary to ensure the security and the protection of the public. He shall take all possible precautions to prevent any nuisance, inconvenience or injury to the holder or occupiers of existing premises and shall at all times keep all paths and access roads affected by the Works in a safe and clear state and shall use proper precautions to ensure the safety of all occupiers.</p> <p>D The Contractor will be held entirely responsible for the protection of the Works and the building including vulnerable areas to prevent water ingress in the building during the Works. Any damage caused due to the Contractor's fault shall be made good by the Contractor himself at his own expense.</p>	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	Protection of public and private drains and Services	
A	Protect, uphold and maintain all existing public and private live drainage, water, and other mains or ducts, power services, overhead cables etc., whether on or off the site, during the execution of the Works.	
B	Before commencing the Works, the Contractor must ascertain from the various public and private owners or statutory authorities the position of all known drains and services etc., and in the event of damage to same caused by the Works, he must arrange for such damage to be made good at his own expense or pay any charges or costs in connection therewith.	
C	The Contractor must allow all necessary protection of existing underground sewer line, including chambers crossing the site till completion of the work to Engineer's satisfaction.	
	Traffic regulations	
D	Allow for complying with any police regulations, or requirements concerning pedestrian or vehicular traffic control, site access and egress, safety precautions and other matters affecting the Works.	
	Statutes and Government regulations	
E	Provide for all costs incurred by complying with Occupational Safety and Health Act 2005, and other current statutes, Regulations and Industrial Agreements especially for working at heights in existing facilities.	
F	The Contractor will be required to satisfy the Engineer at regular intervals that all necessary precautions have been and are being taken to secure the health, safety and welfare of all persons upon the site (whether in his employment or otherwise) and to protect all persons against risks to health or safety arising out of or in connection the activities of persons at work on the site of the Works and will be required to introduce such safety measures as Engineer may determine are necessary to comply with regulations currently in force.	
G	Nothing in these clauses shall be constructed as in any way relieving the Contractor of his obligations at law to comply with current legislation	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	Maintenance of roads and services	
A	Maintain public and private roads, footpaths, Kerbs, etc., and keep the approaches to the site clear of mud, other debris and the like. The Contractor is to make good any damage caused by his own or any Sub-contractor's or Supplier's transport at his own expense or pay all costs and charges in connection therewith. The Contractor shall protect, uphold, and maintain all pipes, sewers, water mains, overhead cables and services etc. during the execution of the work and is to make good any damage caused or pay any costs and charges in connection therewith.	
	Removing rubbish and deep cleaning the works, prior to handing over and after desnagging	
B	Provide for removing all protective casings and coverings and removing all rubbish from the site as it accumulates from day to day and from time to time and, on completion, clean the buildings inside and out, including thoroughly cleaning all floors and paving, easing affected by the works, ventilators, casements etc., cutting out all cracks and blisters in plasterwork and repairing, removing stains and touching up paintwork or polished work, and leaving the whole of the Works deep cleaned and tidy by specialist cleaning Contractors to the satisfaction of the Engineer on completion, at the time of handing over.	
	Testing Charges	
C	The Contractor shall allow for all tests as specified in the Contract including testing of watertightness of the roof covering, gutters and the like, full load test, test of all materials, the production and provision of samples of materials, workmanship and the like as required by the Engineer.	
D	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 Materials and other parts of the Works.	
	Advertisements and notices	
E	No advertisements will be permitted on the fencing, hoardings or any other part of the Works and Contractor shall not erect or allow any other persons to erect any sign, notice, display or advertisement of any kind on any part of the site buildings or hoardings, unless authorized in writing by the Engineer and he shall remove any such unauthorized advertisement immediately he is called upon to do so.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	Samples	
A	The Contractor shall allow herein for all costs incurred in connection with the provision of samples and mock-ups of any material, workmanship or building components and the like. The Engineer shall have the right to reject any materials or workmanship not in conformity with the approved samples.	
	Nuisance	
B	The Contractor shall take all proper precautions for the prevention of propagation of dust, noise, nuisance, inconvenience etc. to adjoining areas or occupiers and shall allow for the work to be carried out at such times and in such order as not to cause any nuisance or inconvenience. The Contractor shall strictly adhere to the provisions of the Occupational, Health and Safety Act 2005 and such recent regulations especially for working at heights. Contractor's attention is drawn that the work is carried out in a fully operational facility.	
	Opening up of work	
C	The Contractor shall, at the request of the Engineer within such time as the Engineer shall name, open for inspection any work covered up; and should the Contractor refuse or neglect to comply, the Employer may employ workmen other than those employed by the Contractor to open up the same. If the said work has been covered up in contravention of the Engineer's instructions, the expenses of opening and covering it up against, whether done by the contractor or by the Engineer shall be borne by and be recoverable from the Contractor or may be deducted from any monies due to the Contractor. Provided always that in the case of any other urgent work so opened up and requiring immediate attention the Engineer shall within a reasonable time after receipt of notice from the Contractor that the work has been so opened, make or cause to be made the inspection thereof.	
	Saving Clause	
D	If any clause, stipulation or provision contained in any contract document shall be wholly or partially repeated in the same document or contained in these conditions or in the Contract Agreement and also on the Drawings, the Engineer may at his option adopt either of such clauses, stipulations or provisions.	
	Contractor to do everything necessary	
E	The Contractor shall allow opposite this item or in the prices/rates throughout the Schedules/Bills for working all overtime, weekends, public holiday etc., and for doing everything necessary to complete the Works and the individual sections thereof by the stipulated dates.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	Checking of drawings	
A	Upon receipt of details drawings for any work, the Contractor shall, before putting that work in hand, he must check and ensure that there is no discrepancy between various Consultants' drawings, schedules and the like. In case of any discrepancy between the drawings and the Bills and or with the work already completed, the Contractor must seek clarification from the Engineer before proceeding with the work. The Contractor is informed that no extra cost shall be entertained or additional time shall be granted in the event the Engineer's decision is to comply with the construction supplemented by the Bills. The Contractor must also ascertain that the dimensions given on the detail drawings correspond with the dimensions of any work already built and which governs the sizes of any work for which details are now issued. In the event of the detail drawings not agreeing with the works already built, the discrepancy shall be brought to the Engineer's attention and the detail drawings shall be returned at once for alteration. The Contractor shall comply therewith, whether this requirement is specified or not on the construction drawings.	
	Figured Dimensions	
B	All dimensions will be figured on the drawings or may be calculated from figured dimensions and are always to be followed. No dimensions shall be obtained by scaling. Dimensions where possible are to be taken from the building.	
C	The Contractor shall check all dimensions on any drawing before putting any work in hand. The Contractor shall take site measurements for production of any items of work which need to be fabricated off site and assembled in the work thereafter.	
	Builder's work	
D	The Contractor is to obtain all necessary particulars from all Sub-contractors as to recesses, chases, sleeves, etc., required so that they may be correctly built in, in the first place. If the Contractor fails to do this, the cost of any alterations or cutting will fall upon him.	
	Co-ordination	
E	The Contractor shall co-ordinate the work of all Sub-contractors tradesmen, workmen and others engaged on the Works and shall liaise and co-ordinate with all parties to ensure the smooth and orderly progress of construction, the closest co-operation between all the parties concerned and the timeously completion of the Contract. The Contractor shall liaise with all suppliers and manufacturers to ensure the timorous delivery of all materials required for the Works.	
	Carried to Collection	

1.36

ITEM	DESCRIPTION	AMOUNT (MUR)
	Definitions	
A	The following definitions are applicable:	
B	(a) Quality Assurance is the organized evaluation of quality control systems and their implementation to provide increased, confidence in the quality of a product or service.	
C	(b) Quality Control is the implementation of a set of techniques to provide increased confidence that the desire quality is being maintained.	
D	The Contractor shall submit a comprehensive QUALITY CONTROL proposals within 14 days from date of commencement of works. The QUALITY CONTROL SYSTEMS shall be drawn up to meet the requirements set out herein and incorporating all additional requirements and controls the Contractor considers necessary for effective control and assurance of a high quality of workmanship.	
E	The Contractor shall provide dedicated and experienced staff capable of implementing the proposed QUALITY CONTROL SYSTEM . The Engineer shall comment on the QUALITY CONTROL SYSTEM within 14 days from the date of submission outlining additions or amendments considered necessary for acceptance of the QUALITY CONTROL SYSTEM . The Contractor shall meet with the Engineer and amend the contents of the QUALITY CONTROL SYSTEM according to the Engineer's comments. Amendments to the system shall be made within seven days of the Engineer's comments. The Contractor will not be able to proceed with any work on the Project until written approval of the system has been issued by the Engineer.	
F	The acceptance of the QUALITY CONTROL SYSTEM by the Engineer does not supersede or negate any other quality control conditions stipulated elsewhere in the contract documentation and in the instance of contradiction of requirements being identified specific requirements shall override general requirements. Acceptance of the system by the Engineer shall not in any way supersede, negate or alter the intent, content or interpretation of the specifications or conditions of the contract specified elsewhere in the contract documentation. Acceptance of the system by the Engineer does not in any way relieve the Contractor of his responsibility to satisfy the conditions of contract and to achieve the specified standards.	
G	The QUALITY CONTROL SYSTEM is an audit procedure and does not necessarily describe the Contractor's total responsibility in terms of quality control.	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
A	The Engineer may from time to time call for the QUALITY CONTROL data sheets for random checking of: <ul style="list-style-type: none"> • the manner in which the system is being administrated. • the technical acceptability of the contents of the sheets, and • the effectiveness of the system in controlling the attainment of the required end product 	
B	If the system is found to be inadequate or ineffective, the Engineer will have the right to declare the system or parts thereof as being areas of "non-performance". In the event of the Engineer instructing the Contractor by an Engineer's instruction of an area of "non-performance" the following options may be implemented by the Engineer at no additional cost to the Client and without any claim for delays.	
C	The structure of approvals may be altered necessitating the signature of QUALITY CONTROL data sheets by designated members of the professional team before work of a particular nature and/or in a particular area can proceed through the various check stages of the system.	
D	The structure of the system may be altered by extending the detail of checking required by the system and/or the frequency at which check sheets have to be produced.	
E	The geographical boundaries of a typical checking operation may be altered thereby requiring the Contractor to perform more comprehensive checks on smaller portions of work.	
F	The Contractor shall react immediately to an instruction by the Engineer regarding any alteration to the procedure of the system. On receipt of a Site Instruction on any "non-performance" from the Engineer the Contractor shall not proceed with any of the affected work until acceptance of the revised procedures has been obtained from the Engineer.	
G	Once the Engineer is satisfied that the revised QUALITY CONTROL procedures are effective, the Contractor will be informed by means of an official Engineer's Instruction of the extent to which the system may revert back to the principle of "Management by Exception". It is envisaged that the system should generally operate on such a basis and providing the results are satisfactory, the Contractor is not expected to attain approval of counter-signature of every QUALITY CONTROL data sheet.	
H	In instances where up front inspection is an industry norm (e.g. inspection of reinforcing by the structural engineer) or where the specification demands such inspection, the Contractor must take this into account when compiling the QUALITY CONTROL SYSTEM .	
	Carried to Collection	

ITEM	DESCRIPTION	AMOUNT (MUR)
	<p>Site records and samples</p> <p>A The Contractor must allow for</p> <ul style="list-style-type: none"> • keeping and providing records of all defective works, non- conformity works, and other works to be undertaken class by class, observations, site tests and laboratory tests on materials or sections of the work as directed. • all samples, site observations, site tests, laboratory tests and analyses as directed. • providing reports site diaries and returns as directed. • providing progress photographs as directed. • providing samples of Architectural and Engineering components as directed. • preparing of a detailed methodology for each type of repair works, remedial works, non-conformity works with checklist for each stage of work duly signed by Contractor's Site Manager/Engineer, or Technicians, and which are duly approved and closed up by the Engineer. <p>Construction Photographs</p> <p>B The Contractor must allow for the costs of construction photographs, minimum 10 nos. size 150 x 200 mm on a fortnightly basis, enclosed in Contractor's progress report and to reflect the progress of the work on site. The progress photos shall be both in printed copy and as well as in electronic version. Contractor's progress Report must be in adequate numbers to cater for all Consultants and the Employer's Representatives.</p>	
	Carried to Collection	

1.40

BILL NO.2
RAISED FLOOR IN GYMNASIUM

ITEM	DESCRIPTION	UNIT	QTY	RATE (MUR)	AMOUNT (MUR)
	<u>BILL NO.2 - RAISED FLOORING IN GYMNASIUM</u>				
	DEMOLITION & PREPARATION WORKS				
	<i><u>Note: All rates for demolition and alteration works shall allow for carting away of items being removed/demolished including debris arising, preparation of surfaces including 1 or 2 coats of paint to match existing or to receive new finishes as described and including making good to match existing finishes, as required, unless instructed otherwise. Contractor shall protect existing MEP network and cater for future MEP works as per MEP drawings, unless instructed otherwise. All salvaged materials shall be removed with care and stored in the compound within a radius of 300m as per Engineer's instruction, with detail of delivery and with a structured list of the materials and components.</u></i>				
A	Remove existing synthetic flooring (about 700 m ²) including existing timber skirting n.e. 100 mm high (about 110 m).	Sum			
B	Remove existing basketball metal frames (in 2 Nos.) with care, remove all scales and dirt and clean surfaces with wire brush, and prepare surfaces for painting; apply 1 coat of etching primer, 1 coat of calcium plumbate primer and 2 coats of white enamel gloss, all as per Manufacturer's specifications; and safely store on site and fix to height as per Engineer's instructions, n.e. 500mm above existing position, upon completion of internal works.	Sum			
C	Remove with care volley ball posts (in 2 Nos.) in new concrete floor slab and reinstate as specified before (for basketball frame) and place upon completion of works.	Sum			
	BILL NO.2 - RAISED FLOORING IN GYMNASIUM	Carried to Collection			

ITEM	DESCRIPTION	UNIT	QTY	RATE (MUR)	AMOUNT (MUR)
A	Remove existing timber wall bar with care, reinstate, apply new varnish as per Manufacturer's specification and safely store on site, and fix upon completion of internal works.	Sum			
B	Cut existing reinforced concrete floor slab with care, overall size 475mm wide and 150mm deep, including bending existing reinforcement to later merge with drain wall reinforcement and make good to any disturbed structure and finishes, as per Engineer's instructions.	m	112		
C	Ditto but 800mm wide and ditto.	m	70		
D	Demolition of existing reinforced concrete canopy including beam, overall 1.20m long and 3.20m wide and making good to disturbed structure finishes and cart away all arisings, as per Engineer's drawing no. 24-108-L2.	Nr	2		
E	Ditto but 1.90m long and 1.92m wide and ditto.	Nr	1		
CONCRETE WORKS					
NEW FLOOR DRAIN & CONCRETE FLOOR <i>(as per Eng. drawing no. 24-108-L2 Rev T0)</i>					
Excavation works					
F	Excavation works in existing subbase, 475mm wide and 325mm deep to receive new drain. Rate shall allow for carting away and make good to any disturbed structure, as per Engineer's instructions.	m	112		
G	Ditto but 600mm wide and ditto.	m	70		
BILL NO.2 - RAISED FLOORING IN GYMNASIUM		Carried to Collection			

ITEM	DESCRIPTION	UNIT	QTY	RATE (MUR)	AMOUNT (MUR)
	Concrete Works & Fillings				
	<u>New Concrete Drain</u>				
A	Insitu reinforced concrete drain 350mm wide and 300mm deep internally, with 50mm thick blinding and 125mm thick bed with slope and 125mm thick wall on one side only. Rate shall allow for formwork, reinforcement and dowelling with Epidermix 372, as specified in Engineer's drawing, and the supply and laying of Ø110mm perforated PN 10 PVC pipes to slope, and aggregates filling n.e. 300mm deep.	m	112		
B	Ditto but with walls on 2 Nos. sides and ditto.	m	70		
C	Extra-over for 100mm wide and 150mm deep concrete in between drain wall and existing concrete floor. Rate to allow for bonding agent and subbase with aggregates n.e. 150mm wide and 325mm deep, as required.	m	140		
D	Supply and fix Ø90mm PVC pipe outlet length n.e. 2.00m. Rate shall include coring in existing 200mm thick substructure wall, bends and connection to drain and existing catch pits, all to Engineer's approval.	Nr	8		
	<u>New Concrete Floor Slab</u>				
E	Concrete floor bed 125mm thick, including 150mm thick aggregates 30/40 laid on existing floor and compacted as per Engineer's specifications, 50mm thick compacted rocksand, 1 No. layer of polythene sheeting and mesh A252.	m ²	700		
	<u>Joints in concrete slab</u>				
F	Saw cut induced joint of 4mm wide and 30mm deep in 125mm thick floor slab including backing strip and filled with approved filler material, all to Engineer's specification and approval.	m	136		
G	Supply and fix keyed joint, in galvanised steel section, in 125mm thick concrete slab, as per Engineer's drawing and to Engineer's approval.	m	112		
	BILL NO.2 - RAISED FLOORING IN GYMNASIUM	Carried to Collection			

ITEM	DESCRIPTION	UNIT	QTY	RATE (MUR)	AMOUNT (MUR)
	NEW CONCRETE RAMP, STEPS & CANOPY <i>(as per Eng. drawing no. 24-108-L2 Rev T0)</i>				
A	Mass concrete laid on existing floor, about 3.53m long and 3.10m wide with thickness varying from 100mm to 325mm thick, with and including mesh A142 as top layer. Price shall allow for removal of existing tiles and screed, hacking of existing concrete floor, demolition of about half area of existing floor n.e. 150mm deep to receive mass concrete, reinstatement of existing expansion joint and supply and fixing of new polystyrene and new aluminium cover 3.10m long to Engineer's approval, laying of 25mm thick floor screed and laying of anti-skid porcelain floor tiles to match existing tiles. Rates shall include carting away of all unused material and debris arising.	Sum			
B	Reinforced 125mm thick concrete ramp about 6.00m long and width not exceeding 3.20m, having 125 mm thick sloping slab. Price shall include excavation works, backfilling, carting away, minimum 200mm thick compacted hardcore filling, minimum 200mm thick compacted crusher run, 500mm x 200mm thick concrete stripfooting with 50mm blinding, 200mm thick blockwork (exposed blockwall to be rendered with cement and sand 20mm thick and painted with anti-fungus paint), concrete ground beam with reinforcement as specified, and with brushed finish on floor. All as per Engineer's drawings and specifications.	Sum			
C	Concrete steps overall size 2.00m long and 1.92m wide, with 4 Nos. steps having 500mm wide tread and 155mm high risers, with anti-skid ceramic porcelain tiles and washed rocksand finish 50mm wide to edges including nosing. Rate shall allow for any excavation works, carting away, backfilling, minimum 50mm thick blinding, formwork, reinforcement to Contractor's proposal but minimum 130 kg/m ³ and to Engineer's approval, and 20mm thick screed to receive tiles.	Nr	2		
	BILL NO.2 - RAISED FLOORING IN GYMNASIUM	Carried to Collection			

2.5

ITEM	DESCRIPTION	UNIT	QTY	RATE (MUR)	AMOUNT (MUR)
A	<p><u>Canopy (Cont.)</u></p> <p>Roof waterproofing treatment in double layer to overhangs including upstands, in 1 No. coat of primer, then 1 No. coat of hot welded oxidised bitumen, The first waterproofing membrane shall be a SBS (Styrene - Butadiene - Styrene) elastomeric bitumen system reinforced with non woven glass fibre Md (50gm2) torched applied with a minimum thickness of 1.5 mm, the second waterproofing membrane shall be of SBS (Styrene - Butadiene - Styrene) elastomeric bitumen system reinforced with non woven glass fibre matt having a minimum thickness of 2.5mm and have a high reflective finish chips as per Specialist, to Engineer's approval, laid to slabs, walls, beams, upstands and around roof outlets. Waterproofing to continue over top of upstands or to minimum height of 150mm above finished roof slab and to be terminated with Pekay Saffbond bandage of 100mm with Acryseal 835 or equivalent with 10 years warranty, laid on waterproofing with minimum 150mm overlap, all as per Engineer's specifications and approval. Waterproofing to be laid as per Manufacturer's specifications and recommendations, having minimum 10 years warranty against leakage, materials and workmanship defects (measured net, no allowance for laps).</p>	m ²	12		
BILL NO.2 - RAISED FLOORING IN GYMNASIUM		Carried to Collection			

ITEM	DESCRIPTION	UNIT	QTY	RATE (MUR)	AMOUNT (MUR)
	OPENINGS				
	Removal of Existing Doors				
A	Remove existing double leaf metal doors of overall size about 1.80m wide and 2.10m high, and make good to disturbed structure and finishes, and prepare surface to receive existing and new openings.	Nr	2		
B	Ditto but existing aluminium glazed door overall size 3.10m x 2.50m (in 1 No.) and ditto.	Sum			
C	Ditto but door overall size 1.80m x 2.13m (in 1 No.) and ditto.	Sum			
	New Aluminium Doors				
D	Supply and fix new powder coated glazed aluminium door to match existing design, overall size 3.10m x 2.18m high, complete with heavy duty ironmongery, lock, handles and the like. Glazing shall be 8 mm thick and all joints to be watertight. Door shall be complete with approved heavy duty floor or wall mounted door stopper. Contractor shall submit shop drawing for approval.	Nr	1		
E	Ditto but overall size 1.80m x 2.10m high and ditto	Nr	1		
	New Metal Doors				
F	Supply and fix new double leaf metal door of overall size 1.80m wide and 2.10m high, in 2 equal panels, in galvanised mild steel tube frame minimum 4mm thick wall thickness and clad with galvanised steel sheet minimum 3mm thick, mild steel galvanised door frame, all spray painted as per Manufacturer's instructions to match existing colour, with and including appropriate primer. Price shall include heavy duty ironmongeries, lock, cane bolt and door handle, all in stainless steel. Door shall match existing door design. Contractor shall submit shop drawings for Engineer's approval.	Nr	2		
	BILL NO.2 - RAISED FLOORING IN GYMNASIUM	Carried to Collection			

ITEM	DESCRIPTION	UNIT	QTY	RATE (MUR)	AMOUNT (MUR)
	FINISHES				
	Floor Finishes				
	<u>Floor Screed</u>				
A	Self levelling screed, as per manufacturer's specifications, and laid to level as specified by the specialist to receive new flooring.	m ²	700		
	<u>Resilient Flooring</u>				
B	Supply and lay multi-use sports flooring "Gerfloor Taraflex" or approved equivalent, with seamless joints. Installation shall be strictly to manufacturer's instructions and shall have minimum 10 years warranty. Colour shall be to Client's approval.	m ²	700		
C	Supply and fix treated 25 mm thick meranti skirting 100 mm high, with chamfered top edge, fixed to walls with anti-corrosive screws and concealed with plugs. Timber shall be painted as per manufacturer's instructions.	m	110		
	Wall Finishes				
	<u>Internally</u>				
D	Prepare and apply 1 coat binder and minimum 2 coats of Antifungus paint, including preparation of surfaces, all as per Manufacturer's specifications.	m ²	1,260		
	<u>Externally</u>				
E	Prepare and apply 1 coat of binder and minimum 2 coats of Inatanche paint or similar approved highly flexible acrylic paint with good weathering and fungus resistance and shall be low maintenance, including preparation of surfaces, all as per Manufacturer's instructions.	m ²	1,615		
	BILL NO.2 - RAISED FLOORING IN GYMNASIUM	Carried to Collection			

2.9

2.10

BILL NO.3
EXTERNAL DRAINAGE

ITEM	DESCRIPTION	UNIT	QTY	RATE (MUR)	AMOUNT (MUR)
A	<u>BILL NO.3 - EXTERNAL DRAINAGE</u>				
	AROUND GYMNASIUM				
	French Drain				
	Excavation of trenches width 600mm and depth n.e. 1.00m in any type of soil including rock, and lay 2 Nos. Ø110mm perforated SN8 PVC pressure pipe, with boxing of size n.e. 600 x 600mm filled with aggregates 20/40 and wrapped with geotextile of type KAYMAT U 14 or equivalent, and trench backfilled with rocksand 0/4 minimum 300 mm deep. Rate shall allow for carting away of unused material, protection to earthwork, compaction as per Engineer's specifications, connection of pipes to manholes including any fittings and reinstatement of grass.	m	115		
B	Manhole				
	Construct manhole with internal size 450 x 450mm and depth n.e. 720mm, in 150mm thick infilled concrete block walls and 150mm thick concrete base and 50mm thick blinding layer. Rate shall allow for excavation in any type of soil depth n.e 920mm and carting away, trimming, backfilling and reinstatement of grass, reinforcement as described, coring to receive outlets and RC precast cover size 600 x 600 x 95mm thick.	Nr	14		
C	Landscaping works <i>(Quantities provisional)</i>				
	Make survey and carefully uproot existing palm trees, girth n.e 300mm, and plant temporarily with watering, as per Specialist landscaping Contractor. Allow for maintaining trees until replanting. Should the trees not be properly maintained and result in a bad state or die, the Contractor to replace same at his own cost.	Nr	15		
	BILL NO.3 - EXTERNAL DRAINAGE	Carried to Collection			

ITEM	DESCRIPTION	UNIT	QTY	RATE (MUR)	AMOUNT (MUR)
	<i>Landscaping works (Cont.)</i>				
A	Remove temporary planted trees and plant permanently to new location on site as per Client, including preparation of soil, supply and lay adequate thickness of approved mulch, and maintain tree up to sign of growth, all as per Specialist landscape Contractor.	Nr	15		
B	Ditto but plant new palm trees of equivalent type to match existing and ditto.	Nr	5		
	AROUND SWIMMING POOL				
	French Drain				
C	Excavation of trenches width 600mm and depth n.e. 2.50m in any type of soil including rock, and lay 2 Nos. Ø110mm perforated SN8 PVC pressure pipe, with boxing of size n.e. 600 x 600mm filled with aggregates 20/40 and wrapped with geotextile of type KAYMAT U 14 or equivalent, and trench backfilled with rocksand 0/4 minimum 300 mm deep. Rate shall allow for carting away of unused material, protection to earthwork, compaction as per Engineer's specifications, connection of pipes to manholes including any fittings and reinstatement of grass.	m	82		
	Manhole				
D	Construct manhole with internal size 700 x 700mm and depth n.e. 2260mm, in 150mm thick infilled concrete block walls and 150mm thick concrete base and 50mm thick blinding layer. Rate shall allow for excavation in any type of soil depth n.e 2460mm and carting away, trimming, backfilling and reinstatement of grass, reinforcement as described, coring to receive outlets and 150mm thick RC removable precast cover slab with slots of size 750x750mm on rebated insitu reinforced concrete coping around manhole and steps iron set at 300mm c/c, laid staggered.	Nr	8		
	BILL NO.3 - EXTERNAL DRAINAGE	Carried to Collection			

3.3

BILL NO.4
MEP WORKS

SBM BANK (MAURITIUS) LTD
UPGRADING WORKS IN GYMNASIUM AT SBM PARK, LA VIGIE
BILL NO. 4 - M&E WORKS - Bill of Quantities

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT (Rs)
	<i>Supply, deliver to site, install, connect, configure, program, test</i>				
	<i>and commission the following all in accordance with specifications,</i>				
	<i>drawings, conditions of contract etc.</i>				
	<i>Note : All rates shall be in Mauritian Rupees and exclusive of VAT.</i>				
4.1	PRELIMINARIES				
4.1.1	Allow for all costs or charges necessary for carrying out, complying with and due observance of any or all conditions of contract.	Lot	1		
4.2	EARTHING				
4.2.1	Test existing earth resistance value and report.	Lot	1		
4.2.2	Allow for reusing existing earth	Lot	1		
4.2.3	Include for identification plates at all earth terminals.	Lot	1		
4.3	NEW MAIN INCOMING DISTRIBUTION BOARD				
	<i>To be install within the length of the existing incoming power cable.</i>				
4.3.1	Reinforced Polyester Enclosure (IP55)	Lot	1		
4.3.2	mcb 4P 63A	No.	2		
4.3.3	Isolator 4P 32A - for extractor fans	No.	1		
4.3.4	mcb 1P+N 20A - for extractor fans	No.	4		
4.3.5	Include for screw type terminal blocks (Phase, Neutral, Earth) for each existing circuit. Allow for 21 nos. circuits of 2.5mm ²	Lot	21		
4.3.6	Earth Bar	Lot	1		
4.4	EXISTING DB-GYMNASIUM				
4.4.1	Survey, label, list, disconnect, remove existing electrical distribution board in presence of a representative of SBM. Safekeep the electrical distribution board.	Lot	1		
4.4.2	Reconnect all existing outgoing circuits to the terminal blocks in the new main incoming DB and label correctly.	Lot	1		
4.4.3	Reinstall the existing DB-Gymnasium, raised by about 400mm.	Lot	1		
4.4.4	Provide all necessary wiring and wireways to again feed all outgoing circuits at the main incoming DB from the raised DB-Gymnasium.	Lot	1		
	TO COLLECTION				

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT (Rs)
4.5	POWER CABLES				
	<i>All power cables to be to BS Standards/colour coding with copper conductor. Allow for all cable glands, lugs, cable identification tags, etc.</i>				
4.5.1	Allow for connection of existing main incoming power cable to the new main incoming DB.	Lot	1		
4.5.2	From main incoming switchgear to "raised" existing DB-Gymnasium 4C x 16mm ² PVC/PVC + SPVC 16mm ²	m	2		
4.6	EMERGENCY LUMINAIRES				
4.6.1	Survey, label, list, disconnect, remove existing emergency luminaires, etc. Handover to SBM.	Lot	4		
4.6.2	Supply and install new emergency luminaires, etc. complete with all light sources, fixation accessories, etc.				
	To be equivalent to Model Safe LED II 3W/3h, IP65 from PXF Lighting (to be non-maintained, automatic test, white with pictogram)	No.	4		
4.6.3	Allow for a connection box c/w blank cover plate at each existing emergency luminaire	Lot	4		
4.6.4	Allow for recessed conduits, wiring, etc. for raising of the corresponding light points by about 400mm.	Lot	4		
4.6.5	Install the new emergency luminaires at the new raised location.	No.	4		
4.7	SWITCHES				
4.7.1	Survey, label, list, disconnect, remove existing switches and switching panel, etc. Safekeep the switches. Handover the switching panel to SBM.	Lot	4		
	Note: The switching panel is for control of the luminaires at the ceiling trusses.				
4.7.2	Allow for an appropriate connection box c/w blank cover plate at each existing switch & switching panel.	Lot	4		
4.7.3	Allow for recessed conduits, wiring, etc. for raising of the switch points by about 400mm.	Lot	4		
4.7.4	Reinstall the existing switches at the new raised location.	No.	3		
4.7.5	Supply a 6 gang new switching panel and install at the new raised location.	No.	1		
	TO COLLECTION				

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT (Rs)
4.8	NORMAL SOCKET DISTRIBUTION				
4.8.1	Survey, label, list, disconnect, remove existing sockets, etc. Safekeep the existing sockets.	Lot	4		
4.8.2	Allow for a connection box c/w blank cover plate at each existing socket	Lot	4		
4.8.3	Allow for recessed conduits, wiring, etc. for raising of the socket points by about 400mm.	Lot	4		
4.8.4	Reinstall the existing sockets at the new raised location.	No.	4		
4.9	POWER TO EXISTING EXTRACTOR FANS				
4.9.1	Survey, label, list, disconnect existing wiring for the 4 nos. extractor fans, etc. at the inverters and/or the DB-Gymnasium.	Lot	4		
4.9.2	Allow for raising of the existing inverters by about 400mm	Lot	4		
4.9.3	Supply and install inverters in replacement of the two nos. faulty ones. To be equivalent to Lenze Type: ESMD152X2SFA Input 1/N/PE, 230/240V, 14.0A, 50-60Hz Output 3/PE, 0-230V, 7.0A, 1.5kW, 0-500Hz	Lot	2		
4.9.4	Provide all necessary wiring and wireways to again feed all fan circuits from the new main incoming DB, through the inverters.	Lot	4		
4.10	CABLEWAYS <i>(To be complete with all proprietary accessories)</i>				
4.10.1	Two compartment PVC trunking system 130 x 50mm	m	10		
4.10.2	Galvanised perforated steel cable tray 200mm	m	2		
4.11	DRAWINGS & MARs				
4.11.1	Preparation and submission of all required detailed shop drawings and material approval requests for approval by M&E Consultant, at least 2 weeks, prior to corresponding works being scheduled to start.	Lot	1		
4.11.2	Allow for preparation and submission of all as-built drawings and O&M manuals, in 2 hard and 1 soft copies, at least 2 weeks prior to testing of the works	Lot	1		
TO COLLECTION					

[illegible]

5

UPGRADING WORKS IN GYMNASIUM AT SBM PARK, LA VIGIE**BILL NO. 4 - M&E WORKS - Bill of Quantities**

Total brought down from priced Bill of Quantities :-

Page 1	Rs	_____
Page 2	Rs	_____
Page 3	Rs	_____
Page 4	Rs	_____
Page 5	Rs	_____
TOTAL (Excluding VAT)	Rs	=====

BILL NO.5
PROVISIONAL SUMS & CONTINGENCIES

5.1

MAIN SUMMARY

**UPGRADING WORKS IN GYMNASIUM AND
SWIMMING POOL, AT SBM PARK, LA VIGIE
MAIN SUMMARY OF BID**

ITEM	DESCRIPTION	UNIT	QTY	RATE (MUR)	AMOUNT (MUR)
	Bill No 1 - Preliminaries and General Items	FROM	PAGE	1.40	
	Bill No 2 - Raised Flooring in Gymnasium	FROM	PAGE	2.10	
	Bill No 3 - External Drainage	FROM	PAGE	3.3	
	Bill No.4 - MEP Works	FROM	PAGE	6	
	Bill No.5 - Provisional Sums & Contingencies	FROM	PAGE	5.1	
	Sub Total excluding VAT				
	<u>Less</u> Discount offered (if any)				
	Total Amount of Fixed Price Bid exclusive of Value Added Tax (VAT) Carried to Form of Bid				

Amount in Words (Fixed Price Bid)

.....

.

.....Excluding Value Added Tax (VAT)

Name of Bidder

Dated this Day of 2026

Signed

Name

In the capacity of

Duly authorised to sign on behalf.....

In the capacity of

SECTION IV
**LIST OF TENDER DRAWINGS AND
SPECIFICATIONS**

LIST OF TENDER DRAWINGS

**UPGRADING WORKS IN GYMNASIUM AND SWIMMING
POOL AT SBM PARK LA VIGIE**
List of TENDER Drawings

Drawing No	Rev	Drawing Title
24-108-L0	T0	GENERAL NOTES
24-108-L1	T0	EXISTING GROUND FLOOR PLAN - GYMNASIUM
24-108-L2	T0	REMEDIAL WORKS TO GYMNASIUM FLOOR AND DRAIN DETAILS
24-108-L3	T0	SWIMMING POOL REMEDIAL WORKS
24-108-L4	T0	DRAIN DETAILS ON PERIMETER OF GYMNASIUM

SPECIFICATIONS

S P E C I F I C A T I O N S

RECORDIAL NOTES

- A The Specification referred to in the Contract and as enclosed hereafter are subdivided in three parts namely:

Part I : Standard Specification

Part II : Civil and Structural Engineering Specification

Notwithstanding anything contained in the contract documents, the Engineering specification shall take precedence over the Standard specification in so far as they relate to Structural and Engineering or related matters.

- B All measurement and pricing notes included in the Standard specification shall however be deemed to apply to the whole of the works described in the Bill of Quantities.

PART I

STANDARD SPECIFICATIONS

SECTION 1 – GENERAL

1.1 SITE VISIT

The tenderer is advised to visit and inspect the proposed site for which he is tendering prior to submission of his tender. The successful tenderer shall be deemed to have so satisfied himself as to the nature and extent of the works and no claim for extra expense or for extension of time under the contract will be allowed on the grounds that insufficient information was given in the Tender Documents and or that the contractor was not conversant with the conditions prevailing at the site or that during the course of the work the contractor encountered unexpected difficulty which could have been avoided by inspection of the site.

1.2 MATERIALS AND WORKMANSHIP

The quality of materials, goods and standard of workmanship shall be of the best quality of their respective kinds and to the Architect's entire satisfaction and shall comply in all respect to the latest relevant British Standard Code of Practice and or Mauritius Standards referred to herein as BS COP and MS respectively unless otherwise stated.

Preambles and descriptions of materials, goods and workmanship given in any one section or trade shall apply throughout all other sections or trades of this Specifications unless otherwise described.

The Contractor's attention is drawn to his responsibilities as to defects after completion as defined in Articles 1792 and 2270 of the Civil Code.

1.3 DISCREPANCIES

The Contractor shall notify the Project Manager / Architect in respect of Materials and Workmanship specified herein, where any of the above conflict with each other or any other specified requirements.

1.4 SUBMISSION OF DOCUMENTS

The Contractor shall when so requested submit all at his own expense to Project Manager / Architect copies of relevant British Standards, Codes of Practice, Mauritian Standards, other equivalent standards for inspection; Compliance certificate in conformity with the specification from manufacturers; manufacturer's specification and recommendation for the use of materials specified.

1.5 ORDER OF MATERIALS

The Contractor shall place orders for all materials, equipment, fittings, etc. within fifteen days after being awarded the contract. He shall keep the Project Manager/ Architect informed of orders placed and of their expected delivery for use in connection with the works.

Delays in obtaining materials, equipment, fittings, etc. or non-availability of same is at the entire risk of the Contractor and will not be considered for extension of time.

1.6 **SUPPLY OF SAMPLES**

The Contractor shall allow for furnishing any sample of materials, workmanship or building components that may be required by the Architect for approval or selection including panels of rendering, blockwalls, painting, stone cladding, etc. The approved samples shall be retained on site in temporary room suitably protected and labelled for comparison with materials used in the works and shall be removed when no longer required at the Contractor's expense.

The Architect will reject any materials, workmanship or components which in his opinion is not up to the same standard of any previously approved sample and such material workmanship or component previously approved.

1.7 **REPORTS AND RECORDS**

The Contractor shall record daily the number of workpeople employed on the works in each trade together with details of delivery of materials on site and movement of plant and equipment to and from site as applicable.

He shall also keep daily records of weather conditions and works executed and tests carried out.

The Contractor shall supply free of charge photostat copy of such records to the Project Manager / Architect at fortnightly intervals from the commencement to the completion of the works. Similar records shall be kept by the Contractor for all sub-contractors employed on the project.

1.8 **PLANT AND EQUIPMENT**

The Contractor shall provide and install all necessary plants, concrete mixers, vibrators, dumpers, excavators, bulldozers, rollers, pumps, cranes, hoist, ladders, scaffolding, staging, tackle, tarpaulins, tools, vehicles and other plant (mechanical and otherwise) and allow for altering, adapting, and maintaining them as necessary for the efficient and expeditious execution of the works and at or before completion clear same from building and site and make all good, to the entire satisfaction of the Architect.

1.9 **GENERAL COSTS**

The Contractor shall allow for all costs incurred in respect of workpeople and site staff :-

- (a) Workmen's Compensation Insurance
- (b) National Pensions Fund Contributions
- (c) Sick Leave, Annual and Public Holidays
- (d) Shut down or account of cyclone warnings, weather conditions, inclement weather, etc.
- (e) Travelling time expenses, fares and transport costs.
- (f) Incentive and Bonus Payments
- (g) Severance and Subsistence Allowance
- (h) Protective and Safety clothing and equipment.
- (i) Any other costs necessary under the application of the Building Industry Remuneration Order and the Labour Act.

The Contractor must make himself acquainted with current ordinances and Government regulations regarding the movement of housing, security and control of labour, labour camps, transport, etc. and make allowance for all costs incurred therewith or arising from the employment of workpeople and site staff.

1.10 **WORKING RULES & REGULATIONS**

The Contractor shall conform to all Regulations, By Laws and other requirements of the Local and Central Administration. He shall give all notices and pay all fees legally demandable by such Administration. If anything shown on the drawings or mentioned herein conflicts with such regulations, the Contractor shall inform the Architect and obtain his instructions before proceeding.

1.11 **HOARDING, BARRICADES AND SCREENS, GANTRIES**

The Contractor shall provide and erect temporary hoarding, gantries, barricades and screens with gates, access doors and fastenings, for the proper execution of the works, for the protection of the workmen, public and occupants of the adjoining premises and for meeting the requirements of any local or other authority.

The whole of the site shall be properly fenced with temporary hoardings and shall be removed and cleared away from site on completion of works, all to Architect's satisfaction.

1.12 SHORING

The Contractor shall provide for upholding sides of all exposed excavated surfaces with timbering shoring or other methods approved by the Architect.

The construction and efficiency of the shoring for the purpose for which it is erected shall be the entire responsibility of the Contractor. Should any subsidence or any other damage occur due to the inefficiency of the shoring or any other support provided, the damage shall be made good by the Contractor at his own expense.

1.13 MAINTAIN AND PROTECT PUBLIC PROPERTY ETC

The Contractor shall maintain and protect public and private carriageways, footing, kerbs, pipes, duct, sewers, service mains, underground and overhead cables, etc. and keep approaches to the site clear of mud throughout the execution of the works, and make good or pay for the reinstatement of any damage caused either directly or indirectly by the execution of the works even if done by nominated suppliers of Sub-contractors to relevant Authorities satisfaction at the Contractor's expense.

1.14 WATCHING

The Contractor, from commencement to completion of he works both day and night including Sunday and Public holidays, shall allow for all necessary watching for the security of the works.

1.15 POLICE REQUIREMENTS

The Contractor shall allow for ascertaining and complying with police requirements and for all costs in connection therewith.

1.16 ANNOYANCE TO NEIGHBOURS, ETC.

The Contractor shall allow all costs in connection for executing any work which in the Architect's opinion is likely to cause annoyance or inconvenience to neighbours in the vicinity, at such times during normal working hours as the Architect may direct.

1.17 OVERTIME

If the Contractor deems it necessary to execute work outside normal hours in order to complete the works by the prescribed date or for any other purpose, he shall obtain the consent of the Architect before doing so.

1.18 ACCESS FOR INSPECTION AND MEASUREMENT OF WORKS

The Contractor shall provide at all times during the execution of the works and the Defects Liability Period proper means of access, with ladders, gangways, etc. and necessary attendance to move and adapt same as directed for the inspection or measurement of the works by the Project Manager, Architect / Quantity Surveyor or his representatives.

1.19 TEMPORARY LIGHTING

The Contractor shall provide all necessary artificial lighting and power for the execution and security of the works and for the protection, with all meters, temporary wiring and fittings, etc. pay all charges and alter, adapt and maintain the temporary works as necessary, and remove and make good at completion.

1.20 TEMPORARY BUILDINGS ETC.

All temporary buildings, etc. shall be situated in approved positions. The Contractor shall provide the following:-

- Proper sheds, etc, for the storage and protection of materials, goods, tools etc, and for the execution of work which may be prepared on site.
- Proper sheds and messrooms for the workpeople.
- All necessary sanitary accommodation for the workpeople and site staff and shall deodorize the ground after removal.
- All other amenities, etc, in accordance with the Building Industry Ordinance and Construction Regulations.
- Offices for the Contractor's staff.

1.21 NOTICE BOARD

The Contractor shall allow for supply and erection of a suitable name board displaying.

- (i) Title of project
- (ii) Name of Employer
- (iii) Name of Project Manager / Architect / Engineer / Quantity Surveyor
- (iv) If the Contractor wishes names of Contractor and Sub-Contractors

Layout of the name board size and type of lettering shall be approved by the Architect.

1.22 ACCURACY OF WORK

The whole of the Works shall be constructed to achieve levels of accuracy within the permissible deviations recommended in BS 5606 unless specified otherwise.

The Contractor shall ensure that all materials, elements and components of the building fit together as designed. Work which fails to meet the specified levels of accuracy must not be rectified without approval. The Contractor shall submit proposals for such rectifications and meet all costs arising, including effects on other work. However, should approval not be given thereby necessitating removal and replacement of the work, the Contractor shall do so at his own expense.

1.23 SETTING OUT

The Contractor shall set out the Works using methods and measuring instruments described in BS 5606 and shall inform the Architect when overall setting out is complete and before commencing construction.

The Contractor shall allow for providing all necessary instruments and assistance for checking the setting out and levels.

The Contractor shall check all dimensions and levels both on drawings and site, particularly the correlation between components and work in place and shall not order materials or any components or carry out the work until any discrepancies if any have been resolved with the Architect.

Details of all grid lines, setting out stations, benchmarks and profiles shall be recorded on the site setting out drawing and retained on site throughout the contract and handed over to the Architect on completion. The cost thereof is deemed to be included in the Contractor's rates.

1.24 PREPARATION AND KEYING OF BASES AND BACKGROUNDS

The Contractor shall ascertain the nature of the surface, after which the backgrounds shall be prepared and keyed where necessary in accordance with:

- (a) the recommendations in any applicable British Standard and Code of Practice documents.
- (b) the specification and recommendation of the Manufacturer of the materials to be laid thereon or applied or fixed thereto.
- (c) best building practice

so as to be suitable to receive and, where keyed, to ensure adhesion of the materials to be laid thereon or applied and fixed thereto.

1.25 ADHESIVES AND FIXINGS GENERALLY

Where and to the extent that the types of adhesives and fixings and / or types, sizes and spacings of fixings are not fully specified they shall be suitable for the intended purpose having regard to the nature of and compatibility with the materials being fixed and fixed to ; the size and weight of the fixture and the conditions under which it can reasonably be expected to be used; the specifications and recommendation of the Manufacturer of the adhesive or fixing, the material being fixed, the material being fixed to.

Adhesives and fixings shall conform to the latest requirements in any British Standard or Codes of Practice document or Mauritian Standards and be used in accordance with:

- (a) the specification and recommendation of the Manufacturer.
- (b) the recommendations in any applicable British Standard or Code of Practice documents or Mauritian Standards.
- (c) best building practice so as to retain the fixture securely in position.

1.26 PRICING

All rates inserted in the Bills of Quantities shall cover all costs, charges and profit that may be considered necessary for the carrying out and observance of the provisions of General Specification unless otherwise specified.

1.27 DISCREPANCIES

During the progress of the works, the Contractor shall satisfy himself as to the correctness of all drawings and measurements. If the Contractor finds any discrepancy in the drawings or between the drawings and the specifications, he shall immediately refer the same to the Architect who shall decide which shall be followed. Figured dimensions shall be taken in preference to the scale mentioned on or attached to any drawings.

1.28 WORKING DETAILS

Two copies of all drawings and of the Specification shall be furnished by the Architect, free of cost to the Contractor for his own use. The Architect shall furnish to the Contractor within a reasonable time after the receipt by him of a written request for the same, any details which in the opinion of the Architect are necessary for the execution of any part of the work, such request to be made only within a reasonable time before it is necessary to execute such work in order to fulfill the Contract. One copy of the drawings, details and Specifications shall be kept on the Works until the completion thereof and the Architect or his representatives shall at all reasonable times have access to the same. All copies of the drawings, details and specifications shall be returned to the Architect by the Contractor on the completion of the Contract.

1.29 DATUM

The levels of the works are related to the Employer's survey plan. All temporary benchmarks required by the Contractor for the execution of the works shall be provided by the Contractor at his own expense.

1.30 PROGRAMME AND PLAN OF OPERATIONS

The whole of the works to be constructed by the Contractor under this Contract shall be completed within the time stated in the tender documents.

The Contractor shall, before commencing work on site, submit to the Project Manager/ Architect, for his approval, a full detailed programme showing the order of procedure and method by which he proposes to carry out the construction and completion of the works, and particulars of the organisation and staff proposed to direct and administer the performance of the Contract. The Project Manager / Architect may ask the Contractor to amend the programme at this or any other time.

The works shall be carried forward to completion with the greatest possible expedition, to the satisfaction of the Project Manager / Architect, in accordance with the programme.

1.31 UNITS

All quantities in the Bills of Quantities, Specifications and the Drawings are given in the "System International D'Unités" (SI Units).

1.32 TEMPORARY WORKS

After the Contract is awarded and before the works on site commence, the Contractor shall submit to the Architect, for his approval, drawings showing the proposed location and general arrangement of his offices, workshops, stores, quarters, access roads and other temporary works required for the proper and expeditious execution of the permanent works.

The Contractor shall allow for paying all rates and other charges which may be made by local or other authorities in connection with temporary buildings erected for the purpose of the Contractor.

Use of existing building as temporary building by the Contractor shall only be made with the consent of the Architect, but with the understanding that the Contractor shall be responsible for any damage incurred and for reinstating the premises to their original condition to the entire satisfaction of the Architect.

1.33 PRIVATE ACCESS

The Contractor shall obtain his own information with regard to access to all parts of the site of the works if he wishes to make use of routes through private property then he must make all arrangements with the owners. The Condition of the surfaces of the private roads, paths or yards used or crossed by him by sub-contractors or by nominated suppliers for the purpose of the contract shall be kept clear of mud and in reasonable repair during its progress and on completion he shall put the roads, paths or yards in proper repair at least equal to the original condition of the roads, paths or yards used or crossed by him and to the satisfaction of the Architect, all at his own cost. In general, the Contractor is to regular the character of his transport to ensure that no undue damage is caused to any roads, tracks or properties within the area of the works, public or otherwise.

1.34 CONTROL OF WORKMEN

The Contractor shall keep all persons (including those employed by sub-contractors) under control and within the boundaries of the area allocated to him.

1.35 CARE OF WORKS

He will be held responsible for the care of the existing premises and the works generally until their completion, including all work executed and materials, goods and plant (including those of sub-contractors and suppliers) deposited on the site, together with all risks arising from the weather, carelessness of workpeople, damage or loss by fire, theft, cyclone or any other cause; and he shall make good at his own expense all such damage or loss.

The whole of the temporary works, plant, equipment, and appliances used on the works will be the liability of the Contractor in regard to construction, sufficiency, safety, maintenance and removal on completion of the Contract and approval by the Architect shall in no way relieve the Contractor of this liability.

1.36 PROTECTION FROM WATER AND SEWERAGE

The Contractor shall keep the whole of the works free from water and sewerage and accept all risks of flooding in view of the high-water table or from any cause whatsoever. The Contractor shall provide and maintain the necessary pumping plant to deal with all water and sewerage which may flow into trenches or excavations and shall allow in his prices for such plant, pumping, shoring, temporary drains, sumps, etc and shall clear away and make good at his own cost and to the satisfaction of the Architect any damage caused.

1.37 EXISTING SERVICES

The Contractor shall make such provisions as may be required by the authorities concerned for the support and protection of any water, main, sewer, telephone cable, power cable or other services met with on the site. Any diversion of those existing services including protection thereof shall be treated as variation under terms of the Contract, but should the authorities concerned prefer to carry out the work with their own workmen the Contractor shall be paid net amounts plus five per cent on such work. The Contractor shall pay such amounts and recover the costs through payment certificates.

1.38 DAMAGE TO ESSENTIAL PUBLIC SERVICES

In the event of the Contractor damaging water, sewerage, electricity, or telephone services, whether these have been marked or not, the Contractor shall immediately inform the authority concerned and advise the Architect without delay and the cost of making good damage shall be at the expense of the Contractor.

1.39 EXPLOSIVES AND BLASTING

The use of explosives for blasting for any purpose whatsoever shall not be permitted on this Contract.

1.40 SITE OFFICE FOR THE ARCHITECT

The Contractor shall erect, maintain for the duration of the Contract and remove on completion, one furnished and well-ventilated office on site and shall provide full time attendance for general cleaning duties.

The office shall be subject to Architect's approval with appropriate meeting table and chairs for a minimum of 10 persons for convening meetings and other site works on a regular basis.

1.41 COVER UP AND PROTECT

The Contractor shall cover up and protect the works from the weather and suspend all operations during weather conditions, which, in the Architect's opinion, would be detrimental to the works.

1.42 CLEARING AWAY

The Contractor shall take down and clear away all plant and temporary work, including sheds, messrooms, sanitary conveniences, offices etc, unless otherwise described and make good.

The Contractor shall remove all existing rubbish and debris and surplus materials from the site as they accumulate and at completion and clean all surfaces, internally and externally, remove stains and touch up paint work and polished work, and leave the works clean and to the satisfaction of the Architect at completion.

SECTION 2- DEMOLITION / ALTERATION / RENOVATION

- 2.1 Notwithstanding the provisions of Clause B.5.1 of the principles of measurement (International) for works of construction, June 1979, all materials described as “set aside for re-use and or salvaged materials” shall become the property of the Employer unless otherwise specified. The Contractor shall allow for cleaning, transporting and storing on site unless otherwise specified as directed by the Architect. All other demolition materials shall be understood to become the property of the Contractor and shall be cleared away and disposed off site.
- 2.2 Demolition works comprise of demolition of items, removal with care of components, units as specified, cutting of existing structures, making good to disturbed existing structures, finishes, including shoring and supporting to same, all to Architect’s satisfaction.

SECTION 3- EXCAVATION AND EARTHWORK

3.1 INSPECTION OF SITE

The contractor is deemed to have visited the site and to have ascertained the nature of the soil, type of rock, bedrock and the like to be excavated and shall be responsible for making his own judgement as to the nature of the ground and subsoil and carrying out any trial pit or other site investigation.

The Contractor must however use his own judgement as to whether conditions revealed by trial pits are consistent over the whole site.

3.2 ORIGINAL GROUND LEVELS

The levels shown on the various drawings relate to Ordinance Datum unless otherwise stated.

The Contractor shall be responsible for setting up and maintaining a site datum level accurately ascertained from this work.

Should the Contractor not be satisfied with the accuracy of the levels indicated on the drawings, he must give written notice thereof to the Architect before any work is commenced, otherwise no claim in respect of inaccuracy of levels will be entertained.

3.3 STARTING LEVELS

The term "Formation level" shall be deemed to be the surface of the ground after reduced level excavation stripped level or after filling to make up levels.

In preparing the Bills of Quantities it has been assumed that, unless otherwise described, the Contractor will carry out the stripping and or reduced level excavation before proceeding with any other items of excavation; the Contractor may execute the work in any order he wishes, but no consequent adjustment will be made to the measured quantities and any re-measurement will be carried out on the same basis as the original measurement.

Any excavation through deposited earth from previous excavation will be entirely at the Contractor's own expense.

The term "Original Ground Level" shall mean the existing ground level, as per the contour of the surveyed plan provided by the Architect / Employer.

3.4 **LIABILITY FOR EXCAVATIONS**

Notwithstanding any authorisations, approvals or directions given by the Architect with regard to excavations or any matter connected therewith, the Contractor shall be responsible for taking the necessary safety precautions and for any damage arising from the operations.

Excavations shall be carefully planned and executed to ensure that boundary walls, adjacent property and trees are adequately supported at all times and their safety shall be the Contractor's responsibility. No tree roots shall be left uncovered during excavation.

3.5 **TOP SOIL**

Top soil retained on site for reuse shall be kept in separated spoil heaps and protected from contamination by subsoil, cement, broken concrete, aggregates and the like or by petrol and other substance likely to impair the growing qualities. Topsoil shall not remain unused for more than 12 months unless the topsoil is overturned to prevent it becoming stale. Weed growth on topsoil heaps shall be controlled by chemical means to prevent soil becoming polluted by weed seeds. All top soil is to be spread as directed by the Architect.

3.6 **DEALING WITH WATER**

The Contractor's attention is drawn to the depths below ground level of the foundations and the consequent possibility of having to deal with water. Unless otherwise specified the contractor will be required by pumping or other means to keep the excavations dry during construction. Care must be taken, especially if ground dewatering equipment is used, that covering of the ground water table in the vicinity of the excavations or extraction of fine particles of soil from surrounding ground causes no damage to adjoining property.

3.7 **SHORING OF EXISTING STRUCTURE**

The Contractor's attention is drawn to the requirements for shoring parts of the structure of the existing building during construction and the consequent need to carry out the excavation in stages. He is not allowed to excavate within the proximity of the existing structure without the drawings and/or instructions by the Engineer to do so.

3.8 **UNDERPINNING (WHERE APPLICABLE)**

Underpinning of the existing buildings on sides of the new structure shall be carried out as per details on the drawings and further instruction on site by the Engineer. No excavation for the new base etc., will start before completion of underpinning. Excavation shall be to the widths and depths shown on the drawings or as instructed by the Engineer. Any excess excavation shall be made up with concrete grade 15, as directed by Engineer.

3.9 **PLANKING AND STRUTTING**

Where necessary sides of excavations are to be secured by planking and strutting to Engineer's approval at no extra cost.

3.10 **EXCAVATION DIMENSIONS**

The excavations are to be executed to the widths and depths of the concrete or other foundations required shown on the drawings or to greater depths if instructed by the Engineer to obtain satisfactory foundations.

If the contractor excavates to any widths or depths greater than those shown on the Drawings, or as instructed by the Engineer he shall be at his own expense fill in such widths or depths beyond that instructed or shown with concrete Grade 15 to the satisfaction of the Engineer.

3.11 **ROCK**

"Rock" means any hard material, bed rock, rock strata which in the opinion of the Engineer can be removed only by use of compressors, wedges, special plants or explosives and the Engineer's opinion shall be final. Decomposed rock, tuff or other material which can be removed by pick, traxcavator or other mechanical plant will not be classified as rock may, if approved by the Engineer, be used as hardcore filling but broken to gauge as approved by the Engineer.

3.12 **BLASTING**

No blasting will be permitted.

3.13 **TRIMMING EXCAVATION IN SOIL**

The lower 100 mm of soft material in the bottom of excavation shall not be removed until immediately before placing concrete.

3.14 **TRIMMING EXCAVATION IN ROCK**

The faces and bottom of excavations in rock shall be cleaned of all loose material to the satisfaction of the Engineer by brushing or washing with waterjets before placing concrete. Any extra concrete required to make up level and or instructed by the Engineer as a result of this unevenness of the faces and bottoms of such excavation shall be deemed to be included in the rates for the items of excavations and or concrete related thereto.

3.15 **COLLAPSE**

Should any ground fall in due to the omission or insufficiency of earthwork support or due to any cause whatsoever, it must be dug out and removed or disposed as directed and the excess excavation should be filled up with concrete grade 15 to Engineer's approval, all at the expense of the Contractor.

3.16 NOTICE

The contractor is to give not less than 24 hours' notice to the Engineer when excavations are complete and no concrete shall be cast until the excavation have been inspected and approved in writing.

3.17 MATERIALS FOUND IN EXCAVATIONS

No material found in the excavations is to be used in the works without the written permission of the Engineer.

3.18 FILLING

Filling under floors or paving shall consist of approved local field stone graded to max 150 mm size placed in layers not exceeding 225 mm thick. Each layer shall be watered and well rolled and compacted by a ten tonne roller or as approved by Engineer.

Hardcore filling is measured nett and to compacted thickness. No allowance has been made for decrease in bulk after compaction.

Top layer of the hardcore shall be levelled or graded to falls as required with crusher run and blinded with 15 mm layer of washed rocksand, well-watered and rolled to receive concrete as described.

Handpacking of hardcore to form vertical or battered faces, sinhings and compactive of bottom of excavation, formation level shall be deemed to be included in the rate of filling, unless otherwise specified.

Backfilling around foundations shall be with selected excavated material free from deleterious material laid in layers not exceeding 200 mm thick, well compacted and consolidated.

3.19 AREAS OF CAVES IN FOUNDATIONS

In the event of caves found in the foundation, the Engineer shall instruct the Contractor to carry out site investigation by rotary core drilling at selected places in the excavations to locate the areas of the caves and filling the same with concrete grade 15 by a specialist subcontractor to the Engineer's satisfaction.

3.20 DIMENSIONS AND LEVELS

The Contractor is to submit to the Quantity Surveyor with all necessary levels, formation levels, levels or top of blinding layer, as approved by the Engineer.

3.21 **EARTHWORK SUPPORT**

Earthwork support, as an item has been provided in the Bills of Quantities for the Contractor to price earthwork support which shall be deemed to include the provision of everything necessary for adequately maintaining the sides of all excavations and for keeping excavations clear of all fallen materials, rubbish or debris and boards or coverings as required. This item shall be not subject to Adjustment for whatsoever.

3.22 **RATES FOR EXCAVATIONS**

The rates for all excavation including the excavation for drains and service ducts shall include :

1. Excavating in any type of soil, including rock, bedrock, rock strata and including excavating below ground water levels or below water level.
2. Breaking up and removing any existing foundations, walls, slabs, footings tarmacadam paving, existing tracks below ground level or any other obstructions encountered during the course of the excavation.
3. Excavating in ground interspersed with boulders, rubble filling or waste material and grubbing up, cutting back and sealing off old service mains, pipes cables, timber and drains or other obstructions.
4. Excavating next to existing roads, footpaths, existing buildings, existing services and around existing services etc. The cost of any necessary measures to be taken in such instances shall be borne by the Contractor.
5. For the disposal of the excavated material to a suitable tip to be provided by the Contractor and or multiple handling of the excavated material.
6. For excavating and trimming the final 100 mm down to formation level by hand immediately prior to concreting.
7. For trimming sides, levelling and ramming bottoms and forming steppings unless otherwise described.
8. For trimming faces and bottom of excavation in rock, including cleaning as described.
9. For removing all ants, pests, termite nests or other parasites over area of site and backfilling
10. For all necessary barricades and watching and warning, lighting and protection.
11. Any additional excavation that may be required beyond the net width of the structure for working space, timbering or other temporary work, formwork to sides of foundations and any subsequent backfilling.

SECTION 4 - CONCRETEWORK

4.1 ENGINEER'S SPECIFICATION

The whole of the concrete work shall be specified in the Engineer's specification included in the Tender Documents. The Engineer's specification shall take precedence over this standard specification in so far as they relate to structural matters. The Contractor is to allow in his rates for all items therein. In the event of the Contractor leaving any item unpriced, he will be deemed to have considered that his rates are adequate to enable him to perform the services and obligations as described in the Engineer's Specification without extra charge.

4.2 CODE OF PRACTICE

All workmanship, material, tests and performance in connection with the reinforced concrete work shall be in strict compliance with the latest edition of British Standard Code Practice CP 110. "The Structural use of Reinforced concrete in Buildings" where not inconsistent with the preambles.

4.3 CEMENT

Cement for use in the works shall unless otherwise specified, be Ordinary Portland Cement to BS 12. It shall be fresh and free from lumps or partly set particles. Cement, which in the opinion of the Engineer is sub-standard, shall be rejected and removed from site.

Cement shall be stored in watertight shed the floor of which shall be raised clear of the ground. Consignments shall be used in the order in which they are delivered.

4.4 WATER

Water used for mixing concrete shall be from an approved source, clean fresh, free from acid, oil, pollution from industrial or farmyard waste or other organic or inorganic matter in solution or suspension in such amounts as to impair the strength or durability of the concrete.

4.5 **AGGREGATES**

Aggregates shall conform to the requirements of BS 882 and samples of all aggregates shall be submitted to the Engineer for the approval before work commences. Fine aggregates shall consist of one part of washed coral sand and two parts of coarse rock sand or such other proportions as the Engineer may authorised The sand shall be clean, strong, durable and free from salt, earth loam, dust, organic matter or other deleterious substances. It shall be graded with the limits specified by BS 882. Fine aggregated shall be washed and / or sieved if required by the Engineer at no extra cost.

Coarse aggregates shall be crushed blue basalt stone obtained from an approved source. The aggregates shall be roughly cubical in shape, clean, hard, non porous, free from dust, laminated or flaky pieces and any impurities in materials which may adversely affect the strength or durability of the concrete. It shall be graded in accordance with BS 882 for its respective nominal size.

If coarse aggregates conforming to the above grading are not reasonably obtainable, the Contractor shall supply two or more sizes of otherwise satisfactory aggregates and if approved the aggregates shall be stored on site separately for each size and mixed in proportions to be directed by the Engineer at no extra cost.

Aggregates shall be stockpiled on paved areas or boarded platform in separate units to, prevent intermixing. On no account shall aggregates be stockpiled on the ground.

4.6 **CONCRETE PROPORTIONS AND MIXING**

Unless otherwise directed or specified, concrete aggregates shall be measured by volume in accurately made and approved gauge boxes to the proportions specified and / or shown on the drawings.

Cement shall be measured by weight. One or more complete bags of 50 kg shall be used for a single batch of concrete. The cement and aggregates shall be mixed for at least two minutes after the water has been added. Only sufficient water to produce dense concrete of adequate workability shall be added.

One or more of the following grades of concrete as specified on the structural drawings shall be used:

Grade 35	1:1:2
Grade 30	1:1.8:2.8
Grade 25	1:2.4:3.8
Grade 20	1:2.7:4.2
Grade 15	1:4:6

Unless otherwise specified coarse aggregates for the above mixes shall be graded from 10 mm to 20 mm. However, 10 mm to 35 mm-graded aggregates may be used in mix grade 15 & 10 subject to the approval of the Engineer. Slump of the concrete shall not exceed 60 mm.

4.7 **CONCRETE PLACING AND CURING**

Concrete shall be placed in its final position in the moulds or forms within 20 minutes of mixing and shall not be subsequently disturbed. Concreting shall be carried on continuously up to predetermined construction joints as directed by the Engineer. It shall be placed in layers and worked around the reinforcement to fill all corners of the formwork.

All reinforced concrete shall be compacted by an approved type of vibrator, but shall not be over vibrated to bring cement and fine aggregate to the surface.

As soon as possible after the initial set has taken place all exposed concrete shall be covered as directed by Engineer and kept constantly wet for at least seven days.

4.8 **CONCRETE TESTS AND STRENGTHS**

Unless otherwise instructed the Contractor shall provide at his own cost for the making and testing of concrete test cubes in accordance with BS 1881, in standard steel moulds. The cubes shall be forwarded to an approved testing authority at 7 or 28 days. The contractor shall keep a record of all cubes made with details of cube markings and test results. A copy of this record shall be submitted to the Engineer when each test result is received.

The concrete strengths as determined by the test tubes shall give the following minimum strengths for each grade specified.

<u>Grade</u>	<u>Nominal Mix</u>	<u>Minimum 7-day strength</u>	<u>Minimum 28 Day strength</u>
		<u>N / mm²</u>	<u>N / mm²</u>
35	1:1:2	24	35
30	1:1.8:2.8	22	30
25	1:2.4:3.8	17	25
20	1:2.7:4.2	14	20
15	1:4:6	10	15

The strengths above are the minimum acceptable crushing strengths at 7 and 28 days. The average crushing shall be at least 10% above the minimum strength.

4.9 **CONSTRUCTION, EXPANSION AND CONTRACTION JOINTS**

Construction joints in concrete shall be made only at positions predetermined and agreed with the Engineer. Concrete shall be placed continuously until completion of the work between construction joints. Such joints shall be truly vertical or horizontal as the case may be, except that in inclined members the joints shall be right angles to the axis of the member. Vertical and inclined joints shall be formed by using temporary stop boards. The provision of such boards shall be deemed to be included in the Contract Sum and joints shall not be measured as shuttering. A record of all construction joints shall be maintained by the Contractor and a record copy to the Engineer. Floor slab and beams shall be cast in one operation.

Construction joints shall be formed at distance not greater than 12 metres. No concrete shall be poured at this formed joint be the lapse of 48 hours. The spacing between construction joints ground floor on hardcore shall be not greater than 6 metres. Ground floor slabs shall be cast before walling above.

Expansion and contraction joints shall be formed in the positions to the details shown on the drawings.

4.10 **DEFECTS IN CONCRETE**

Any honeycombing, cavities or other defects in concrete shall on account be patched or repaired but shall be brought to the attention of the Engineer who will give instruction for the action to be taken. All remedial works shall be at the Contractor's expense.

4.11 **FORMWORK**

All formwork and shuttering shall be of sound timber or other applicable material and of adequate sizes, strength and construction to with the loading from the placing and consolidation of concrete without distortion, springing or other movement. All joints shall be sufficiently tight to prevent leakage of cement grout and to avoid the formation of fins or other blemishes.

The following minimum intervals of time shall be allowed between placing concrete and removal of shuttering:

	<u>Days</u>
Beam sides walls and columns	2
Slabs with props left in place	7
Removal of props to slabs	14
Beam soffits with props left in	10
Removal of props to slabs	14
Cantilever beam and slabs with props left in	14
Removal of props to cantilever beams and slab	21

The contractor shall be responsible for any injury to the work any consequent damage by or arising from premature removal of shuttering centering or supports.

4.12 **CONCRETE COVER TO REINFORCEMENT**

Unless otherwise directed or shown on the drawings, concrete cover to reinforcement bars in any face shall be: The greater of the diameter of the bar or the following dimensions:

Foundations against earth	75mm
Foundations against blinding	50mm
Columns and ground beams (links)	30mm
Beams (links) and walls	20mm
Slab	15mm

The specified concrete cover shall be maintained by the use of 50 x 50 concrete spacer blocks made with 1:11/2" cement and sand mortar, which are cast length of 18 SWG annealed wire for tying to the reinforcement bars. Such spacer blocks shall be so spaced as to ensure a constant cover to the reinforcement bars, but in no case shall the spacing exceed 1.00 m in any direction.

For hollow pot slabs spacer blocks shall be of the correct size to give the specified width of rib.

4.13 **STEEL REINFORCEMENT**

The steel reinforcement shall comply with the latest requirements of the following British Standards:

Round Mild, Medium Tensile and High Tensile Steel Bars	to MS 10
Hot rolled deformed bars for the reinforcement of concrete	to MS 10
Cold twisted steel bars	to MS 10
Fabric reinforcement	to BS 4483
	to BS 4482

It shall be in metric sizes as detailed on the drawings. It shall be in lengths not exceeding 12 metres. No claim on account of non-availability of reinforcement in specified lengths will be entertained; price of reinforcement in schedule of rate shall include for cutting, bending and all wastes.

All reinforcement shall be free from oil, grease, dirt, paint and loose rust scales, etc., and the Contractor must allow for cleaning wire brushing, etc. as necessary to achieve this. All steel bars must be cut and bent cold in accordance with BS 1478 and to the dimensions shown on the drawings.

Steel reinforcement shall be accurately placed in position as shown on the drawings and shall be secured against displacement during concreting by using 16 SWG annealed binding wire or suitable clips at all inter – sections. Concrete or metal supports, spacers or metal hangers shall be used to ensure that the correct position of the steel bars and specified cover is maintained.

The contractor shall give a minimum of two days notice to the Engineer of his intention to concrete any portion of the works to enable an inspection of the reinforcement and shuttering to be made. The carrying out of any such inspection will in no way relieve the Contractor of his responsibility for fixing the reinforcement in accordance with the drawings or the provisions indicated therein and to ensure the specified cover. Any failure in the concrete work where the reinforcement is found to be not in accordance with the drawings or the provisions indicated therein and to ensure the specified cover.

Any failure in the concrete work where the reinforcement is found to be not in accordance with the drawings or not in the correct position will be the sole responsibility of the Contractor. Such liability will include for any consequential delays in completion of the works or any claims arising whatsoever and for the repair of the structure as directed by the Engineer.

4.14 **FABRIC REINFORCEMENT**

Fabric reinforcement shall be electrically cross-welded steel wire and reinforcement to BS 1221 or 4483 and of the size and weight specified.

The fabric shall be free from scale, rust, grease or other substance likely to reduce the bond between the steel and the concrete and shall be laid with minimum laps of two spacing in both directions and bound with No 18 SWG annealed iron wire. The Contractor is to include in his price for providing such laps.

4.15 **POSITION OF ELECTRICAL CONDUIT**

Unless otherwise instructed by the Engineer all electrical conduits to be positioned within the reinforced concrete shall be fixed inside the steel cages of beams and columns and between the top bottom steel layers in slabs and similar members. Conduit runs over 25 mm diameter shall be approved by the Engineer before the conduit is fixed.

4.16 **TOLERANCES**

The surface of the concrete shall be finished to a wood float finish to the levels, falls and crossfalls, as directed or shown on the drawings and shall be subject to the following tolerances:

1. The level shall be within + or – 6 mm of the levels directed.
2. The falls shall be within 10% of the falls directed.
3. The smoothness shall be such that departures from a 3.0 m straight edge laid in any direction shall not exceed 3 mm.

Minor irregularities shall be made good by the use of a steel float but in no circumstances shall mortar be used to make good the surface.

4.17 **PRECAST CONCRETE**

Precast concrete shall be cast in properly made strong moulds true to the shapes required. Formwork described as “fairface” the moulds shall be lined with hardboard, sheet metal or other approved material. The concrete shall be thoroughly vibrated into the moulds and shall not be removed from them until seven days of placing the concrete, but the sides may be removed after two days providing the concrete is not damaged by so doing.

The precast work shall not be cast under cover and shall remain under the same for seven days after removal of the moulds. During the whole of this period the concrete shall be protected by the hessian or other approved material kept wet. It shall then be removed from the cover and stacked in the open for at least seven days. All angles and prominent parts are to be suitably protected from damage during the execution of the works.

4.18 **FILLER BLOCKS (for hollow for slabs)**

Precast concrete hollow filler blocks shall be to the shapes and sizes as shown on the drawings and shall comply with Bs 2028 and of strength or gross area of 3.5 N / mm^2 . The ends of the block facing beams shall be filled in for 25 mm depth.

4.19 **WATERPROOF CONCRETE**

Where “waterproof concrete” is required, unless otherwise specified, Sika Waterproofing Compound or other approved to be added to the mixing water strictly in accordance with the Manufacturer’s instructions and unless otherwise directed.

4.20 **WATERBAR**

Waterbar shall be PVC waterbar or equivalent of approved manufacture and shall be provided in the positions indicated on the drawings.

Joints shall be heat welded in accordance with the Manufacturer’s instructions. Where the waterbar is to be fixed vertically, approved metal clips shall be provided to suspend the waterbar from the reinforcement. Formwork supporting waterbar or used to form a starter containing waterbar shall be carefully constructed and to the exact details shown on the drawings.

No concreting will be permitted to portions where upstand starters form an integral part until the formwork to the starter has been fixed and approved by the Engineer.

4.21 **CHASES AND HOLES**

Form of all chases, holes, etc. in concrete work as required by other trades and make good thereafter.

4.22 **CONCRETE SURFACE FINISH TO FLOORS**

Where a tamped finish for concrete surfaces is specified, the surface shall be a levelled and floated uniform plain or ridged finish which shall not be disturbed in any way after the initial set and during the period of curing; surplus concrete being struck off immediately after compaction. Any additional cement mortar required shall be allowed therein to obtain the uniform plain or ridged finish.

Where a wood float finish is specified, floating shall be done after the initial set of the concrete has taken place and the surface has hardened sufficiently. The concrete shall be worked no more than is necessary to produce a uniform surface free from marks. Any additional cement mortar required shall be provided as before described.

Where hard smooth steel-trowelled finish is specified, trowelling shall not commence until the moisture film has disappeared and the concrete has hardened sufficiently to prevent excess laitance from being worked into the surface. The surfaces shall be trowelled under firm pressure and left free from trowel marks. Any additional cement mortar required shall be provided as before described.

Where the surface is to be power floated smooth it shall be carried out by mechanical means and skilled operatives. On completion the surface shall be checked to ensure that the final finish is within 5 mm of required levels and shall be smooth and dense and free from marks and similar imperfections. The finished surface shall be adequately protected against damage by subsequent trades as agreed with the Architect. Any additional cement mortar shall be provided as before described.

If specified floor hardener type Multi Dura or equivalent shall be provided at the rate of 7 kg/ m² or as recommended by the Manufacturer subject to Architect's approval.

4.23 **FORMWORK FINISH**

Formwork may be of steel or timber and will be specified for use in accordance with the following classifications:

- | | |
|---------|---|
| Type A- | Formwork intended for use in forming concrete faces with special surface features which will not be covered by any other finishes and shall be such as to impart to the resultant concrete face as for Type B formwork. Board marked feature shall be achieved with the use of wrot timber boards to the pattern as shown on the drawings. |
| Type B- | Formwork intended for use in forming concrete faces which will not be covered other than by painting, if at all shall be such as to impart to the resultant concrete face a finish equal to that which would result from the use of plywood faced shutter boards or special steel forms which are new when concreting commences and thoroughly cleaned after each use. The Architect may require that parts of the concrete be rubbed down with a carborundum stone to finish clean and smooth without trace of shuttering marks or any disfigurements. The term "Type B Formwork Finish" shall deem to mean "Fair Face Formwork" unless otherwise specified. |

Where this class of formwork specified to be used to form the soffits of slabs or the faces of walls, the arrangement of panels shall be symmetrical, set out from edges or centre lines. Odd dimension fill-in panels shall be cut to size and symmetrically place in approved positions. All joints between shutter panels shall be straight and tight to approval.

Type C- Formwork intended for use in forming concrete faces which will be plastered or covered with tiles, or other similar finishes shall be such as to impart to the resultant concrete face a finish equal to that which would be obtained by the use of sawn timber or ordinary steel plates. The term "Type C Formwork Finish" shall deem to mean "Sawn Formwork" unless otherwise specified.

Face Groove or rebate formers

Where shown or noted on the drawings, forming grooves or rebates, approved plastic and or wrot timber or similar material shall be inserted in or between formwork elements to soffits or faces in such a manner as to form grooves, rebates in the concrete to obtain a class B finish formwork. The grooves or rebates shall be straight, to true lines and arranged in approved patterns.

4.24 **MEASUREMENT AND PRICING FOR CONCRETE**

All costs incurred by the Contractor for complying with the provisions concerning the preparation and use of graded mixes shall be allowed herein.

All rates for concrete shall include for mixing and depositing at the various levels required throughout the building and shall also include for forming or hacking a satisfactory key for all faces receiving asphalt and plaster work.

Rates for concrete work shall include for all labour and material for forming all construction and day joints and kickers.

Prices for concrete are to include for all necessary curing.

Concrete in small projections, hoods, nibs, fins and the like unless otherwise described is included in the relevant concrete item to which they are attached.

Concrete poured against faces of excavation and beds laid on earth and or stone are measured to nett volumes. The Contractor shall allow in his prices for any formwork or extra concrete he may consider necessary for such times.

Notwithstanding the provisions of Clause C4, 1.4 of the principles of measurement (International) for works of construction, Formwork to sides of foundations is not measured and shall be allowed for by the Contractor in his rates for concrete if he so desires.

4.25 **MEASUREMENT AND PRICING OF FORMWORK**

The term “formwork” is to be taken to include centering, casing, shuttering and the like. Rates for all formwork shall include for fitting together in the required forms, hoisting, strutting, shoring, staging, bracing and wedging, plumbing and fixing to true surface and angles, all straight and raking, cutting, splayed edges, notchings, holes for electric conduits, service pipes, etc., cutting and fitting around projecting pipes and continuity bars and the like, narrow widths and small quantities nails, bolts, clamps, wedges, including waste in cutting, overlaps and passings, and properly fixing at intersections, cleaning out before concreting, maintaining in position for the period directed, easing, striking and removing.

The formwork is measured to the actual net area in contact with the finished face of concrete.

The Contractor shall allow in his rates for formwork for forming all grooves or rebate, projections as shown or noted on the drawings and as required at all formwork joints.

The cost of the formwork required to form construction joints and the like, which may be necessary to uphold the concrete during the operation and setting is deemed to be included in the rate for concrete.

Notwithstanding the provisions of Clause C4.1 item 3 of the Principles of Measurement (International) for works of construction formwork to sloping upper surfaces of concrete shall be measured only where the slope is in excess of 45 degrees from horizontal. In all other cases, the Contractor must allow in the prices for the concrete for any formwork he considers may be necessary.

4.26 **MEASUREMENT AND PRICING FOR REINFORCEMENT**

Reinforcement is measured by computing its theoretical mass from the nominal size and lengths stated on bar bending schedule in line with the structural drawings as approved by the Engineer, no allowance being made for waste, rolling margin, support, stools spacers or tying wire or for cutting to lengths.

The Contractor shall also allow in his rates for wire or other material required for binding or supporting the reinforcement as well as that of bending, hooking and all other work in providing and fixing the reinforcement as shown on the drawings or as specified.

The Contractor shall allow in his rates for fabric reinforcement for the extra material at laps, for cutting the fabric to the sizes required, and for bends, binding wire, stools, distance blocks and waste.

Notwithstanding the provisions of Clause C 3.2 of the Principles of Measurement : (International) for works of construction, reinforcement bars of differing diameters are grouped together irrespective of location.

SECTION 5 – BLOCKWORK

5.1 CONCRETE BLOCKS

Concrete blocks shall comply with BS 6073: Part 1:1981 for strength, drying, shrinkage, moisture content curing and mix.

Concrete blocks shall be generally Grade A type (3.5 N/mm²) unless otherwise specified.

Concrete blocks shall be obtained from an approved manufacture and the size of the blocks shall be 457 x 203 x 200 or 150 or 100 mm. Blocks of dissimilar dimensions will not be accepted, half length blocks shall be used where required to break bond.

5.2 MORTAR MIXES

Cement mortar to be used shall be composed of cement and sand (1:3) with an approved plasticiser as per manufacturer's specification unless otherwise specified. All mortar shall be measured in specially prepared gauge boxes and thoroughly mechanically mixed with water added until all parts are completely incorporated and brought to a proper consistency. Small quantities of mortar may be mixed on platforms subject to Architect's approval.

All mortar must be used within sixty minutes of mixing. No partially or wholly set mortar will be allowed to be used or to be re – mixed.

5.3 SETTING AND JOINTING

All blocks shall be lightly wetted immediately before being bedded and jointed to minimise absorption of water from the mortar. Top of walling where left off shall be well-wetted before recommencement of block laying.

Blocks are to be well buttered with mortar as previously specified. The blocks shall be laid, in stretcher bond with 10mm thick, joints full, flushed up and grouted solid joints. The joints shall not vary by more than 3 mm and shall achieve the specified height in specific number of courses shown on the drawing. The work shall be carried out with horizontal joints truly horizontal and level. The vertical joint shall be 10 mm thick with approx. 3 mm tolerance. No vertical joint in any course shall be within 110 mm of a similar joint in the course immediately above or below unless otherwise shown. Joints shall be raked out where surfaces of walling are to be plastered.

No extra claim of labour and or material whatsoever shall be entertained by the Employer due to non-availability of specified sizes of the concrete blocks. The Contractor shall build to the specified height floor to floor by cutting the concrete block and or placing extra concrete height of the beams at his own expense. The adjustments of mortar joint shall not be permitted.

5.4 **LAYING OF BLOCKS**

All walls throughout the work shall be carried up evenly in courses, no part being allowed to be carried up more than 900mm higher at one time than the other part and in such cases the joining shall be made in long steps so as to prevent cracks arising and walls shall be leveled around at each floor.

All putlog holes shall be carefully, properly and completely filled up with concrete grade 25 on completion of walling work.

All walling shall be properly protected while mortar is setting. Wall shall be kept thoroughly wet for at least three days or for longer period of time as the Architect may direct. Walls exposed to the sun shall be protected with hessian, which shall be kept wet.

5.5 **REINFORCEMENT IN BLOCKWORK**

Provide for reinforcing blockwork vertically in hollow core of block and horizontally in mortar joints as specified and where indicated on the drawings.

Provide wall ties at tee and right-angle junctions at every three courses as shown on Engineer's drawings or as specified.

Provide doors and window jamb with 1 Y10 mm reinforcement in 1 hole of blockwork, and filled with concrete grade 25, all as shown on Engineer's drawings or as specified.

5.6 **BEDDING AND POINTING**

Bedding and pointing of timber door and window frames shall be in cement mortar. Where frames are in metal, they shall be fixed with metal lugs and void to metal frame shall be filled with cement mortar well compacted.

5.7 **FIXING BLOCKS AND LEAVING HOLES**

Provide and built into walls all necessary fixing blocks and leave cut away as necessary holes and chases for pipes conduits and the like and make good after fixing by other trades and specialists.

5.8 **BUILD IN LUGS AND THE LIKE**

Form of leave mortises in walls for and build in lugs and all necessary fixing for metal windows and doors, door frames and lining, sanitary fittings, rainwater pipes, clips and bearer of various types.

5.9 **PRICES FOR BLOCKWALLING**

The Contractor must allow in his rates for blockwalling for plumbing angles, rough cutting whether straight raking or splay and waste, cutting and or filling with concrete grade 25 under soffit of beams and slab split courses necessary for bond, bonding at angles, intersections junctions of walling of different thickness, cutting and fitting columns, cutting and pinning to beam, cutting and fitting around end of cills and lintels, cutting and pinning ends of structural timber, steel sections and the like and also shall include for wall ties at angles, junctions and tees as shown on drawing or as specified.

The rates of blockwork must also include for fixing all door, window like openings, forming reveals to same and for cutting and waste to walling in short lengths to mullions and jamb of openings.

The rates of blockwork must also include for hoisting and building off slab and beams at any level, all necessary scaffolding and for work built overhand and building in of items as described.

SECTION 6 – STONEWALLER

6.1 CEMENT AND SAND

Cement and sand for this trade shall be as specified for “concrete”.

6.2 MORTAR FOR MASONRY WORK

Mortar for bedding and jointing of stonework shall be composed of cement and sand (1:3) mix with an approved plasticiser as per manufacturer’s specification unless otherwise specified.

6.3 STONEWORK IN WALLS

All stones for use in walling, cladding shall be of approved local fields stones of blue or other colour basalt stone carefully selected according to the type of walling required. Walls to be built to the thickness shown on the drawings and the stones shall be well bonded and all voids filled in the solid with mortar as described. Excessive gaps between adjacent stones shall be filled with smaller stones to match with all the stonework. Wall to be laid at random i.e uncoursed.

Mortar joints shall be raked to a depth of 25 mm from face of stonework for an open joint finish as a dry stone wall appearance or finish flush pointed with cement mortar with matching colour pigments.

All stonewall faces, angles, features, returns reveals shall be dressed to true lines, and levels, accurately plumb and true in vertical plane.

For fully dressed stonewall and or cladding, the joints shall be fine joints or invisible joints to all exposed surfaces unless otherwise specified.

6.4 BONDING

All walls shall be constructed with all materials fully bonded and or tied together, and joints filled, to ensure compliance with design requirements for stability and strength.

Appropriate galvanised malleable ties, shall be provided to backing wall as per Contractor’s design as required and to Architect’s approval.

6.5 SAMPLE STONEWORK PANELS

Allow for constructing two sample stonework panels approximately 2 sq m each 450 mm thick for stone masonry wall, and 150 mm thick for cladding on blockwalling background and approved sample panels shall form the standard to be maintained throughout the contract.

6.6 **COPINGS**

Copings to top of stone walls shall be dressed on all exposed faces.

6.7 **PROTECTION**

The stone wall shall be properly protected from mortar droppings, etc, and kept clean and neat as the work proceeds and the whole of the stonework shall be wirebrushed and cleaned down to the satisfaction of the Architect on completion. Should the contractor be unable to clean the wall from mortar droppings etc., to the satisfaction of the Architect, he will be required to re-execute the work to the extent which the Architect may deem necessary at no extra cost.

6.8 **RATES AND MEASUREMENTS**

The Contractor shall allow in his rates for walling for all plumbing angles, rough cutting whether straight, raking or splay and waste, split courses necessary for bond, bonding at angles, intersections and junctions of walling of different thickness, forming solid tops under beams and soffits of slabs for forming joints as specified, forming any split course and cutting and fitting around ends of cills and lintels or other members, cutting and pining ends of structural timbers, steel sections, forming all door, window or other openings including forming reveals to same and for all cutting and waste to walling to short lengths to mullions or jambs of openings; for hoisting and building off beams and slabs at any level, all necessary scaffolding and for work built overhand and building in of items as described.

Rates for stonewalling shall include for all dressing to external angles, features, reveals returns and for galvanised wall ties.

SECTION 7 – ROOF COVERINGS

7.1 ROOF WATERPROOFING

The whole of the roof waterproofing works shall be carried out by a specialist firm approved by the Architect / Project Manager. The roof waterproofing shall be generally laid on screeded surfaces with an approved double layer, the bottom layer being minimum 2.5mm thick and the top layer being minimum 2.5 mm thick of bituminous roof waterproofing membrane on sealer coat and hot laid with melted oxidised bitumen executed by specialist strictly in accordance with the manufacturer's instructions and shall carry an irrevocable ten year guarantee with the terms and conditions as approved by the Architect / Project Manager. The guarantee shall be deposited with the Architect / Project Manager on issue of the Practical Completion Certificate. The waterproofing treatment shall be applied over all expansion joints, parapets, upstands, flashings and dressed into all rainwater heads.

All surfaces to be waterproof shall be inspected by the Specialist who must satisfy himself that the surfaces are slope and are in a perfect state to take the waterproofing. All the surfaces shall be cleaned and prepared as required by the Contractor at his own expense.

SECTION 8 – CARPENTRY AND JOINERY

8.1 STRUCTURAL TIMBER

All structural timber in the works shall be according to BS 4978 and shall be treated Kempas, keruing, Gurjun, Mahogany or other approved type.

The timber shall be imported good, sound, well-seasoned vacuum impregnated with tanalith salts Type C at the rate of 64 kgs per cubic metre of timber, free from all defects and shall be worked to the full sizes indicated on the drawings.

8.2 TIMBER FOR JOINERY

Timber for joinery shall be Dark Red Meranti or equivalent unless otherwise specified conforming to BS 1186 for quality and workmanship.

8.3 TREATMENT OF TIMBER

The ends and backs of all doors, frames and all timbers built in, resting or in direct contact with walling or concrete where not exposed to view, shall be coated with two coats of creosote, solignum or other approved preservative.

8.4 REPLACEMENT OF DEFECTIVE TIMBER

Should any of the timber warp, shrink, wind or develop any other defect the same shall be removed and new fixed in its place and at the Contractor's sole expense together with all other work that may be effected.

8.5 PREPARATION OF TIMBER

The preparation of timber shall commence simultaneously with the beginning of the work generally and shall proceed continuously until the whole of the woodwork is prepared and stacked on the site and properly protected from the sun and weather.

8.6 CONSTRUCTIONAL TIMBER

All constructional timber shall be properly jointed and framed together and secured with dowels, bolts or spiked as indicated on the drawings.

8.7 WORKMANSHIP

All carpentry shall be executed with workmanship of the best quality. All carpenter's work shall be left with sawn surface except where specified to be wrot.

All carpenter's work shall be accurately set out and in strict accordance with the drawings and shall be framed together and securely fixed in the best possible manner with properly made joints. Provide all brads, nails, screws, etc. as necessary and as directed and approved. All timber shall be as long as possible and practicable, in order to eliminate joints.

Actual dimensions of scantlings for carpentry shall not vary from specified dimensions by more than 3mm in deficiency or excess.

8.8 **JOINERY WORK GENERALLY**

All joiner's work generally to be cast and framed together as soon is practicable after the commencement of the building but shall not wedged or glued until the building is ready for fixing same.

All work to be properly tenoned, shouldered, wedged, pinned, braided etc. as directed by and to the satisfaction of the Architect and as properly glued up with best quality approved glue.

Oval or round brads or nails shall be used for fixing on face work heads properly punched in and the holes filled with putty or as wise described.

8.9 **FINISH TO**

All exposed faces of woodwork shall be wrot, which shall mean bring up the surface after planing with sand and paper to a smooth satin like finish.

8.10 **WORKMANSHIP**

All joinery work shall be executed with workmanship of the best quality in strict accordance with the detailed drawings.

All joiner's work shall be accurately set out on boards to full information and guidance of artisans before commencing the respective work. All joints, ironwork and other work connected there fully delineated which said setting out will be required to be suit to the Architect and approved before such respective works are completed.

All mouldings shall be accurately and truly run and all work planed and finished to the approval of the Architect. All arrises to be pencil rounded.

Should any of the joinery work shrink, warp wind or develop other defects before the end of the defects liability period, the same be removed and new fixed in its place, together with all other work which may be affected thereby at the Contractor's cost and expense.

All plugs described as fixing for joinery, etc., unless otherwise shall be formed by Rawlplastc Philplug screwfix or other approved patent material. No woodplugs shall be used.

Any fixed joinery which in the opinion of the Architect is liable become bruised or damaged in any way shall be properly cased and tested by the Contractor until the completion of the works.

8.11 DOOR FRAMES AND LININGS

Door frames and linings shall be constructed to the sizes and details shown on the drawings. Joints between stile and head shall be mitred.

Doorframes shall be fitted with three fixing galvanised irons to each side of the frame and one at the head. Frames for double doors shall have two fixings at the head.

Fixing irons shall consist of 300mm long g.m.s hoop not less than 3mm thick bent up at 75mm at one end and twice screwed to the frame and the other end built fishtailed into the walls and cast into lintels to the depth of 225mm (where lintels to the depth of 225mm deep, the straps shall be cut off to the full depth of the lintel).

6mm diameter galvanised metal dowels shall be fixed to each end of the frames and let into the floor concrete to a depth of at least 50mm.

Door linings shall be screwed to wooden fixing slips let into the walls and lintel the same number as for fixing irons to frames.

8.12 DOORS

Doors shall be provided and fixed to the sizes and details shown on the drawings. Doors shall be free from all blemishes and shall be rubbed down to a satin like finish. Framed, ledged and braced doors shall be made to the sizes shown on the drawings and the nailing in construction shall be driven from the face side, the heads of nails shall be punched and the holes filled with putty.

Butts and hinges shall be to the sizes and type specified and be fixed with the full number of screws and on no account shall nails be used.

8.13 PLYWOOD

Shall be to the specified thickness and shall comply with BS 1455. Plywood shall be Grade 1 whether varnished or painted. Concealed side of plywood can be Grade 2 .

8.14 BLOCKBOARD

Shall be to thickness shown on drawings and shall conform to BS 3444 and 3583.

8.15 GLUES

All glues to be used for joinery works shall be the best of their respective kind and shall conform to BS 745, 1444, 1203 and 1204.

8.16 SCREWS

All screws to be used for the joinery works shall be rustproof and shall conform in every respect to BS 1210.

8.17 **NAILS**

These shall be galvanised mild steel wire nails – all in accordance with BS 1202.

8.18 **MOISTURE CONTENT OF TIMBER**

The Contractor is to ensure that the moisture contents of the various items of joinery delivered to the site are appropriate to the conditions of use to which the components are to be put.

8.19 **SHRINKAGE**

The arrangement, jointing and fixing of all joinery works shall be that shrinkage in any part and in any direction shall not impair to strength and appearance of the finished work and shall not cause damage to contiguous materials or structure.

8.20 **TOLERANCE**

Reasonable tolerance shall be provided at all connections between joinery works and the building carcass, whether of masonry or frame construction, so that any irregularities, settlements or other move shall be adequately compensated.

8.21 **FABRICATION**

The joiner shall perform all necessary mortising, tenoning, grooving, matching, tonguing, housing, rebating and all other works necessary for correct jointing. He shall also provide all metal plates, screw nails and other fixings that may be instructed by the Architect or may be necessary for the proper execution of the joinery works. The joining shall also carry out all works necessary for the proper construction of all framing, linings, etc. and for their support fixing in the building.

8.22 **JOINTS**

The joinery shall be constructed exactly as shown on the Architect details. Where joints are not specifically indicated they shall recognised forms of joints for each position. The joints shall made so as to comply with BS 1186, Part 2: 1971

Loose joints are to be used where provisions must be made for shrink or other movement acting other than in direction of the stress fixing or loading.

Glued joints are to be used where provision need not to be made for shrinkage or other movements in the connections and where sealed are required.

All glued joints shall be cross – tongued or otherwise reinforced.

All nails, sprigs, etc. are to be punched and puttied.

Glued joints surfaces in contact are to have a good swan or planed finish. All cutting edges of tools are to be sharp to avoid ‘burnishing’. The surface of plywood to be glued should be lightly dressed with sand or glass paper. The sad or glass paper must not be allowed to clog and cause ‘burnishing’.

Members in construction to be jointed by gluing are to be of similar conversion. All surfaces to be glued are to be kept clean, free from dirt, sawdust, oil and any other contamination .

Adequate pressure should be applied to glued joints to ensure intimate contact is maintained whilst the glue is setting.

Mixing, application and setting conditions should be in accordance with the glue maker's instruction.

"Adhesives" for joints in non – loadbearing internal work and for joints in work where moisture content is always less than 16 per cent can be case in or organic glues.

For work under damp conditions (moisture content normally 20 per cent or more or conditions liable to fungal attack) : resin type adhesives are to be used.

8.23 **SCRIBING**

All skirting, architraves, plates and other joinery works shall be accurately scribed to fit the contour of any irregular surface against which they may be required to form a close butt connection.

8.24 **FLUSH DOORS**

Flush doors shall be semi – solid cored and shall be lined on both sides with 4mm Grade 1 plywood for painting, unless otherwise described.

The doors shall be lipped with 8mm thick hardwood strips on four sides and shall be fitted and hung to frames as detailed on drawings and specified previously .

Doors shall otherwise conform to BS 459 Part II

8.25 WORKING PROCEDURE

(a) Measurements for Joinery

The Contractor is to take all measurements for joinery works on site to the building and not from the architect's drawings, except where the work is specified to be "built-in".

(b) Fixed-in Joinery

Where joinery works are specified to be "fixed-in" or inserted in the positions, they are to occupy after the surrounding or enclosing carcass has been constructed, it shall be the responsibility of the Contractor to ensure that the necessary fixings are incorporated in the carcass, alternatively, the Contractor shall construct such groundwork as are required to provide a suitable base and fixing for the joinery works. The spaces enclosed in the ground works and behind joinery works shall be filled in the solid with plaster. The contractor is to secure 'fixed -in" joinery works so that they are plumb and true to the shapes and dimensions shown on the working drawings and details. Vertically junctions shall be solidly bedded with mortar, wedged or otherwise secured, as may be specified or as is most appropriate in the circumstances but a clearance is to be maintained in all overhead junctions so that settlements in the building carcass may take place without stressing or otherwise loading the joinery works.

Joinery works shall not be fixed in position until after all floors, wall and ceiling surfaces have been formed or constructed, unless otherwise specified.

(c) Joinery Assembled insitu

Where joinery works are specified to be "assembled in site" and all stresses of support and fixing are to be engaged in the building, it shall be the responsibility of the Contractor to ensure that the necessary fixings are incorporated in the carcass; alternatively, the Contractor shall construct such ground works as are required to provide a suitable base and fixing for the joinery works.

The spaces enclosed in the ground works and behind the joinery works shall be fitted - in solid with plaster or concrete.

Insitu joinery works shall not be executed until after all floor, wall and ceiling surfaces have been formed or constructed, unless otherwise specified.

(d) Drawings

Work is not to commence until the Architect has approved the manufacture full-size setting out drawings. Suggestions, which the manufacturer may wish to make for modifying the construction and joints shown on the Architect's drawings, will be, and considered when the shop drawings are examined.

(e) Inspection

Facilities are to be given for the Architect to inspect all work in progress in shops and on the site.

(f) Time for delivery

None of the joinery is to be delivered until it is required for fixing in the building. Joinery which does not require to be built in as the work proceeds is not to be brought to the site and fixed until the building is enclosed and dry out.

(g) Transport and Protection

The joinery is to be kept under a waterproof cover during transit and it is to be similarly covered and kept clear of the ground on the site. It is to be handled and stacked carefully to avoid damage.

(h) Plugging and screwing

Where items are described as plugged or plugged and screwed this shall mean plugging, plugging and screwing to concrete blockwalling, concrete walling, stone walling to the approval of the Architect.

8.26 **IRONMONGERY**

Butts and hinges shall be of sizes and types specified and fixed with the full number of screws and on no account shall nails be used.

All locks and ironmonger shall be fixed before the woodwork or metal work is painted. Handles shall be removed carefully stored and re-fixed after completion of painting. Locks shall be oiled and left in perfect working order. All locks to include two keys and or three keys and all keys shall be labelled with door references marked on plastic labels before handing to the Architect on completion.

8.27 PRICES OF TIMBER WORK

The Contractor is to include in his prices of all members for fitted ends, miters, housings, returned ends, etc. and for short-lengths not exceeding 30mm.

The prices for all joinery items are to include for pencilled rounding all arrises and all labour for crossgrain.

Where hardwood is described as screwed, prices are to include for pellating with a matching hardwood.

Allowance is to be made in the prices for angles, ramps, mitres, ends, etc. on timber worked on solid and shall include for all necessary non-ferrous metal screws, metal cramps, dowels and the like.

The prices for all timber described as select quality are to allow for keeping clean for light coloured finishes, polishing, etc.

SECTION 9 – METALWORK

9.1 GENERALLY

Metal Work shall be of mild steel complying with BS 4360, and shall be hot dipped galvanised to BS 729 Part I minimum 610 gm/m², unless otherwise specified. Locally welded joints, if approved, shall be treated with epoxy zinc rich primer to Architect's satisfaction.

Bolts, nuts and screws shall be in compliance with BS 916 or BS 1494 as appropriate. Bolts, nuts and screws shall be of sizes as shown, with hexagonal heads and nuts and washers as required.

Rivets shall be countersink at all bearings joints and where required.

Stainless Steel shall comply to BS 1449 of BS 4127 and shall be generally of marine grade, type 316.

All metal work shall be delivered to the site clean and tidy, free from rust, putting or any corrosion.

9.2 STEEL WINDOWS

All steel windows shall be from galvanised sections or hot dipped galvanised after manufacture. A sample window shall be submitted to the Architects for approval before any order is placed. All sectional frames, casements and glazing bars to be free from flaws and other imperfections.

All steel windows and doors and frames shall be constructed in FX 6 and FX 8 section with tee glazing bars as specified.

All top, bottom and side-hung opening casements, unless otherwise described or shown on the drawings, are to be hung on stout steel pivot hinges with gunmetal centres.

All top hung opening fanlights and casements, unless otherwise described or shown on the drawings, are to be fitted with brass peg stays with pegs arranged to lock window when closed.

All side-hung casements, unless otherwise described, or shown on the drawings, to be fitted with brass handles and pivot with night ventilating notches to engage with striking plate and adjustable brass sliding stay.

All horizontal and vertical pivot hung sashes are to be fitted with approved bronze friction centres capable of adjustments and fitted with brass fastening, unless otherwise described or shown on the drawings.

Steel doors with frame and sash frame are to be as described. Kicking plates and other solid plates are to be of 3 mm galvanised mild steel pressed and bent to profile and fixed on locks and furniture to be as described and to have generally

two keys. Each leaf of doors is to be fitted with two 150 mm brass square pattern tower bolts.

All large windows are to be provided with temporary braces or stiffeners to prevent coupling screws or sections being strained during transit, hoisting and handling. After windows are built in and prior to glazing, each window must be carefully tested and adjusted to ensure that opening sections are in perfect working order, make good contact and are watertight and that glazing bars are perfectly aligned.

9.3 **NACO LOUVRES**

Naco louvres shall be in galvanised steel or anodised aluminium with an anodising of not less than 20 microns and shall be obtained from an approved manufacturer. A sample louvre shall be submitted to the Architects for approval before any order is placed.

Naco louvres shall be complete with fixing screws, plugs, weatherstrips at heads and sills and all necessary fixing accessories. Composite openings of 1000 mm high and above shall be provided with aluminium mullions 6 mm x 50 mm as the manufacturer's recommendations and shall be fixed by means of retaining brackets with 4 screws each head and cill and bolted to the louvre channels.

Naco louvres shall be glazed with either 152 mm x 6 mm clear float glass louvre blades with two long edges bevelled and polished.

The whole of the naco louvres shall be fixed in accordance with the manufacturer's instructions.

9.4 **PRESSED STEEL DOOR FRAMES**

Pressed steel door frames are to be of minimum 1.60 mm (for once rebated frames) and minimum 1.20 mm (for twice rebated frames) made up with mild steel, hot dipped galvanised after manufacture pressed and bent to profile to shape, mitred and welded at angles and provided with six approved steel lugs (three to each jamb) with fishtailed ends and flanged for building into walls. Frames described as suitable for fixed or opening fanlights are to have transomes of similar steel with welded seams at edges and ends tenoned into and welded to frames. Frames are to be fitted with solid plates or bracing bars across bottom.

Unless otherwise stated, each frame is to be fitted as described with approved heavy steel butts welded on. Each frame to doors fitted with a mortice lock is to be slotted for bolt, correctly positioned and to have a mortice cap welded on at back of perforation. All necessary drilling for sundry ironmongery such as fanlight openers, bolt sockers, etc. should be executed by the steel frame manufacturers at the works and the Contractor is to undertake to supply the correct information to the manufacturer to ensure that this is done. All frames are to be fitted with a pair of anti-slam buffers.

Fixings for set-crews are to have a solid welded on at back in all cases. All steel frames are to be thoroughly cleaned free from rust, scale, etc., and to be primed of delivery to the site.

9.5 **ROLLER SHUTTERS**

Roller shutters shall be in galvanised mild steel plates of 18 S.W.G sheets and be obtained from an approved manufacturer.

Shutters shall be complete with guides, channeled manual gear, gearbox, lock Cyclone bars are to be provided where the width of roller shutters exceeds 2.80 m.

Roller shutters are to be designed, manufactured and fixed to withstand the basic wind speed of minimum 280 km/hr. Calculation to be submitted to Engineer for checking purpose, prior to manufacture.

9.6 **ALUMINIUM OPENINGS**

Aluminium Openings shall be to BS standards or equivalent and shall generally be powder coated finish minimum 60 microns to BS 6496 (powder coating to be guaranteed for ten years). Aluminium opening shall be strictly to manufacturer's specification and to Architect's approval and shall be made up with extruded aluminium profiles, and if approved by Engineer reinforced with galvanised infills to resist a basic wind speed of 280 km/hr. Glazing shall be generally with clear float glass minimum 6 mm thick, properly set in neoprene gaskets. Perimeter of openings shall be pointed with elastometric silicone mastic minimum 6 mm thick and 10 mm deep, all around internally and externally. All joints are to be mitred, and openings shall watertight and dust proof all as recommended by manufacturer. Doors shall be fitted with approved heavy duty mortice lock, handle powder coated finish unless otherwise specified, and 1 ½ pairs of heavy duty stainless steel to each door leaf hinges. Windows shall be in heavy duty friction hinges, with heavy duty powder coated fasteners. All ironmongeries shall be to BS Standards and to Architect's approval. Contractor will be required to submit sample of openings, of a miniature type, complete with ironmongeries to Architect, supported with all technical literature from manufacturer for approval prior to placing order, unless otherwise specified.

The Contractor shall be responsible to cover all exposed aluminium opening surfaces with protective paper or the like during erection and after installation against damage, staining, abrasion and or other injuries. On completion the contractor shall remove all protective material and clean the surfaces to Architect's satisfaction. No abrasive agents shall be used.

9.7 **FIXING AND ERECTION**

All openings including doors and windows shall be inspected for damage on arrival on site and any damage shall be made good as described.

All seatings and surrounds shall be checked for line, level and bolt setting before commencement of fixing. Errors which cannot be accommodated without distortion shall be brought to the attention of the Architect. Drifting or burning of holes will not be permitted.

9.8 **FREEDOM FROM SURFACE DEFECTS**

All welded fillet or butt joints shall be ground smooth and shall be free from porosity, cavities and entrapped slag before hot dipped galvanising.

Welds which are to be hot dipped galvanised shall be neatly formed and the surfaces shall be acceptably free from cracks in the welds or heat affected zone, from overlap, undercuts, porosity, entrapped slag and spatter in or associated with the welds. The welds shall seal completely the edges of all overlapping or contacting surfaces.

The profile of the weld shall be uniform of approximately equal leg length and free from overlap at the toes of the weld. Unless otherwise specified, the surfaces shall be either flat or slightly convex in the case of fillet welds and with a reinforcement of not more than 3 mm in the case of butt welds. The weld face shall be uniform in appearance throughout its length.

9.9 **TEMPORARY BRACING OF METAL WORK**

The Contractor shall be responsible for whatever temporary bracing is necessary. Upon completion of the works all temporary bracing, brackets, cleats and the like shall be removed and all surfaces made good or painted as specified.

SECTION 10 – PLASTERING, SCREEDING, WALL AND CEILING FINISH**10.1 GENERAL**

The renderings are to be carried out so that the finished surfaces appear without visible joints or patches. The rendering of wall surfaces, reveals of openings and cills are to be carried out in one operation and each day's work stopped at a suitable point where it can be picked up again on the following day without noticeable joints. The quality and mixing of the materials are to be constant throughout so that there is no variation in colour or texture. The finished coat to be brushed down and left clean to receive decoration. If any continuous face of a wall the rendering shall be carried out continuously and day to day breaks made to coincide with architectural breaks in order to avoid unsightly junctions.

10.2 PREPARATION OF SURFACES FOR RENDERING

All faces of concrete work shall be well hacked to form a good key and in the case of block or stone walls the joints shall be raked out.

Concrete floors and roofs receiving screeds shall be hacked to form a good key, well washed and wire-brushed perfectly, well wetted and painted with a cement and sand (1:1) grout immediately before commencing screeding work.

All surfaces for rendering shall be well wetted with a hose before rendering is applied.

10.3 CEMENT

Shall be as specified previously.

10.4 SAND

Shall be as specified previously for fine aggregates, but in addition shall be in accordance with BS 1199 and shall have three washings if coral sand is used.

10.5 MIX FOR RENDERING

The mix for rendering both internally and externally shall be composed of cement and sand (1:3) mix plus an approved mortar plasticiser used strictly in accordance with the manufacturers' written instructions.

10.6 **APPLICATION OF RENDERING**

External rendering shall be not less than 16 mm or more than 20 mm in thickness.

Internal rendering and rendering to soffit of slabs, concrete beams shall not be less than 13 mm or more than 16 mm in thickness unless otherwise specified.

Moulds, weathering, projections, sunk bands and other architectural features shall be executed in accordance with the drawing to a true line finish and are to include for any dubbing out.

Internal angles are to be coved to a radius of not more than 25 mm.

The surface of internal rendering shall be steel trowelled to a smooth, even and true finish.

The surfaces of external rendering shall be finished to a true even surface with a wood float and to a sponge textured finish.

External rendering generally at joints between beams, columns and blockwalling must be watertight. Contractor shall also provide a minimum of 250 mm wide strip of waterproofing membrane as per Specialist and with chicken mesh (where applicable) to joints between infill blockwalling and soffit of beams and to joints between blockwalling and sides of structural columns of concrete frame structural building. This treatment must be to Architect's approval. The rates and prices of rendering work must include for watertightness of these aforesaid joints as specified.

Rendering shall be returned into reveal soffits of openings, margins and sunk bands and the like, with strong and true arises and all angles shall be true and straight with salient angles rounded.

All rendered surfaces shall be free from blemish. All cracks, blisters and other defects shall be cut out and made good and the whole left perfect on completion.

All rendered surfaces be kept damp and moist for at least two days on completion of the rendering work.

10.7 **TYROLEAN FINISH**

Tyrolean renderings shall consist of two coats, with a backing coat of 12 mm thick made up with cement and sand mortar as before up to an even and true surface followed by a tyrolean finishing coat of cement and sand for a suitable mix applied with a special spraying machine and built up in three coats to a total thickness of 8mm approx. to the approval of the Architect.

10.8 ROOF SCREED

Provide for laying a cement sand screed 1:3 mix plus plasticiser and to which may be added an approved quality waterproofing compound in accordance with manufacturer's specification, if specified.

Minimum screed thickness if not specified shall be 13mm and the maximum to be as necessary to provide adequate falls to rainwater outlets and to ensure that no water ponds on the roof. All loose screed will be removed by the Contractor and a new screed laid on epoxy compound.

Screeds shall be laid to falls and crossfalls and shall be dished towards rainwater outlets.

Where roofs are to be waterproofed, provide for inspection of roof by specialist waterproofer and obtain signed statements that roof falls are acceptable. No waterproofing work should be allowed to commence before being accepted in writing by the waterproofing specialist.

10.9 QUARRY TILING

Quarry tiling shall be to the quality, sizes and colour as selected by the Architect, laid to area indicated on the drawings. The tiles shall be set square jointed bedded and pointed in cement mortar (1 part of cement to 3 parts of sand).

Tiles shall be soaked in water 24 hours before laying and shall be thoroughly scrubbed to remove all traces of cement after laying and protected with sawdust or sacking and not used for at least 10 to 14 days.

The surfaces shall be polished on completion of the contract.

10.10 WALL TILING

Wall tiling shall be executed with approved quality wall tiles conforming to BS 1281 of approved Manufacture true to shape and free from blemishes unless otherwise specified.

The backing coat for wall tiling shall be finished perfectly true and not less than 10mm thick and not greater than 16mm thick in mortar of a mix of one part of cement to two parts of sand, the surface of which after 24 hours shall be combed or scratched and left for a further 24 hours. When still slightly green the surface shall be well wetted and the wall tiles after soaking in water for 30 minutes and left to drain shall be bedded on the backing coat with a similar mixture of cement and sand as for the backing coat. The tiles shall be laid perfectly level and finished proud of the surrounding rendered wall surfaces. Internal and external angles and round edged tiles are to be of the same manufacture, colour of thickness as the foregoing. All joints to run perfectly straight both horizontally and vertically. The joints between the tiles are to be pointed in neat matching colour tile adhesive. Exposed returns and edges of wall tiling shall be finished with mitre cut with fine invisible joints to Architect's approval, unless otherwise specified.

10.11 SAMPLE PANEL

The Contractor shall prepare samples of plastering, tyrolean finish, bush-hammered finish as directed until the quality texture and finish required is obtained and approved by the Architect after which all plastering, tyrolean and bush-hammered finished executed in the work and shall conform to the respective approved samples.

10.12 PRICES FOR SCREEDS, PLASTERS, TILING, ETC.

Prices for paving or screeds are to include for preparation of the concrete base all necessary hacking, grouting with cement grout, any extra thickness consequent upon the concrete surfaces not being finished to true and level, laying in bays and all necessary formwork and temporary dividing strips, and curing the finished screed or paving for at least seven days.

Prices for tiling shall also include for all straight and raking cutting, fair edges and fair joint, prices for tile skirtings shall further include for angles, ends, mitres and for short lengths not exceeding 300mm, mitre cut to tile edge or for PVC tile trim at angles where specified.

Prices for plastering are to include for preparation of the surface, hacking of concrete, raking out joints of blockwork, grouting, forming temporary rules, fair edges and arrises, rounded external angles, V-joints, working to rebates making good to window or door frames, around pipes, holderbats, sanitary fittings, narrow widths and small quantities.

Prices for rendering on walls shall also include for any extra labour involved in working to breaking columns, beams, cill, etc., all of which have been included in the general term of walls.

SECTION 11 – GLAZING

11.1 QUALITY OF GLASS

All the glass to be of the best quality obtainable free from all defects and imperfections and shall be to the approval of the Architect.

11.2 WINDOWS AND DOORS

Glaze all windows and doors in suitably thick clear sheet glass unless specified otherwise.

11.3 TRANSLUCENT GLASS

Windows requiring obscure vision shall be glazed with translucent glass of an approved texture or pattern, the thickness to be not less than that mentioned above unless specified otherwise.

11.4 PUTTY

Putty for glazing to wood shall be made of pure whiting and raw linseed oil and to be used fresh. Putty of glazing to metal shall be steel sash putty of approved manufacture.

All putty shall be delivered on site in the original manufacturer's sealed cans or drums and used direct therefrom, with the addition only of pure linseed oil of necessary. No mineral or other oils shall be used in the putties except genuine linseed oil.

The rebates of metal window shall be painted one coat before puttying.

11.5 GLAZING

All glass to be cut accurately in one piece, to fit easily into their rebates and to be well puttied, back puttied and secured with springs in the case of fixing to wood or with metal clips in the case of metal. Care must be taken to ensure that the putty does not show beyond the sight lines of panes and that the putty is neatly cut off externally and neatly splayed off externally all mitres and angles left clean and sharp.

11.6 GLAZING WORK AT COMPLETION

All glass broken, cracked or scratched during the progress of the works to be reinstated at the sole cost of the Contractor and all glazing to be left clean and perfect at the completion of the Contract.

SECTION 12 – PAINTING

12.1 GENERALLY

All work shall be carried out in strict accordance with schedule of colours to be obtained from the Architect.

Samples of colours if requested by the Architect shall be painted on the walls 1.00m x 1.00m square and approval obtained from the Architect before proceeding with the work.

12.2 MATERIALS, PAINT, VARNISHES, ETC.

All oil paints, emulsion paints, varnish and other materials shall be of an approved manufacture and to Mauritius Bureau Standards or B.S Standard or as specified and shall be used strictly in accordance with the manufacturer's instructions. The Contractor will only be allowed to use materials which are brought to the site in sealed cans, bearing the name of the manufacturer and properly labelled as to quality. Exterior quality paints only shall be used, both internally and externally unless otherwise specified. All cans of paints must be kept well stirred before and during the work and mix with approved admixture as recommended by the Manufacturer. All coats of paint applied over each other shall be from the same manufacturer and the type recommended by the manufacturer.

Well before commencing the painting work the Contractor shall submit to the Architect for approval a list of all the brands of paint and finishings including the necessary primers and undercoats he intends to use and immediately upon being so approved orders shall be placed and total requirements obtained for the works.

Once approved no other brand of material shall be used without the express permission of the Architect.

12.3 PREPARATION OF SURFACES

All surfaces to be painted shall be thoroughly cleaned down and surfaces of wood to be sandpapered and to be twice knotted and stopped before applying the priming coat which shall be regarded as additional to the undercoat. All surfaces of ironwork to be thoroughly cleaned of all scale. And every particle of rust, dirt or grease removed by scrapers and white bushes or other approved method. Galvanised, sheradised or zinc sprayed metal to be painted shall be treated with mordant solution and application of two pack etch primer. Copper pipes specified to be painted shall be rubbed down and clean as recommended by manufacturer.

12.4 WOOD PRESERVATIVE

Treat all timber built in or in contact with walling and concrete with 2 coats of approved type of wood preservative.

12.5 GALVANISED METAL SURFACES

Clean down, treat with galvanised iron cleaner, apply two pack etch primer, one coat of Universal undercoat, two coats of hard gloss enamel paint.

12.6 IRONWORK

Clean down, removing every trace of rust and paint one coat red lead primer, one coat of undercoat and two coats of gloss finishing.

12.7 RENDERED SURFACES

Brush down to remove dirt and dust, prime with alkali resistant as specified by the suppliers of the emulsion paint to be used and three full coats of approved PVA emulsion paint MS 3 standard (external quality) internally and externally strictly in accordance with the manufacture instruction.

12.8 WOOD SURFACES

Prepare, knot and stop and sand down all timber surfaces, apply on coat of undercoat and two coats of oil paints on surfaces of timber.

Unless otherwise stated, teak veneered doors shall be prepared, sand down and varnished with three coats of varnish.

12.9 LIME WASH

Rub down thoroughly by brushing, scraping or sand papering, remove fill crack and imperfections with universal emulsion filler.

Whenever stated, lime wash shall be applied three full coats to concrete blocks surfaces. Lime wash shall be glued type and shall be applied in accordance with manufactures' instruction.

12.10 CLEANING ON COMPLETION

All floors to be twice washed, all marks of paint to be sponged of windows cleaned, the works generally to be touched up after all the trades are finished and the whole of the building left clean and on the completion to the satisfaction of the Architect.

SECTION 13 – PLUMBING INSTALLATIONS

13.1 GENERAL

All materials and workmanship shall comply with the latest editions of the British Standard's Specification, Codes of Practice, Byelaws and regulations of all Statutory Authorities concerned.

The Contractor shall include for producing all working drawings, details builder's work and holes drawings necessary to carry out the work as and when required by the architect. The drawings shall be based upon the Architect's diagrammatic drawings and shall be submitted in duplicate progressively at least one month prior to the programmed commencement of the work for co-ordination and approval of the Architect. All alterations to drawings, whether due to co-ordination or otherwise, shall be carried out by the Contractor. The Contractor shall provide the Architect with four copies of each approved drawings in addition to those required for his own use.

All completion of the Contract, the Contractor shall provide the architect with one complete set of negatives indicating the "As Installed" installation and three prints of the said drawing complete with all operational and maintenance instructions, value charts and test certificates. These drawings shall be provided to the Architect at practical completion of the works.

All work shall be tested in sections as required and before being covered up for the Architect and statutory authorities. Before any test is carried out, a minimum of seven days notice shall be given to the Architect.

Where access is indicated to soil, waste and rainwater pipe fittings, the Contractor shall ensure that all access doors and rodding eyes are so positioned as to be accessible. Before testing, all access doors shall be removed, inspected, the washer greased and then re-assembled by the Contractor.

13.2 SOIL VENTILLATING PIPES

Soil ventillating pipes shall be not less than 63 mm internal diameter rigid PVC pipes conforming to B.S.Standard and fitted with the necessary junctions and bends. The pipes shall be securely fixed to the wall with PVC clips and sheradised screws maximum 1.20 m centres.

Ventillating pipes shall be carried out at least 900 mm above eaves levels and shall be fitted with approved PVC grating.

13.3 RISING MAIN

The Contractor shall include for all charges fees and the like for tapping and connection to public watermain where applicable, including all necessary excavation and reinstatement of public roads.

13.4 WATER SUPPLY PIPEWORK

All internal and external water supply pipework, and the like with high density polythene pipe to BS Standard with socketed joints and associated fittings and ancillaries to manufacturer's written specification and to Architect's approval, unless otherwise specified.

13.5 WATER TAPS

All bib, pillar, and stop taps shall be of the screw down pattern and comply in every respect with BS 1010. The size specified or shown on the drawing shall mean the maximum bore of the seating.

13.6 STOPCOCKS

Brass stopcocks shall be provided at the immediate entry of the water services into the building and at the other points as indicated on the drawings and shall be a pattern approved by the Architect.

13.7 WASTE PIPES

Waste from sinks and shower to be in 38mm bore pipe and from lavatory bassins to be 31mm. All wastes to be fitted with PVC bottle trap unless otherwise specified. All waste pipes shall be at each change of direction of pipe be fitted with a tee, one end with screwed plug for cleaning purposes. All pipes to be laid to fall.

13.8 SUPPLY OF SANITARY WARE

W.C's, bassins, sinks and other sanitary units shall be of approved manufacture and shall comply with the relevant B.S.S. They shall be of a type and design approved by the Architect. The whole of the units shall be properly fixed and connected to the water service complete with wastes as described.

13.9 RAINWATER PIPES

Rainwater pipes shall be approved rigid PVC rainwater pipes to BSS unless otherwise described. Pipes shall be properly fixed to wall with approved clips at distances not more than 1.20 m centres. Roof outlet shall be fitted with fullbore PVC outlet with dome or flat PVC grating and fixed as per manufacturer's specification.

13.10 TESTING

The whole of the water installations must be tested by the Contractor and any defective work or part be made good or replaced immediately and shall be re-tested until found satisfactory. Testing should be carried out in whole or in sections as the proceed by means of adequate test pump to Architect's approval.

13.11 COMMISSIONING

Upon completion of the works, the Contractor shall issue a certificate stipulating that the installation has been examined and tested, it is according to specification and that it will operate and maintained efficiently.

When handing over the Contractor shall demonstrate to the Employer the methods of operation, limitations, the maintenance instruction and any other documents or information appropriate to the installations.

13.12 PROTECTION

All pipework shall be properly protected from damage during the course of the works and during the backfilling of any trenches or closing up of any ducts. Any pipework damaged due to non-protection thereof shall be replaced by the Contractor at his own expense.

13.13 BUILDER'S WORK IN CONNECTION WITH SERVICES

Notwithstanding anything contained in the principles of measurement of works (International) for works of construction, June 1978, builder's work in connection with plumbing and sanitary installation has been given as an item.

13.14 MEASUREMENT AND RATES

Rates for pipes shall include for fixing as required, the provision of all plugs, screws and other fixings, for all pipe clips, holder bats, etc., short lengths, cutting and joints in the running length.

All taps, meters, sanitary ware, tanks, etc., shall include for jointing to pipes and prices shall allow for all necessary fittings, adoptors, connectors, bolts, flanges, sealing rings, etc. The Contractor shall also include for all testing as described and for complying with all byelaws and regulations.

SECTION 14 - DRAINAGE INSTALLATION

All relative clauses in “Excavation” and “Concrete work” shall apply to Drainage Installation.

14.1 DRAINAGE EXCAVATIONS GENERALLY

All excavations shall be kept free from water at all times by means of pumping or baling and where the ground is loose or the sides of the excavation are liable to collapse, they shall be securely supported with planking or sheeting properly strutted and maintained as long as long as necessary. In the event of the excavations being taken out of deeper or wider than is necessary they shall be filled in at the Contractor’s expense with concrete grade 15. All surplus excavations arising from the construction of any drainage works shall be spread and levelled to the Architect’s requirements or removed from the site.

14.2 EXCAVATIONS FOR PIPE TRENCHES

The excavations shall be taken out to such lengths at the time as the Architect shall approve and no pipes shall be laid until the excavations have been approved.

The bottom of all excavations shall be such a width as to provide at least 150mm clearance between the outside of the barrel of the pipe and the face of the excavation and / or timbering. The bottoms of all trenches shall be trimmed to the correct level so that all pipes shall rest upon the full length of the pipe and hand holes shall be excavated for all sockets except where pipes are laid concrete

After the drains have been laid in granular bedding and surround and tested the trenches shall be carefully filled in and great care must be taken to see that the drain pipes are not disturbed or damaged by stones and rocks and the remainder of the filling shall be made in 300mm layers, each layer well consolidated and rammed. Any depressions arising at or before the expiry of the contract period shall be made up to Architect’s approval.

14.3 PIPES

Pipes for foul and storm drainage shall be rigid PVC of approved manufacture unless otherwise specified, cut, laid, jointed and handled strictly in accordance with the manufacturer’s specifications with all necessary bends, angles, collars, etc. Diameters of foul drains shall be as shown on the drawings or as specified.

14.4 DRAIN PIPES FOR SOIL DRAINAGE

All pipes for soil drainage which include the conveyance of discharges from W.C’s, basins, sinks, urinals, baths and showers shall be PVC pipes unless otherwise specified, include bends, junctions and tapers complying in all respects with BS 4660 and BS 5481.

14.5 LAYING OF DRAIN PIPES

The pipes to be laid in straight runs to even and regular falls and put together with great care strictly in accordance with the manufacturer's instructions.

14.6 FALLS IN DRAINS

All pipes except where otherwise shown shall be to the diameter and laid to as shown on the drawings, or as specified.

14.7 CONCRETE BED AND SURROUND TO PIPEWORK

Where, specified, concrete surround to be pipes shall be in plain concrete grade 20, all to Engineer's approval and cross-sectional size as shown on drawing and or specified.

14.8 GULLEY TRAPS

Provide trapped gullies, complete with gratings in positions shown on drawings set on concrete bed under, be completely surrounded in concrete and jointed to drain as described.

14.9 MANHOLES

Manholes are to be constructed in the position shown on the drawing. The internal dimensions of the manholes shall vary according to their depth and shall be to Architect's approval. Manhole shall be built to size and details as shown on drawing or as specified.

Step irons shall be in malleable cast iron and shall be provided where shown on drawing and or specified and shall comply with BS 1247 and shall be placed at intervals of 450mm vertically with 300mm offset between alternative steps.

Manhole covers shall be as shown on drawings or as specified and will be in cast iron unless otherwise specified with frame set flush in concrete cover slab shall, bedded in grease and shall be of an approved type.

14.10 SOAKWAYS

Construct soakaways shall be located as shown on drawing in position approved by the Architect. Water from rainwater pipes to be first taken into catch pit below rainwater pipes and thence by 100mm diameter pipe to soakway. The soakaways are to be 900mm x 900mm x 1500mm deep unless otherwise specified filled with stones and finished with a 200mm layer of 38mm macadam

Soakaway shall be provided with concrete kerb all around as specified.

14.11 SEPTIC TANKS

Septic tanks shall be constructed in position shown on the site plan in accordance with detail drawing.

14.12 INTERCEPTING CHAMBER

Intercepting chamber shall be constructed in position shown on the site plan in accordance with detail drawing.

14.13 DRAIN TESTING

All drainage runs shall be tested before trench are filled up and afterwards when the drainage system is complete in the presence of the Architect. The Contractor shall supply all necessary equipment and labour for carrying out the tests. The air test shall be carried out by plugging all openings with standard air test apparatus to one end. The air pressure in pipes to be built up by means of a suitable pump until a head of 100mm is reached and the test continued until approved by the Architect. The maximum loss allowed shall be a fall of 25mm over a period of 5 minutes after pumping has ceased. If the fall exceeds 25mm a smoke test shall be immediately carried out to locate defects and all such defects shall be made good and further tests carried out at the expense of the Contractor, all to Architect's approval. All drains, manholes and the like shall be coved cleaned and flushed on completion.

PART II

ENGINEER'S SPECIFICATIONS

Engineer Specifications

Technical Specifications

- General
- Site Clearance and Earthworks
- Excavation, Underfloor & hardcore Filling
- Materials
- Testing
- Concrete
- Painting

GENERAL SPECIFICATION

GENERAL SPECIFICATION

Table of Contents

	Page No.
1.01 Location of the Works	1
1.02 Works to be executed	1
1.03 Technical Documents	1
1.04 Programme To Be Furnished	1
1.05 Notice of Operations	2
1.06 Temporary Works	2
1.07 Extent of contract	3
1.08 Works Executed by Employer Or Other Contractors	3
1.09 Standard Specification	4
1.10 Safety, Security and Protection of the Environment	4
1.11 First Aid, Welfare and Safety Precautions	4
1.12 Liaison With Police And Other Officials	5
1.13 Alterations To And Preservation Of Services	6
1.14 Traffic Deviations, Traffic Control and Signs	7
1.15 Setting Out	8
1.16 Documents required for Operation	9
1.17 Progress Report	9
1.18 Water And Electricity Supplies	10
1.19 Nature Of Ground And Conditions Of Work	10
1.20 Faulty Work	10
1.21 Particulars Of Existing Works	10
1.22 Protection Of Works	11
1.23 Protection From Water and Sewage	11
1.24 Unauthorised Persons	11
1.25 Filling In Holes And Trenches	11
1.26 Joint Measurement Of Extras	11
1.27 Advertising	12
1.28 Provisional Acceptance	12
1.29 Progress Photographs	12
1.30 Responsibility of The Contractor	12

1.31	Units Of Measurement	12
1.32	Standard Specification	12
1.33	Site Diary	13
1.34	Signboards.....	13
1.35	Protection of The Environment.....	13
1.36	Quality Assurance Plan.....	19
1.37	Liaison with Frontagers	23
1.38	Contractor's Orders to be approved	24
1.39	Responsibility of the Contractor	24
1.40	Sub-Contractors.....	24
1.41	Contractor's Working Area	24
1.42	Overhead Power Line	25
1.43	Survey Beacons.....	25
1.44	Use of Heavy Plant	25
1.45	Survey and Exploratory Excavations.....	25
1.46	Dilapidation Survey & Protection of Properties.....	26
1.47	Laboratory Tests	26
1.48	Construction Control Testing.....	29
1.49	Tests carried out by the Contractor	29
1.50	Alteration in Frequency of Tests.....	29
1.51	Tests carried out by a Nominated Testing Authority	30
1.52	Clearance of Site on Completion and Maintenance Period	30

Annex A – Checklist	5 pages
----------------------------------	----------------

GENERAL SPECIFICATION

1.01 Location of the Works

As defined in Instruction to Bidders

1.02 Works to be executed

The works comprise of the following:

- As defined in Instruction to Bidders

1.03 Technical Documents

For the purpose of carrying out the Contract, the Contractor will be issued two copies of the General Conditions of Contract, Special Conditions of Contract, Specifications, Bill of Quantities and Drawings. However, due to the particular nature of the works, these documents may be subject to modifications, additions and adaptations to the Site Conditions, as described in the General Conditions of Contract.

The Engineer shall have authority to issue to the Contractor, from time to time, such supplementary Drawings and instructions as shall be necessary for the purpose of the proper and adequate execution and completion of the Works and the remedying of any defects therein. The Contractor shall carry out and be bound by the same.

The Contractor shall have the latest drawings and drawing register list in possession on site and shall produce same upon request. Superseded drawings and corresponding register list shall be discarded.

The attention of the Contractor is drawn to the fact that the Specifications and Drawings also include supplementary information about works that are not mentioned in the Bill of Quantities. In the event that such works would be required, the rates shall be agreed with the Engineer.

1.04 Programme To Be Furnished

Within fourteen days (14) days after the date of Letter of Acceptance, the Contractor shall submit to the Engineer for his approval: -

- A fully detailed programme (Programme of Works) showing the timing, order of procedure and general methods for carrying out the Works, with timing for mobilisation of equipment and plant and for purchase of important materials (Milestones).
- The organization (Organigram), staff (Staff List), labour (Labour List), equipment and plant (Plant List) proposed for the execution of the Contract. The planning

shall be updated on the last week of each month.

- The layout and general arrangement of all temporary Works including site installation, he proposes to construct for the purposes of the Contract.

The Contractor must allow in his methods of working the necessity to provide vehicular access to the residents and the commercial buildings as well as the through traffic. In this respect, the requirements of the Municipal Council, the Traffic Management and Road Safety Unit, Road Development Authority, Ministry of Public Infrastructure, District Councils, Police, etc. must be checked before tendering and respected during the construction stage.

The Engineer after examining and if necessary discussing, with the Contractor such document shall give his final approval before the commencement of the Works.

1.05 Notice of Operations

No operation or test shall be carried out without full and complete notice having been given to the Engineer, by the Contractor sufficiently in advance of the time of the operation, a minimum of **24 Hours**, to enable the Engineer to make such arrangements as he may deem necessary for its inspection and checking. Note that inspection by the Engineer shall be carried out only during working weekdays (Monday to Friday) as from 8.00 a.m. to 5.00 p.m.

The Contractor shall ensure that an independent check/verification is carried out and all checklists are duly filled and submitted as part of the request/notice for inspection.

A copy of the Checklists is enclosed as **Annex A** at the end of the Specifications.

1.06 Temporary Works

1. After the Contract is placed and before the Works on Site commence, the Contractor shall submit to the Engineer drawings showing the proposed location and general arrangement of his offices, workshops, stores, access roads and other temporary works required for the proper and expeditious execution of the permanent works.
2. The Contractor shall be wholly responsible for obtaining a site for his camps, offices, stockpiles of aggregates, constructional plant and other temporary Works, outside the road reserve and for making all payments in connection therewith.
3. All temporary buildings or stores and plant shall be located only on sites approved by the Engineer. The Contractor shall make his own arrangements with the landowners at his own expense.
4. All land to be permanently used or occupied by the Works will be provided by the Employer, in whole at the start of works or in part as the works progress.
5. The Contractor shall maintain all offices required by his Site Staff, workshops, storage sheds, etc., and clear away on completion of the Contract and leave the Site in clean and tidy condition.
6. The Contractor shall provide latrines and ablutions for his employees, maintain them in a sanitary condition throughout the Contract and clear away on completion and leave the Site in a clean and tidy condition. The Contractor shall be solely responsible for any living accommodation required by his employees.

7. When no longer required for the Contract, all such provisions shall be left or dismantled and disposed of as directed by the Engineer and their Sites shall immediately be cleaned and left as far as practicable in the same condition as that obtained immediately prior to occupation.

1.07 Extent of contract

The work specified shall include all general work preparatory to execution, all matters, things, requisites and work of any kind necessary for the due and satisfactory construction, completion and maintenance of the Works to the true intent and meaning of the Drawings and this Specification and further drawings and orders that may be issued by the Engineer from time to time; compliance by the Contractor with all Conditions of Contract whether specifically mentioned or not in the clauses of this Specification; all materials; apparatus, plant, machinery, tools, fuel, water, temporary works and roads, strutting, timbering moulds and tackle of every description, transport, offices, stores, workshops, staff and labour; the provision of proper and sufficient protective works, temporary fencing, lighting and watching required for safety of the public and protection of the Works and adjoining lands and waterways; all measures necessary to ensure the safety of shipping, and sanitary accommodation for staff and workmen; taking and maintenance of all insurances, the payment of all wages, salaries, fees, royalties, duties or other charges arising out of the execution of the Works; the regular clearance of rubbish, reinstatement and clearing up and leaving perfect on completion. If any items are left unpriced it will be assumed that their value is included in other items and that they are not to be separately charged.

Any error in description or in quantity or omission of items from the contract bills shall not vitiate this contract but shall be corrected accordingly.

1.08 Works Executed by Employer Or Other Contractors

The Employer reserves the right to execute, on site, works not included under this Contract and to employ for this purpose either his own employees or another contractor whose contract may be either a sub-contract under this contract or an entirely separate contract.

The Contractor shall ensure that neither his own operations nor trespass by his employees shall interfere with the operations of the Employer, or his contractor employed on such works and the same obligations shall be imposed on the Employer or Contractor in respect of work being executed under this Contract.

1.09 Standard Specification

In order to establish standards of quality, reference has been made in this Specification to British Standards (BS), European Norms (EN) and to other National or International Standards. Such Specifications will be referred to as "Standard Specifications" and shall be the latest editions of such specifications issued prior to the issue of Tender Documents together with such addition and amendments as may have been issued prior to the same date. Subject to the approval of the Engineer any internationally accepted standard requiring an equal quality of work may be used.

If the Contractor proposes to use a Standard Specification other than that specified, one copy of the proposed Standard Specification shall be submitted to the Engineer not less than 28 days before approval of the Standard Specification is required.

1.10 Safety, Security and Protection of the Environment

The Contractor shall be compliant to the current rules and regulations of the Occupational Safety and Health Act, Public Health Act, Road Act and Environment Protection Act or any other norms & regulations stipulated under the laws of the country.

The Contractor shall, throughout the execution and completion of the Works and the remedying of any defects therein:

- (a) have full regard for the safety of all persons entitled to be upon the Site and keep the Site (so far as the same is under his control) and the Works (so far as the same are not completed or occupied by the Employer) in an orderly state appropriate to the avoidance of danger to such persons, and
- (b) provide and maintain at his own cost all lights, guards, fencing, warning signs and watching, when and where necessary or required by the Engineer or by any duly constituted authority, for the protection of the Works or for the safety and convenience of the public or others, and
- (c) take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

Any person having access to the site premises shall attend a training & an induction course, under the tutelage of an approved Health & Safety Officer, regarding the implementation of health and safety norms and regulations to be observed for the execution of the works to be carried.

The Contractor shall appoint a qualified Health & Safety officer to appraise the risk assessment and to enforce health and safety norms and regulations, including heavy machinery to be used, for the proper execution of works. Daily assessment shall be carried out and monthly report shall be submitted to the Employer and Engineer.

1.11 First Aid, Welfare and Safety Precautions

The Contractor shall provide, equip and maintain an adequate First Aid Station on the Site of the Works and provide all necessary transport and shall have experienced First Aid men available for attending minor accidents.

The Contractor shall allow in his prices and be responsible for the cost of all site welfare arrangements and health requirements.

Work is to be executed in a safe and responsible manner and the Contractor is to proceed

in accordance with the provisions of the appropriate legislation. Particular attention is drawn to the need for adequate hand railing and fencing off dangerous areas, e.g., excavations on roads.

The Contractor shall be fully compliant to current stipulations of the Occupational Health & Safety Act, Public Health Act and other regulations stipulated under the laws of the country.

The Contractor shall appoint a qualified Health & Safety officer to appraise the risk assessment and to enforce health and safety norms and regulations for the proper execution of works. Daily assessment shall be carried out and monthly report shall be submitted to the Employer and Engineer.

The Contractor shall provide all required approved safety equipments, as in helmets, gumboots, boots, shoes, reflective jackets, goggles, raincoats, gloves, umbrellas and ear muffs, to all people having access to site.

The Contractor shall provide:

- a) Mess rooms comprising of doors & locks, tables, chairs, sheds, lighting, ventilations & all required sanitary.
- b) Rest room & changing rooms comprising of doors & locks, wall partitions, cupboards, lockers, lighting, ventilations & all required sanitary. The changing rooms shall be separate based on gender.
- c) Toilet blocks comprising of doors & locks, wall partitions, all necessary plumbing, septic tanks & absorption pits, urinals, sinks, basins, shanks, lighting, ventilation and any other required sanitary. The block shall also comprise of a squat toilet.
- d) Bathroom and other washing facilities with all wall partitions, lockers, doors & locks, all necessary plumbing, lighting, ventilation and any required sanitation.

The Contractor shall allow in his prices and be responsible for the cost of all site welfare arrangements and health requirements.

1.12 Liaison With Police And Other Officials

The Contractor shall keep in close contact with the Police Dept, the Ministry of Public Infrastructure, Land Transport and Shipping, the Ministry of Agriculture, the Mauritius Telecom, the Central Electricity Board, the Central Water Authority, the Irrigation Authority and other interested institutions of the areas concerned regarding their requirements in the control of workmen, movement of traffic, passage through inhabited zones or other matters, and shall provide all assistance or facilities, which may be required by such officials, in the execution of their duties.

1.13 Alterations To And Preservation Of Services

1.13.1 Contractor's Responsibilities

The Contractor shall acquaint himself with the position of all existing works and services such as water pipelines, irrigation canals, power cables surface water drains, water mains, electricity, telephone cables and telephone lines and poles, optical fibres etc. before any excavation or other work likely to affect them is commenced.

Where work is being carried out in the vicinity of overhead power lines, the Contractor is responsible for ensuring that all persons working in such areas are aware of the relatively large distance that high voltage electricity can short to earth when cranes, or other large masses of steel, are in the vicinity. The Contractor's attention is drawn to BS I62, which states safe clearance for various voltages.

In all cases where such works are exposed, they shall be properly shored or hung up. Special care must be exercised in refilling to compact the ground under mains, cables, etc., and not to cover up exposed water meters and stopcock boxes etc.

Poles supporting cables, adjacent to the Works, shall be kept securely in place until the work is completed, and then shall be made safe and permanent.

1.13.2.1 Survey of Existing Services

The Contractor shall carry out a survey of any existing services which may interfere with or be damaged by the construction and shall submit this to the Engineer who will instruct the Contractor as to what measures are required to remove, alter, change or re- direct existing services. Precautions shall be taken to maintain the flow of water in streams, rivers, conduits and pipelines. The work required to protect services will be notified to the Contractor after approval by the relevant services authorities.

Notwithstanding the foregoing requirements, and without lessening the Contractor's responsibility, the Contractor shall inform the Engineer immediately if any existing works are exposed.

The foregoing requirements will apply equally to any work on services or roads completed by the Contractor in an earlier stage of the Contract.

The price for investigation of all services, its protection, temporary diversion and maintenance of such services shall be deemed to be included in the tendered rates and price.

1.13.3 Removal And Diversion of Services

The Contractor shall be responsible for arranging, for the moving of services where necessitated by the works, subject to the approval of the Engineer.

Immediately after the issue of the Engineer's instructions to commence work, the Contractor shall carry out a survey of all the existing services likely to be affected by the permanent works.

He shall then liaise with the relevant authority for the removal, modification or diversion of the services.

In the case of existing water pipes the Contractor shall work, in conjunction with the C.W.A and the Engineer for finalisation of all instructions regarding the works on CWA network. Permanent supply using existing services shall be maintained throughout the construction period, and any costs shall be included in the contractor's tendered rates for any temporary diversions required by the contractor.

1.13.4 Damage To Services

Any damage to, or interference with existing services, occasioned during the progress of the Works, shall be deemed to be the responsibility of the Contractor, who shall undertake to make good at his own expense any damage so caused to the existing services or other features and shall be liable in respect of all claims arising from such damage or interference however occasioned.

In the event of damage, the Contractor shall inform the authorities concerned, who may carry out the repairs themselves. In such a case, the Contractor shall pay for the cost of repairs within one month or else the Engineer shall request the Employer to deduct the sum, which is assessed to be reasonable from any monies due to the Contractor, after inspection of the accounts.

1.14 **Traffic Deviations, Traffic Control and Signs**

The Contractor shall be responsible for the safe and easy passage of road traffic on the existing carriageway as well as sections under construction day and night.

The Contractor shall due application 3 (Three) Months prior to any diversion of used/ classified roads on demolition of bridge to RDA, TMRSU and Police to have all necessary clearances and security and any rerouting of the diversion of the traffic.

Public traffic must be always reasonably and effectively accommodated on existing roads in the vicinity of the works and throughout the project area and all access roads to private lands must be kept open until adequate deviations have been constructed by the Contractor to the satisfaction of the Engineer.

The Contractor shall bear all cost of and shall be responsible for the provision of flagmen guards, fences, barriers and lights as may be necessary for the safety and direction of the public as required by the Laws of Mauritius or local By-Laws or as ordered by the Engineer

and all such arrangements shall receive the approval of the Engineer.

The Contractor shall erect and maintain on the Works and at prescribed points on the approaches to the Works all signs necessary for the direction and control of traffic, and advertisement of the Works. All these signs and their locations shall be approved by the Engineer before erection. Traffic signs shall be illuminated by night and the cost of providing, maintaining and lighting the signs shall be included in the sum tendered against the appropriate item in the Bill of Quantities. Traffic signs shall be reflectorised with flashing beacons on dangerous points.

Where by reason of the contractor's activities in the execution of the works or for any other reason due to the execution of the contract, public traffic cannot be safely accommodated on sections of the existing road, the contractor shall construct and maintain temporary deviations as instructed by and to the approval of the Engineer. The contractor shall submit to the Engineer for his approval all site plans and other drawings showing alternative routes that will have to be followed by deviated traffic indicating all warning, directional, informative and other signs required for the safe and easy passage of such traffic. All such drawings shall be submitted at least two months before the coming into operation of the said traffic diversions. The cost of all diversions and detours required for the construction shall be borne by the Contractor.

All temporary traffic signs and markings used for any traffic diversion should be in accordance with international norms regulating same. These standards shall also be applicable to the signalization of all site works.

The cost of all deviations or repairs to existing roads prior to the operation of the traffic diversions or reinstatement thereof after the completion of traffic diversions shall be borne by the Contractor.

The Contractor shall also submit with his tender a list of equipment which he proposes to use for diversion works.

1.15 Setting Out

1.11.1 The Contractor shall be responsible for the full and proper setting out of the Works. The principal setting out points and benchmarks shall be referenced out during construction and the Contractor shall maintain these throughout the Contract Period.

1.11.2 The dimensions and levels shown on the Drawings are believed to be correct, but the Contractor shall verify the same on Site and is no way absolved from responsibility from any consequence arising from the inaccuracy of such dimensions or levels.

1.11.3 The Contractor may be required to prepare and submit additional drawings to complete the tender drawings. He shall give the Engineer not less than 24 hours notice, of his intention to set out or give levels for any part of the work in order that arrangements can be made for checking. The Contractor shall provide all the necessary instruments, appliances, labour and any material or staging that the Engineer may require for checking the setting out or levels as specified in the Article hereof.

1.11.4 Any marks made by the Engineer shall be carefully preserved Work shall be suspended for such time as it is necessary for checking the lines and levels on any part of the Works.

Throughout the Contract, both the general and detailed methods of the complete setting out of the Works shall be submitted by the Contractor for the prior approval of the Engineer.

The Contractor shall ensure that all plant operator, gangers and key men working on the Site are made aware both of the positions of all important line and level marks and of the importance of reporting the least disturbance of the same. In the event of any reference marks being damaged or misplaced during the Works, the contractor shall replace or reinstate such marks to the satisfaction of the Engineer.

1.16 Documents required for Operation

The Contractor shall submit for the approval of the Engineer, a detailed notice of operations by sections of two hundred metres at least (15) days before starting the works on the section under consideration.

These documents will consist of (but not limited to) the following: -

- The results of the geotechnical survey for materials, the laboratory test results and the quantities.
- The proposals for protecting and/or rerouting the network after research and discussions with the competent authorities as required in section 1.13.
- Working drawings clearly indicating the technical details of the works to be executed
- The detailed planning of the works

It is clearly pointed out that the Contractor will not be allowed to start work unless and until the above documents are submitted to and approved by the Engineer. The Engineer shall give his approval or make any remarks within a period of fifteen days. The Contractor is allowed to start the works, if no answer is received from the Engineer within the prescribed delays. The Contractor shall carry out the modifications required within 48 hours of receipt of the Engineer's reply, failing which he shall not be allowed to start the works on the sections concerned.

It is pointed out that the approval (or absence of reply) of the Engineer shall not in any way absolve the Contractor of his contractual obligations under the terms of the Contract.

No separate payment will be made in respect of providing the notice of operations and preparation and submission of the working drawings and the costs thereof shall be deemed to be included in the other rates and prices.

1.17 Progress Report

The Contractor shall submit to the Engineer on the last day of each month a Progress Report for the preceding period, showing up to date progress during the previous period on all important items in each section of the Work in the manner prescribed by the Engineer including the plant and personnel schedule. The progress report shall be related to the programme such as defined in section 1.04 hereto.

1.18 Water And Electricity Supplies

It is the Contractor's responsibility to provide water and electricity for both construction purposes and also for the camps and offices. The Contractor's attention is drawn to the fact that no separate payment will be made for the provision of water and electricity and the Contractor shall be deemed to have included for these in his rates and prices. The Engineer may reject any water, which in his opinion is contaminated and not sufficiently clean for the purpose intended.

The condition of the surfaces of the private roads, paths or yards used or crossed by him for the purpose of the Contract shall be kept in reasonable repair during its progress, and on completion he shall put the roads, paths or yards in proper repair at least equal to the original condition of the roads, paths or yards used or crossed by him and to the satisfaction of the Engineer, all at his own cost.

In general the Contractor is to regulate the Character of his transport to ensure that no undue damage is caused to any roads, tracks or properties within the area of the Works, public or otherwise.

The whole of the temporary works, plant, equipment and appliances used on the Works will be the liability of the Contractor in regard to construction, sufficiency, safety, maintenance and removal on completion of the Contract and approval by the Engineer shall in no way relieve the Contractor of this liability.

The Contractor shall provide and allow in his rates and prices for all temporary works, bridges, or other work required in the construction of the Works.

1.19 Nature Of Ground And Conditions Of Work

The Contractor must satisfy himself as to the general circumstances at the site of the Works and the construction thereon, the form of river beds, and banks, the flows in the river, the surface of the ground and nature of the materials to be excavated, the possibility of subsidence from soft ground and bad and broken materials, and falls of rock in or arising out of the Works, and the possibility of floods and landslides, and the rates and prices in the Bills of Quantities will be held to cover all such contingencies.

No additional allowance, related to time or cost, shall be made, after submission of offer, regarding the above stipulations.

1.20 Faulty Work

Any work, which fails to comply with this Specification, shall be rejected and the Contractor shall, at his own expense, make good any defects, as directed by and to the satisfaction of the Engineer.

1.21 Particulars Of Existing Works

Such information as may be given on the Drawings, as to the present condition and

character of the existing structures, roadways and other services, and as to the form and dimensions of various parts of the existing structures and positions and particulars of pipes, cables and other mains and information arising as a result of trial pits and boreholes is given without guarantee of accuracy and neither the Employer nor the Engineer will be liable for any discrepancy therein.

1.22 Protection Of Works

The Contractor shall take all steps necessary to protect the permanent Works and all stores and materials from the effects of weather, including floods and cyclones, theft and shall be entirely responsible for any delay, damage or loss arising therefrom. The Contractor shall take account in his rates for the mitigation of noise and dust pollution generated in the execution of the contract.

1.23 Protection From Water and Sewage

The Contractor shall keep the whole of the Works free from water and sewage and allow in his prices for all dams, cofferdams, pumping, piling, shoring, temporary drains, sumps etc., necessary for the purpose and shall clear away and make good at his own cost and to the satisfaction of the Engineer all damage caused thereby. The drainage of the natural ground in the vicinity of the earthworks and drainage work generally shall be carried out in advance of the rest of the Works.

1.24 Unauthorised Persons

No unauthorised persons are to be allowed on to any part of the Site and the Contractor shall take steps to prevent this and instruct his Foremen and Watchmen accordingly.

1.25 Filling In Holes And Trenches

The Contractor immediately upon completion and approval of any work shall fill up all holes and trenches which may have been made or dug, level mounds or heaps of earth that may have been raised or made, and clear away all rubbish which may have become superfluous or have been occasioned or made by the execution of such work; and the Contractor shall bear and pay all costs, charges, damages and expenses which may be incurred or sustained on account or in consequence of any accident which may happen by reason of holes and trenches connected with the work being dug and left unfenced or material being left or placed in improper situations.

1.26 Joint Measurement Of Extras

In such case as the Contractor shall find it necessary to execute any works, or provide any materials which he feels entitled to claim as extras to the Bill of Quantities he shall obtain written permission from the Engineer before commencing such work and shall make arrangements for the Works, or materials to be measured jointly with the Engineer, and the quantities agreed. Neglect to obtain authority to commence any such work, shall entitle the Engineer to disallow any claim for extras arising there from. The fact that joint measurement took place in no way commits the Engineer to recognise the validity of such claim, if it is considered unjustified. The Engineer, shall at all times, have full access to the Contractor's time books and may daily check the item of any extra works with the Contractor's timekeeper or otherwise, but the fact of his agreeing upon any time, shall in

no way bind the Engineer to value the work, other than by measurement if he thinks fit to do so.

1.27 Advertising

The Contractor shall not erect any advertisement in any form within the Site or on adjoining ground, but shall provide a project board at the main entrances to the Site bearing suitable inscriptions including the name of the Contractor in accordance with details provided by the Engineer.

1.28 Provisional Acceptance

After completion of the Works and at least eight (8) working days before the date of provisional acceptance, the Contractor is to submit to the Engineer the as-built drawings.

The drawings shall be supplied at the Contractor's expenses in six (6) copies, two (2) of which shall be in the form of printouts and one (1) copy on CD ROMs. The failure to supply the as-built drawings in time shall automatically prevent the provisional acceptance.

1.29 Progress Photographs

The Contractor shall arrange for the taking of progress photographs including electronic copies for the different stages of construction of the Works, upon the direction of the Engineer. The photographs will be taken at intervals of one month minimum and the Contractor shall arrange to supply four unmounted enlargements not less than 150mm by 100mm and electronic copies of each print chosen by the Engineer for enlargement.

The contractor shall also arrange for a video of the site in high definition at the start of the Works, and progress monitoring

The number of exposures and enlargements will be as directed/ordered by the Engineer.

1.30 Responsibility of The Contractor

Where the approval of the Engineer is required under these Technical Specifications, such approval shall not relieve the Contractor of his duties or responsibilities under the Contract.

1.31 Units Of Measurement

The units of measurement to be used throughout this Contract are in general metric units of metres (m), kilogrammes (kg), Newton (N) degrees Celsius (C) and litres (l).

1.32 Standard Specification

In order to establish standards of quality, reference has been made in this Specification to certain British Standards (BS) and to certain other National or International Standards.

The British or other Standards referred to shall be the latest edition published at the date of issue of tender documents.

All the conditions and particulars as to standard of materials, workmanship and tests contained in such British or other Standards shall be compiled for the various items.

Other equivalent National or International Standard Specifications, which will ensure equal

or higher qualities of materials or workmanship, may be substituted at the sole discretion of the Engineer if requested by the Contractor.

1.33 Site Diary

A diary shall be held on site by the Contractor or his representative and signed by the Engineer.

The following entries shall be made every day: -

- Administrative procedures relative to the execution and running of the contract, such as notifications, visas etc.....
- Climatic conditions (rainfall, winds, temperature, water levels etc.)
- The results of control tests
- Incidents and details likely to have an effect on the future functioning of the works, calculation of cost prices and the actual duration of the Works.
- Any observation and instruction imposed on the Contractor

Everyday there shall be annexed to this journal, a detailed statement prepared by a representative of the Contractor and which shall indicate for each item of work the working hours, the number and qualification of the personnel, the equipment present on site and their running time, the duration and causes of any stoppages, the daily evaluation of the amount of work executed.

1.34 Signboards

Signboards (2 Nos.) shall be erected by the contractor at locations to be given by the Engineer. The signboards shall be made up of 5 no. wooden planks, 2.5m long, 300mm wide and 25 mm thick, bolted on 50mm diameter galvanized pipes embedded in concrete and properly braced against wind loadings. The planks shall be painted white and the lettering blue. A height of 100mm should be adopted for the letterings in lower case. Alternative proposal shall be submitted to approval of Engineer.

The Contractor shall obtain instruction from the Engineer in respect of the information to be displayed on the signboards and dimension of lettering. The cost of supply and erection and maintenance of the signboards shall be covered in the Preliminaries & Generals of the Bill of Quantities.

1.35 Protection of The Environment

The Contractor shall comply with all regulatory and legal measures related to environmental protection, in force in Mauritius.

The Contractor shall implement all environmental protection / mitigating measures prescribed in the Environmental Management Plan (EMP) provided in section 1.35.3 hereto.

The Contractor shall integrate the costs and durations related to these measures in his offer and his construction planning. Such costs shall include costs associated with measurements/observations required for monitoring of environmental parameters during the construction phase.

Moreover, he shall submit to the Engineer for the Engineer's approval method statements,

construction methods and the characteristics of the structures he intends to build in connection with environmental measures to be implemented.

On that account, the Contractor shall be responsible for carrying out all studies and researches in order to provide all the information and required documents to the Engineer, including:

- An Environmental Management Plan (EMP) at the beginning of the construction period
- A Site Environment Protection Plan for each construction site
- A monthly situation of the incidents related to the site environment and the environment in general.

The main instructions to apply in this field are detailed hereafter.

1.35.1 Environmental Monitoring and Pollution Control

The Contractor shall appoint a suitably qualified member of his site staff to be responsible for environmental matters, including environmental monitoring and pollution control, arising from the works. The responsibilities shall include:

- Proper and safe storage and disposal of wastes and spoil.
- Clearance of approved vegetation only.
- Stockpiling and safeguarding of topsoil.
- Erection and maintenance of all approved safety fencing, barriers, warning signs, diversion signs, to safeguard the public from the Works.
- Protection of watercourses from pollution arising from the Works.
- Provision and maintenance of approved wastewater disposal systems.
- Safe storage of all potential polluting substances required for the Works.
- Prevention of spills.
- Maintenance of the plant to avoid public nuisance due to fumes, noise, leakages, etc.
- Dust control via watering and preventing formation of dust plumes.
- Noise control to minimise nuisance to the public, particularly outside normal working hours.
- Traffic control to minimise disruption and to allow access for residents.
- Cleaning of roads and footpaths during construction.
- Reporting of any accidents or environmental incidents to the Project Manager and to the relevant Authorities, together with organisation of required remedial action.
- Site restoration, cleaning, planting on completion of the Works.
- Watering of trenches prior to completion of roadworks.

The Contractor shall take all necessary measures to comply with the above requirements and mitigate the environmental impact of his construction activities. The construction phase mitigation management plan shall include, but not restricted to the measures given in table below.

Environmental Impacts and Mitigation Measures for Construction Phase

<u>SUBJECT/ MEDIA</u>	<u>POTENTIAL NEGATIVE IMPACT</u>	<u>MITIGATION/MANAGEMENT PLAN</u>
<u>Air Quality</u>	Dust Generation	<ul style="list-style-type: none"> • Employ dust suppression measures, as in daily sprinkling of exposed areas, covering of stacked excavated materials, maintain roads or site free from dust and dirt, removal of accumulated dust, installation of screens throughout the perimeter of the site and any other measure, which are likely to induce formation and proliferation of dust plumes. • Accept residual impact.
	Dust generation - vehicular access	<ul style="list-style-type: none"> • Use traffic routing arrangements to avoid built-up areas and bottlenecks • Routine control and maintenance of all equipment used for transportation • Employ dust suppression measures • Accept residual impact
	Vehicle Emissions (mobile)	<ul style="list-style-type: none"> • Use traffic routing arrangements • Routine control and maintenance of vehicles • Ensure vehicles use exhaust emission control technologies • Accept residual impact
	Vehicle/Engine Emissions (static)	<ul style="list-style-type: none"> • Run only when required • Routine control and maintenance of equipment • Ensure vehicles use appropriate exhaust emission control
<u>Water</u>	Release of particulates into river	<ul style="list-style-type: none"> • Minimise pollution from construction activities • Restrict surface runoff • Construct a surface water lagoon • Discharge drainage following settlement • Accept residual impact
	Release of fuel from construction sites	<ul style="list-style-type: none"> • All above ground storage tanks and drums to be stored on low

<u>SUBJECT/ MEDIA</u>	<u>POTENTIAL NEGATIVE IMPACT</u>	<u>MITIGATION/MANAGEMENT PLAN</u>
		permeability bases with bund able to retain 110% of the stored volume
<u>Soil</u>	Soil erosion	<ul style="list-style-type: none"> Careful location of buildings and spoil disposal sites Careful storage of spoil Restriction of traffic to designated access roads and vehicle parks Employ soil erosion prevention techniques Reclaim land as soon as possible after development Accept residual impact
<u>Noise</u>	Noise generation	<ul style="list-style-type: none"> Construct noise bunds between new works and residential areas during construction Restrict work to daylight hours Place noisy operations as far away on the site from the residential areas Use sound meters to measure sound levels. The following levels shall not be exceeding 60db (A) Leq – 7-18hrs 55db (A) Leq – 18-21hrs 50db (A) Leq – 21-7hrs. <p>Any activities generating sound levels exceeding the above, shall be stopped and alternative method shall adopted to proceed and complete the works.</p>
	Noise	<ul style="list-style-type: none"> Use equipment with appropriate silencers Only run equipment when required Accept residual impact
<u>Waste</u>	Waste Control	<ul style="list-style-type: none"> To limit construction waste as much as possible. To stack construction waste in designated area, away from residential areas or near places easily accessible to public or third parties. No onsite destruction of waste, as in through burning, to be carried out.

<u>SUBJECT/ MEDIA</u>	<u>POTENTIAL NEGATIVE IMPACT</u>	<u>MITIGATION/MANAGEMENT PLAN</u>
		<ul style="list-style-type: none"> To cart away and dump construction waste in Government approved areas.
<u>Vibrations</u>	Vibration Control	<ul style="list-style-type: none"> To limit use of excavator hammer and instead use pneumatic tools or any other appropriate machinery as alternatives. To use static method for compaction if dynamic compaction generates vibration beyond acceptable norms. To use vibration meters to check vibration levels, with a Peak Component Particle Velocity of 15mm/s at 4Hz as threshold.
<u>Traffic Impact</u>	Congestion, capacity	<ul style="list-style-type: none"> Designate traffic routes for all heavy traffic Use haul road as much as possible Accept residual impact
<u>Ecology</u>	Loss of habitat	<ul style="list-style-type: none"> Reduce construction site area as much as possible Restrict access into adjacent lands Restore sites using ecological principles, and native or indigenous species Accept residual impact
<u>Visual</u>	Visual impact	<ul style="list-style-type: none"> Screen site area wherever possible Accept residual impact

1.35.2 Environmental Procedures Monitoring

The Contractor shall comply with the procedures regarding:

- The prior works declarations to be done to various administrations and local authorities,
- The authorisations to obtain before the commencement of the works, whatever they are.
- For the opening of the quarry operation plant:

The authorisation of the opening of the quarry operation plant to be obtained from the competent local authority, subordinated to the prior approval by the Engineer of an Environmental Protection Plan produced by the Contractor.

The Contractor is not allowed to store or be in possession of explosives at any time.

1.35.3 Environmental Management Plan (EMP)

Within sixty (60) days from the date of notice of contract award, the Contractor shall

prepare and submit to the Engineer for his approval an Environmental Management Plan updated accordingly to its general programme.

It will include

- The team organization of the staff responsible for the environmental management of the project and their CVs;
- A general description of the methods that the Contractor suggests to implement so as to reduce the impacts on the physical and biological environment for every phase of the works as specified in the annexed EMP and / or as directed by the Engineer as required;
- A general description of the methods that the Contractor suggests to implement so as to reduce the negative socio-economic impacts of its presence in the region, during the works duration;
- A general management plan for the exploitation and the rehabilitation of the borrow pits and quarries (anti-erosive action...);
- A water management plan (supply, location, quantity),
- A wastewater management plan regarding collection, treatment and disposal of wastewaters from the construction site
- A solid waste management plan (type of waste, method of collection, method and location of storage, method and location of disposal)

The Engineer will approve these documents or will make comments on it within twenty (20) days.

1.35.4 Site Environment Protection Plans (SEPP)

Within thirty (30) days at least before the commencement of the works on site (camp site, quarries, storage zone, borrow pits, etc.), the Contractor shall prepare and submit to the Engineer for his approval a Site Environment Protection Plan, which should include:

- All measures that the Contractor intend to take so as to ensure the protection of the site environment,
- The programme of application of these measures

Each SEPP will include at least the following information and documents:

- A brief presentation of the initial condition of the site reminding:
 - Its particularities (soils and sub soils, hydrography, land and aquatic ecosystems, humid zones, specific fauna and flora, human environment);
 - Its constraints regarding the above points;
 - The location and the surface area of the land to be used;
 - A general appropriate-scale plan,
 - Giving the specific elements of the environment within a 200-metres radius: water points, wetlands, areas planted with trees, built-up are, buildings and houses, cultivation area, structures, religious site;
 - Indicating precisely the different exploitation zones;
 - Management plans including, depending on the area particularities, the measures and the developments planned during and at the end

of the construction period, so as to minimise the negative impacts on the environment. These plans should refer to the standard codes for a good management of water, soils, air, chemical and petroleum products, hazardous products, waste, human resources, social integration,

- The planning of implementation of the measures of the SEPP, related to the works construction planning, the management plan with monitoring indicators.

The Engineer will approve each SEPP or will make comments on it within ten (10) days.

1.35.5 Incident Reporting

The Contractor shall submit monthly to the Engineer:

- A situation on the security level on the construction site and the measures taken to maintain it at a high level,
- A copy of the site diary including lists of notable events or incidents leading to a significant impact on the environment, or an accident/incident with the population and the precise corrective measures

1.36 Quality Assurance Plan

The Contractor shall submit to the Engineer or the Client/Employer, within fifteen (15) days at the latest after the contract award, his Quality Assurance Plan (QAP) prepared:

- In accordance with the Organization scheme of the Quality Assurance Plan submitted with his offer
- On the basis of an "Interior Control" composed of an "Internal Control" and an "External Control" (Quality Control Engineer)
- For all the works to be undertaken

This QAP shall include the sub-contractors for the specialised works such as the deep foundations, pre-stressed concrete structures work, revegetation works.

It shall be submitted to the Engineer for its approval. The approval of the QAP by the Engineer is absolutely necessary for the effective commencement of the works.

1.36.1 Composition of The QAP

The QAP includes:

- A general organisation document presenting the common elements for the overall construction site,
- One or several documents related to a construction execution procedure,
- The framework of the monitoring documents

The following paragraphs define the minimal content of the general document of the QAP, and the common elements of the execution procedures.

General organisation

The organisation document should detail the following points:

- Tasks assignment, human resources: the document has also to precise the persons in charge of the sub-contractors on site,
- Internal control organisation: the document shall remind the principles and present the conditions of organisation and management of the internal control, these conditions being related with the indications regarding the designated persons to execute or coordinate the related tasks. It specifies the resources and means allocated and defines the list of execution procedures and their implementation schedule. It gives a list of activities for which testing is required. Finally, it defines the certification/validation conditions of the documents and designs approved by the Engineer for the construction works, so as to distinguish them from the draft versions.

This document is to be submitted within one (1) month after the issue of the Instruction to commence the works.

Execution procedures

a) Content

The execution procedures shall comply with the instructions of the chapters hereafter, and define in particular:

- The part of the works concerned by the considered procedure;
- The specific equipment used
- The choices of the Contractor regarding the materials and products (quality, certification, origin, brand and exact model if applicable).
- The sensitive points of the execution (a sensitive point is an execution point which should particularly catch the attention to ensure a good construction), related to the phases of the Works, with, if applicable, a description of the implementation methods and the execution instructions.
- If applicable, the interactions with other procedures and the prior conditions to fulfil for the future implementation of other activities, especially if this implementation has to be approved by the Engineer or has to comply with external control results (hold points);
- Interior control details.

b) Internal Control

The part of the document detailing the internal control should define:

- For materials and products used, subject to an official conformity certification procedure (official conformity certification procedures include the brand NF), the identification conditions on site of delivered products (identification consist in comparing the information on the documents of the delivery and the information required by the certification regulations or the decision giving the approval of the certificate)
- If there is not an official certification procedure, or if, with derogation, the delivered product is not certified, the execution methods of the conformity control of the products indicating the operations to be done by the sub contractors or suppliers.

- The laboratory to be used for all the control procedures (Contractor's laboratory or a registered sub-contracted laboratory) and its organisation
- The execution and interpretation conditions of the conformity tests, whether the latter are planned since the beginning or they become necessary during the construction period;
- The model of the documents of execution control, to be collected or prepared during the Interior Control, as well as their communication conditions to the Engineer.
- The content of this part of the QAP has to comply with the provisions of this Technical Specifications and the CCTG France (including the fascicule 65 A).

1.36.2 Preparation And Implementation Of The QAP

The documents constituting and implementing the QAP are prepared through several steps:

During the mobilisation period

- Definition of the framework of the QAP
- Preparation of the general organisation plan
- Preparation the execution procedures related to the first phases of the works

During the construction period, but before any execution

- Preparation of the other execution procedures
- Preparation of the execution control documents

During the execution

- Communication on site of the control documents and transmission of 3 copies of them to the Engineer

At the end of the construction period

- Collection and submission to the Engineer of all the documents of the QAP and the execution control documents. These documents should be submitted in an easily reproducible format.

1.36.3 Internal Control

Internal control tests

The Contractor has to do a technical control (control tests) of his works, in accordance with the paces given by this Technical Specifications manual and the QAP.

He can only ask for an acceptance certificate of the works or part of the works if the latter is submitted with the results of the interior control tests, which are a guarantee that the quality of the works achieved the required quality.

Control of materials quality

The tables "Quality Control" of fascicules A to H give the main tests and their pace that the Contractor has to carry out on the materials during the Construction period on the account of the Interior contro

Control of implementation quality

The tables "Implementation quality control" give the main tests and their pace that the Contractor has to carry out during the implementation of the works during the Construction period on the account of the Interior control.

In case of differences between the elements given in the tables below and the related article in the Technical Specifications Manual, it is the article of the text of the Technical Specifications Manual which prevails over the tables.

Laboratories

The Contractor cannot pretend any weakness of its laboratories, even if he has decided to make a sub contract with a certified laboratory.

The Contractor should name a person in charge (to be approved by the Engineer) to manage and supervise all the tests of the internal control and the laboratories, as well as all the complementary tests which could be required by the Engineer to Contractor.

The professional qualities/competencies of the employees of the Contractor working on the testing procedures will be checked by the Engineer at their mobilisation on site.

The agreement of an employee can be taken away from the Contractor at any time if a lack of competency is detected.

In case of a persisting bad operation of the internal control testing, the Engineer can require either the staff replacement or the execution of all the tests in an external laboratory, at the charge of the Contractor. The Contractor could not make any claim for delays or construction interruptions due to this change, and this until he has proven that the Contractor's laboratory can function in satisfactory conditions.

1.36.4 Exterior Control

Agreement points, hold points, and notice period

During the road works, the Engineer will conduct predefined controls. These control points are called agreement points and hold points.

- An "Agreement Point" is a point of the construction which requires a prior agreement between the Contractor and the Engineer.
- A "Hold point" is a critical point of the construction which requires an internal control materialisation and a formal approval of the Engineer for the works continuation.

In both cases, the approval or the comments of the Engineer has to be communicated to the Contractor before or at the end of a notice period (given in working days) which starts the day of the submission by the Contractor of:

- An "Agreement Document" in the case of an Agreement Point,
- A "Release of hold point form" in case of a Hold Point.

In case of different execution procedures of the QAP, the Contractor will sum up the notice periods related to hold points and agreement points.

The Contractor is supposed to have taken into account these notice periods in the programme of the works.

Exterior control tests

The Exterior Control tests will only be carried out if the Engineer is willing to, and after the submission of the internal control tests with a demand for acceptance certificate by the Contractor; except in particular cases where measurements and tests can only be carried out during the implementation, then the exterior control is carried out at the same time as the internal control.

The pace for the exterior control tests will be approximately one fifth or one tenth of the pace of the internal control. The Engineer is free to reduce or increase the pace of the exterior control. This pace could be reduced in particular when the methodology used by the Contractor guarantees that the required quality is achieved. It could be increased in case of important differences between the internal control and the exterior control.

The Engineer will require the immediate halt of a production:

- i. If the internal control results are not submitted on time,
- ii. If the results of exterior control are unsatisfactory.

1.37 Liaison with Frontagers

Where works are to be carried out in vicinity of residential, industrial or agricultural premises, the Contractor shall deploy a qualified Public Relations Officer, together with required assistants, whose duties and responsibilities shall include the following:

- Liaising, holding and chairing meetings with the local community representatives and other stakeholders in order to inform them of the works to be carried out, its progress and likely impacts regarding health, sanitation, social and financial associated with the projects.
- Issuing press notice, whenever required or whenever instructed by the Engineer, in the Local Newspapers to inform residents, owners and other stakeholders of traffic disruptions, diversions and locations of contractor's site operations.
- Design, printing and distribution of pamphlets to inform residents, owners and other stakeholders, within the project area, of the impact that the works will have on their daily routine. The pamphlets shall be approved by the Employer and Engineer prior distribution. The distribution shall be carried out at least 14 days prior the start of works.

- The setting up and functionality of a complaint reporting kiosk, at an agreed location with the Employer and Engineer, to receive complaints from residents, owners and other stakeholders. The facility kiosk shall have full attendance by competent staff and a registry shall be provided to record complaints or query or comments and chronology on how it is being attended to. An updated copy of the registry shall be forwarded to the Engineer and Employer.
- Ensuring that all complaints received are being attended to within the shortest delay and informing the Engineer and Employer, of the progress.
- Liaise with the Local Authorities in case of damaged to existing services which are likely to cause discomfort or prejudice to the residents, owners and other stakeholders.

1.38 Contractor's Orders to be approved

Before ordering any materials for incorporation in the Works, the Contractor shall inform the Engineer of the names of the persons or firms from whom he desires to obtain such materials, and, except as regards small and unimportant matters, no order of such materials shall be given except with the sanction of the Engineer. The Contractor shall keep the Engineer fully advised of all orders and delivery dates of all materials.

All materials shall be delivered to the site a sufficient period of time before they are required for use in the works to enable the Engineer to take such samples as he may wish for testing and approval. Any materials condemned as unsuitable for the Works shall be immediately removed from the site at the Contractor's expense.

The Contractor may propose alternative materials to those specified, provided that they are of equivalent quality and, subject to the Engineer's approval, such materials may be used in the Works.

1.39 Responsibility of the Contractor

Where the approval of the Engineer is required under these Specifications, such approval shall not relieve the Contractor of his duties or responsibilities under the Contract.

1.40 Sub-Contractors

Piecework workers employed or paid in gangs are deemed to be Sub-Contractors, and as such shall be subject to the requirements of the General Conditions of Contract. Individual pieceworkers directly under the control of the Contractor's supervisory staff will not be deemed to be Sub-Contractors.

1.41 Contractor's Working Area

The Contractor shall provide and maintain on site suitable offices. He shall also provide and maintain sufficient stores, tanks and workshops for the proper storage of materials, fuel, plant and equipment. The stores shall be of such size and construction that they shall provide adequate protection of stocks, materials, fuel, spares, etc. In quantities ensuring uninterrupted progress of the work and all costs in this connection shall be borne by the Contractor.

The Contractor shall allow in his rates for all charges incurred by him for the offices and workshops.

1.42 Overhead Power Line

Where work is being carried out in the vicinity of overhead power lines, the Contractor shall be responsible for ensuring that all persons working in such areas are aware of the relatively large distance that high voltage electricity can 'short' to earth when cranes or other large masses of steel are in the vicinity of power lines; the Contractor's attention is drawn to BS162 which gives safe clearance for the various voltages.

1.43 Survey Beacons

During the progress of the Works, the Contractor shall not remove, damage, alter or destroy in any way any plot beacons or survey beacons of the Survey Department of the Government of Mauritius. Should the Contractor consider that any survey beacon will be interfered with by the construction work or will ultimately be above or below the final level of the finished Works, he shall notify the Engineer, who if he considers it necessary, will make arrangements for the removal and replacement of the beacon.

1.44 Use of Heavy Plant

In the event of the Contractor desiring to use heavy machinery in the vicinity of existing services, structures or roads, he shall first satisfy the Engineer that it will be of such size and used in such a manner as not to cause any disturbance or damage whatsoever. In particular, the Contractor and his suppliers shall not either before or after acceptance of it as complete, subject any pavement to a wheel load exceeding 4500 kg, nor shall they subject any pavement shoulder to any traffic after completion.

1.45 Survey and Exploratory Excavations

Before any excavation or earthworks is commenced, the site shall be surveyed by the Contractor in a manner and to the extent required by the Engineer. Drawings recording the survey shall be submitted to the Engineer in A1 format.

The Contractor will be required to liaise with the Local Authority to pre-identify and carry out exploratory excavations, in the presence of the representatives of the Local Authority, to establish types and sizes of existing services where such exist prior to earthworks.

Once determined, the line of identified services should be noted and marked with waterproof crayon chalk or paint on paved surfaces, or wooden pegs in grassed or unsurfaced areas.

The trial pits shall be excavated to suitable size and carried out with due care to as reduce the risk of damaging the services. Steel pins, spikes, long pegs or crow bar which could damage the services should not be used. Once the upper layer of 350mm has been excavated, hand digging should be carried to complete the trial pits.

The Contractor shall include in his rate, the above but also for the provision of barricading safety precautions and any other requirements by Authorities concerned. The services should then be indicated with respect to the works on an A1 size drawing to be submitted to the Engineer prior to commencement of earthworks.

1.46 Dilapidation Survey & Protection of Properties

For works to be carried out near existing dwellings & properties, a dilapidation survey must be carried out prior commencement of any work. This survey must be done by a Registered Professional Engineer from the Contractor's side and its Insurer or Broker.

A detailed inspection should be carried regarding the existing serviceability state of any roads, buildings, fences or land in the vicinity of operations and a record should be kept of their conditions with particular regard to any defects. These records, supported with photographs where appropriate, should be agreed with the owner or Local Authority, client and insurer or broker as a true record before any works commence. It may, for example, be necessary to affix tell tales across cracks in adjacent structures to determine if the works caused subsequent movement. The Contractor shall submit this report to the Engineer and the Employer. The Engineer shall thereafter carry out a site visit to verify same.

Works shall only commence after completion of dilapidation surveys as described above.

On completion of works or whenever requested by the Engineer, the Contractor shall carry out a post dilapidation survey of all the existing dwellings & properties in the vicinity where works have been carried.

The Contractor shall include all the above in his Programme of Works.

The Contractor shall reinstate at his own expense and to the satisfaction of the Engineer any damaged caused to the property identified during dilapidation survey, resulting from the execution of works by the Contractor.

Contractor shall ensure that all inhabitants have their access to their property during construction works.

Contractor shall make survey and provide temporary parking facilities within a radius of 200m to provide safe parking to the inhabitants.

The cost of carrying out a Dilapidation Survey and Protection of Services shall be covered in the Preliminaries & General of the Bill of Quantities.

1.47 Laboratory Tests

All tests as listed below required for the selection of materials, design of mixes, control of materials and workmanship in order to comply with the requirements of this Specification may be carried out in a laboratory approved by the Engineer.

The Contractor shall submit with his tender the name and address of the laboratory where he intends to carry out tests together with the list of tests to be carried out there.

All site tests and sampling shall be carried out by the Contractor's own qualified technicians but the Engineer or his representative shall be allowed at all times free access to and use of the testing facilities.

The Contractor should note that all tests are deemed included in the unit price for the works and that no extra claim would be entertained under laboratory tests.

The following laboratory tests shall be carried out by the Contractor for the following in accordance with the procedures given in the relevant standard:

(a) Cement, Concrete and Concrete Aggregates

Description of Test	Relevant Specification
Ordinary Portland Cement	
Fineness and Strength	MS 36
Water for use with cement	BS 3148
Particle size analysis of aggregate	BS 812
Aggregate crushing value	BS 812
Flakiness	BS 882
Sampling fresh concrete	BS 1881
Slump test of concrete	BS 1881
Concrete cubes	BS 1881

(b) Soil, Materials for Sub-bases and Bases, and Aggregates for Bituminous Surfacing

Description of Test	Relevant Specification
Liquid Limit	BS 1377
Plastic Limit	BS 1377
Plasticity Index	BS 1377
Linear Shrinkage	BS 1377
Specific Gravity of Soil	BS 1377
Specific Gravity of Aggregate	BS 1377
Particle Size Analysis of Soil	BS 1377
Particle Size Analysis of Aggregate	BS 812
Field Dry or Wet Density	BS 1377
Moisture Content of Soil or Aggregate	BS 812 (subject to the Engineer's approval by Speedy Moisture Content to maker's instructions with calibration against oven-drying method BS 1377 Test 1A)
Test for Silt, Clay and Impurities of Fine Aggregate Sedimentation or Decantation Method (in case of discrepancies, the Sedimentation Method shall rule).	BS 812
Bulk Density of Filler in Toluene	BS 812

BS Compaction Test on Soil or Aggregate 4.5 kg hammer	BS 1377
BS Vibrating Hammer Method Test	BS 1377
Aggregate Crushing Value	BS 812
Los Angeles Aggregate Abrasion Test	BS 812 or ASTM C131, C535
Soundness of Aggregate	BS 1438
California Bearing Ratio (CBR)	BS 1377
Determination of Sulphate Content	BS 1377 Test 9A

One complete analysis shall be made of aggregates or material for aggregates prior to the opening of any borrow pit or the use of any stockpile for at least every 1,000 cubic metre of materials to be used.

(c) Bituminous Materials

The following tests shall be carried out on each 400 tonnes of mix but at least thrice a day for each mix plant in use.

In addition, the extraction of bitumen shall be carried out for each 200 tonnes of mix. In certain circumstances, such as the start of production of a new mix, these frequencies may be increased.

On representative samples Taken at the Plant	Relevant Specification
Particle Size Analysis	BS 812
Extraction of Bitumen	BS 598 : Part 102
Marshall Stability and Flow	BS 598, ASTM D1559
Specific Gravity	ASTM D1188 or D2726 as appropriate

(d) Core Testing

On the compacted pavements, cores 100 mm diameter will be taken using rotary diamond coring drill. On these cores the following tests will be carried out:

The density to ASTM D1188 or D2726, as appropriate, and voids content of the compacted mix shall be determined for every 700 m² or at least thrice from each day's output.

(e) Bitumen

Before ordering, the Contractor must furnish a test certificate as well as a sample quantity of 4 litres of the bitumen to be tested locally by an approved laboratory.

Every 1,000 tonnes of bitumen on every consignment must be accompanied by a Certificate of Testing from the supplier. The Certificate shall be that of an approved laboratory. If required by the Engineer, the following test shall be carried out at an approved laboratory for every 500 tonnes of delivery:

Description of Test	Relevant Specification
Penetration Test	AASHTO T49
Viscosity – Temperature Relationship	ASTM D2493
Specific Gravity	ASTM D70
Softening Point (Ring and Ball)	ASTM D38
Solubility in Carbon Tetrachloride	ASTM D2042
Flash Point (Open cup)	ASTM D92

1.48 Construction Control Testing

All earthworks and layers of pavement construction will be subject to quality control testing and the Contractor must allow in his tender for any disturbance or delays to the sequence of his operations occasioned by such control testing.

The Contractor shall request, in writing, the Engineer's approval for each section of each layer of earthworks and pavement construction. Such requests shall be made only when the Contractor has carried out the necessary tests and is fully satisfied that the section of the work concerned is in the condition required by the Specification.

The Engineer shall thereupon without undue delay inspect the section of the works, analyse the test results submitted and inform the Contractor in writing whether he is accepting or rejecting the section(s) or layer concerned.

Work on layers shall in no circumstances commence until the preceding layers have been approved and accepted by the Engineer in writing. The Contractor is wholly responsible for protecting and maintaining the condition of the work which has been submitted for approval until such time as the required written approval has been given by the Engineer.

Before the last layer of earthworks (the 150 mm of material beneath the top of subgrade) is submitted for approval, all drainage and underground works shall have been substantially completed to the satisfaction of the Engineer.

1.49 Tests carried out by the Contractor

The Contractor's attention is drawn to those parts of the Specification requiring the sampling and testing of materials by the Contractor.

The Contractor is therefore required to make his own arrangements for carrying out tests in compliance with these requirements.

The Contractor shall prior to start of works submit in writing the tests and frequency of tests, which he proposes to carry out to ensure compliance with Specifications and quality workmanship for approval by the Engineer.

1.50 Alteration in Frequency of Tests

Notwithstanding any provision in these Specifications as to the frequency of tests, the Engineer shall be empowered to alter the number, type or nature of such tests, as may, in his opinion, be necessary for the proper execution of the works. The Engineer shall

be at liberty to increase the frequency of testing, and repeat tests which, in his opinion, are unsatisfactory and vary the nature and type of test.

1.51 Tests carried out by a Nominated Testing Authority

If in the opinion of the Engineer, the facilities of the Contractor's laboratory or other proposed laboratory are inadequate to carry out control tests on materials or workmanship, such tests shall be carried out at the Contractor's expense by a Testing Authority (Material Testing Laboratory of the Ministry of Public Infrastructure) or any other which shall be nominated by the Engineer), and the Contractor shall be fully responsible for any delays and costs in the testing or works which may entail.

1.52 Clearance of Site on Completion and Maintenance Period

Upon the issue of any Taking-Over Certificate the Contractor shall clear away and remove from that part of the Site to which such Taking-Over Certificate relates all Contractor's Equipment, surplus material, rubbish and Temporary Works of every kind, and leave such part of the Site and Works clean and in a workmanlike condition to the satisfaction of the Engineer.

The Engineer will give the Contractor due notice of his intention to carry out any inspections during the period of Maintenance and the Contractor shall upon receipt of such notice arrange for a responsible representative to be present at the time and date given by the Engineer. The representative shall render all necessary assistance and shall take note of the Engineer's remarks.

SJPCE LTD

ANNEX A

SERVANSINGH JADAV & PARTNERS CONSULTING ENGINEERS LTD 7 Remy Ollier Street, Beau Bassin, Rep of Mauritius Rose Hill TEL: 466 2777 FAX: 467 7984	PROJECT:	Job Ref:
	CONTRACTOR:	Sheet No.:
	WORK SECTION:	Date:

CHECKLIST FOR PIPELINES (SEWERS & WATER MAINS - PRESSURE AND GRAVITY PIPE)

DRAWING REFERENCE:

ITEM	CONTRACTOR	SJPCE REPRESENTATIVE	REMARKS
1.0 Setting out			
1.1 Ground levels			
1.2 Level markers			
1.3 Confirmed invert levels			
1.4 General alignment			
2.0 Storage			
2.1 Protection shed			
2.2 Manufacturer requirement			
2.3 Fittings and valves			
3.0 Trenches			
3.1 Alignment/Length			
3.2 Formation level			
3.3 Formation material			
3.4 Width			
3.5 Pipe bedding			
3.6 Shoring			
3.7 Protection of works			
4.0 Pipe laying			
4.1 Alignment/Trench			
4.2 Gradient			
4.3 Bedding compaction			
4.4 Jointing			
4.5 Pipe surround/bedding			
4.6 Backfilling			
4.7 Testing			
4.8 Sterilisation			
4.9 Marker post			
5.0 Manholes/chambers			
5.1 Reinforcement			
5.2 Concrete (incl benching)			
5.3 Step Irons & Covers			
5.4 Water tightnes testing			
6.0 Reinstatement			
6.1 Services			
6.2 Roads			
6.3 Road Surfacing			
6.4 Painting			

General Remarks

Checked (SJPCE)	Final Approval (SJPCE)	Date:
-----------------	------------------------	-------

NOTE: Approval by SJPCE does NOT absolve the Contractor of his responsibilities to construct the works in accordance with the engineers drawings and specifications.

SERVANSINGH JADAV & PARTNERS CONSULTING ENGINEERS LTD 7 Remy Ollier Street, Beau Bassin, Rep of Mauritius Rose Hill TEL: 466 2777 FAX: 467 7984		PROJECT:		Job Ref:
		CONTRACTOR:		Sheet No.:
		WORK SECTION:		Date:
CHECKLIST FOR DRAINAGE WORKS				
DRAWING REFERENCE:				
ITEM		CONTRACTOR	SJPCE REPRESENTATIVE	REMARKS
1.0 Setting out				
1.1 Ground levels				
1.2 Level markers				
1.3 Confirmed formation levels				
1.4 Centerline alignment				
2.0 Storage				
2.1 Protection shed				
2.2 Manufacturer requirement				
2.3 Handling				
3.0 Trenches				
3.1 Alignment/Length				
3.2 Formation level				
3.3 Formation material				
3.4 Width				
3.5 Pipe/drain bedding				
3.6 Shoring				
3.7 Protection of works				
4.0 Pipe/Drain laying				
4.1 Alignment/Trench				
4.2 Gradient				
4.3 Bedding compaction				
4.4 Jointing				
4.5 Pipe surround/bedding				
4.6 Backfilling				
4.7 Reinforcement				
4.8 Formwork				
4.9 Covers				
5.0 Manholes/chambers				
5.1 Reinforcement				
5.2 Concrete (incl benching)				
5.3 Step Irons & Covers				
5.4 Water tightnes testing				
6.0 Reinstatement				
6.1 Services				
6.2 Roads				
6.3 Road Surfacing				
6.4 Painting				
General Remarks				
Checked (SJPCE)		Final Approval (SJPCE)		Date:

NOTE: Approval by SJPCE does NOT absolve the Contractor of his responsibilities to construct the works in accordance with the engineers drawings and specifications.

SERVANSINGH JADAV & PARTNERS CONSULTING ENGINEERS LTD 7 Remy Ollier Street, Beau Bassin, Rep of Mauritius Rose Hill TEL: 466 2777 FAX: 467 7984	PROJECT:	Job Ref:
	CONTRACTOR:	Sheet No.:
	WORK SECTION:	Date:

CHECKLIST FOR SERVICES (CEB AND MT)

DRAWING REFERENCE:			
ITEM	CONTRACTOR	SJPCE REPRESENTATIVE	REMARKS
1.0 Setting out			
1.1 Ground levels			
1.2 Level markers			
1.3 Confirmed formation levels			
1.4 Centerline alignment			
2.0 Relevant Authority			
2.1 RDA			
2.2 CWA			
2.3 TMU			
2.4 Telecom			
2.5 CEB			
3.0 Trenches			
3.1 Alignment/Length			
3.2 Formation level			
3.3 Formation material			
3.4 Width			
3.5 Protection of works			
4.0 Installation			
4.1 Alignment			
4.2 Gradient			
4.3 Jointing			
4.4 Protection			
4.5 Backfilling			
4.6 Testing			
4.7 Marker post			
5.0 Reinstatement			
5.1 Services			
5.2 Roads			
5.3 Road Surfacing			
5.4 Painting			
6.0 Manholes/chambers			
6.1 Reinforcement			
6.2 Concrete (incl benching)			
6.3 Step Irons & Covers			
6.4 Water tightnes testing			

General Remarks

Checked (SJPCE)	Final Approval (SJPCE)	Date:
-----------------	------------------------	-------

NOTE: 1. Approval by SJPCE does NOT absolve the Contractor of his responsibilities to construct the works in accordance with the engineers drawings and specifications.

2. The relevant authority must give consent for work related to the authority to commence and approval on testing

SERVANSINGH JADAV & PARTNERS CONSULTING ENGINEERS LTD 7 Remy Ollier Street, Beau Bassin, Rep of Mauritius Rose Hill TEL: 466 2777 FAX: 467 7984		PROJECT:		Job Ref:
		CONTRACTOR:		Sheet No.:
		WORK SECTION:		Date:
CHECKLIST FOR COMPLIANCE CERTIFICATES				
DRAWING REFERENCE:				
ITEM		SUBMISSION DATE	SJPCE REPRESENTATIVE	APPROVED / NOT APPROVED
1.0	Roadworks			
1.1	Bitumen / primers / paints			
1.2	Asphalt Concrete Mix			
1.3	Manhole/chamber covers			
1.4	Road base material / Asphalt			
1.5	Subbase /crusher run material			
1.6	Cats eye markers			
1.7	Concrete Precast units			
1.8	Side rails / Handrails			
1.9	Paints			
2.0	Pipelines			
2.1	Pipes			
2.2	Manhole/chamber covers			
2.3	Pipe fittings and valves			
2.4	Bedding materials			
2.5	Pipe protection			
2.6	Step irons			
2.7	Joints and sealant			
2.8	Paints			
3.0	Drainage			
3.1	Pipes/Precast units			
3.2	Manholes / Chambers covers			
3.3	Grating Covers			
3.4	Pipe fittings			
3.5	Bedding materials			
3.6	Compaction			
3.7	Joints and sealant			
General Remarks				
Checked (SJPCE)		Final Approval (SJPCE)		Date:

NOTE: 1. Approval by SJPCE does NOT absolve the Contractor of his responsibilities to construct the works in accordance with the engineers drawings and specifications.

2. Materials delivered or procured for incorporation to the works must comply with the compliance certificates.

SERVANSINGH JADAV & PARTNERS CONSULTING ENGINEERS LTD 7 Remy Ollier Street, Beau Bassin, Rep of Mauritius Rose Hill TEL: 466 2777 FAX: 467 7984	PROJECT:	Job Ref:
	CONTRACTOR:	Sheet No.:
	WORK SECTION:	Date:

CHECKLIST FOR ROADWORKS

DRAWING REFERENCE:

ITEM	CONTRACTOR	SJPCE REPRESENTATIVE	REMARKS
1.0 Setting out			
1.1 Ground levels			
1.2 Level markers			
1.3 Confirmed formation levels			
1.4 Curves & centerline alignment			
1.5 CBR/Proctor Test on subgrade			
2.0 Earthworks (Exc/Fill)			
2.1 Formation level			
2.2 Compaction			
2.3 Protection works			
2.4 Landscaping			
3.0 Crusher Run bases			
3.1 Slope & Levels			
3.2 Thickness			
3.3 Compaction			
4.0 Asphalt Concrete layer			
4.1 Prime / Tar coat			
4.2 Slope & Levels			
4.3 Thickness			
4.4 Compaction			
5.0 Road making & signs			
5.1 Painting			
5.2 Cats eye markers			
5.3 Traffic signs			
6.0 Road kerbs / Bollards			
6.1 Precast kerbs			
6.2 In-situ Concrete kerbs			
6.3 Bollards/side rails/handrails			
7.0 Drains			
7.1 Formation level			
7.2 Bedding			
7.3 Invert levels and gradients			
7.4 Precast units			
7.5 In-situ Concrete drains			
7.6 Drain & Culvert crossing			
7.7 Slab and openable covers			
7.7 Joints and sealant			
8.0 Services			
8.1 Road signs & Markers			
8.2 Erosion protection			
8.3 Sewer services			
8.4 Manholes/chambers			
8.5 CEB cables/Ducts			
8.6 CWA pipes			
8.7 Telecom ducts/chambers			
8.8 Protection works			

General Remarks

Checked (SJPCE)	Final Approval (SJPCE)	Date:
-----------------	------------------------	-------

NOTE: Approval by SJPCE does NOT absolve the Contractor of his responsibilities to construct the works in accordance with the engineers drawings and specifications.

SPECIFICATION FOR SITE CLEARANCE AND EARTHWORKS

SITE CLEARANCE AND EARTHWORKS

Table of Contents

1.00	Mass Diagram	1
1.01	Existing Structures And Services.....	1
1.02	Demolition And Dismantling	1
1.03	Demolition of Masonry, Concrete, and Reinforced Concrete Structures	1
1.04	Setting Out	2
1.05	Site Clearance	2
1.06	Cutting of trees	3
1.07	Ownership Of Salvaged Materials	3
1.08	Classification Of Excavated Materials.....	3
1.08.1	Topsoil.....	3
1.08.2	Approved Material	3
1.08.3	" Rock"	3
1.08.4	Power of The Engineer.....	4
1.09	Removal of Top Soil.....	4
1.10	Dewatering	4
1.11	Excavation.....	4
1.12	Road Excavations.....	5
1.13	Borrow Pits	6
1.14	Use of Explosives	6
1.15	Preparation of the Formation.....	6
1.16	Preparation Prior To Embankment Construction.....	7
1.17	Proof Rolling Section	7
1.18	Preparation of Natural Ground	8
1.19	Filling and Compaction of Embankments and Fills.....	8
1.20	Construction of Embankment.....	9
1.21	Subgrade.....	10
1.22	Embankment against Sloping Ground	11
1.23	Embankment and Subgrade Around Structures.....	11
1.24	Construction of High Embankments and Embankments on Soft Foundation	11
1.25	Subgrade Preparation in Earth Cuts.....	12

1.26	Subgrade Preparation in Rock Cuts	12
1.27	Tolerances.....	12
1.28	Compaction of Earthworks	13
1.29	Side Slopes	13
1.30	Earthworks for structures	14
1.31	Measurement of Earthworks	18

SJPCE LTD

SITE CLEARANCE AND EARTHWORKS

1.00 Mass Diagram

The Contractor shall prepare a mass diagram showing in as much detail as the Engineer may consider necessary the programmed movement of the earth for measurement purposes. The programme for earthworks shall be submitted for the approval of the Engineer before the commencement of the Works. Such approval shall not be deemed to relieve the Contractor of any of his responsibilities under the Contract. The Contractor shall before preparing his earthworks programme, carry out such soil testing as necessary to determine the suitability of materials for use in the Works.

1.01 Existing Structures And Services

The existing structures and services on the Site include: -

- (a) Services such as channel, water-mains, telephone, electricity cables, overhead lines, street lighting etc.
- (b) Masonry, concrete, reinforced concrete
- (c) Structures
- (d) Existing Roads
- (e) Any other miscellaneous structures

1.02 Demolition And Dismantling

The Engineer must be given 7 days' notice of any proposal to demolish or dismantle all or any part of the existing structure on the Site, which is necessary for the completion of the Works.

The Contractor shall give the Engineer an explanation of the method and order of demolition and the steps taken to ensure the safety and stability of any remaining structure affected thereby.

The approval of the Engineer shall not relieve the Contractor from his responsibility for injury, loss, inconvenience and annoyance to persons, damage to animals, property and Works consequent on the demolition and dismantling.

1.03 Demolition of Masonry, Concrete, and Reinforced Concrete Structures

Demolition of existing masonry, concrete, reinforced concrete structure if any shall be carried out in accordance with the Drawings or as directed by the Engineer.

The Works as directed by the Engineer shall include: -

- Demolition (reinforcement shall be cut off close to concrete)
- Removal of material
- Loading, carting away & disposal of material as directed by the Engineer
- Filling under embankment of all inspection pits and openings made in connection with the removal of these structures to the original ground or to the lines and levels as directed by the Engineer, to be levelled with an approved material compacted to a density at least equal to that of the surrounding ground or as directed by the Engineer.

1.04 Setting Out

Before starting work the Contractor shall set out the road centreline with temporary markers every 20 metres and at the horizontal intersection point.

Permanent pegs outside the working area should be established as follows:

- (a) Pegs at both sides of the road at right angles to the centreline at each 20 metres station, from which the centreline station point can readily be obtained at any time.
- (b) Reference marker pegs from which the horizontal intersection point can readily be obtained.

Temporary pegs shall also be established at the limit for stripping topsoil.

Temporary pegs should be 12 mm diameter mild steel rods at least 600 mm long with about 200 mm left projecting above ground.

Permanent pegs shall, unless otherwise agreed by the Engineer, be 450 mm mild steel rods 12 mm diameter set in concrete at least 300 mm deep by 250 mm diameter. The steel rod should be projecting about 20 mm above the concrete. The station and distance from the centre line should be clearly marked to the Engineer's satisfaction.

Before starting the works the Engineer shall check and agree the setting out and the level of the existing ground with the Contractor.

All permanent marks shall be carefully preserved so that the work can be checked at any time.

Permanent benchmarks shall be established in suitable positions and agreed with the Engineer. These should be maintained so long as they are needed to check the work.

1.05 Site Clearance

Clearing site shall consist of clearing the ground of trees, bush, hedges, fences, shrubs, stumps, rubbish, loose boulders, piles of boulders and other objectionable

material excluding soil and rock, including disposal from areas shown on the Drawings or as directed by the Engineer, and shall include the grubbing up of all root and backfilling with approved materials of all cavities caused by the clearing to a density at least equal to that of the surrounding ground.

The Works include the loading, carriage and disposal of all materials to tip as directed by the Engineer.

1.06 Cutting of trees

Trees defined as having a girth of 1,000 mm, measured 1,000 mm from the ground shall be cut by the Forestry Service or by owners, at the request of Engineers. Otherwise, this work shall be carried out by the Contractor and paid under day work schedule. The Contractor must seek the approval of the Forestry Service prior to the removal of any trees.

The removal of stumps and roots of such trees as defined above, is included in the works. Holes left by the removal of stumps and roots shall be backfilled and compacted to 90% B.S. Heavy Compaction with approved materials up to the top of the sub-grade level or as directed by the Engineer.

1.07 Ownership Of Salvaged Materials

Salvaged materials, components and other items which the Contractor has demolished, dismantled or otherwise removed in compliance with the Contract shall remain the property of Employer unless and until the Contractor is informed in writing by the Engineer that ownership of all or any of the materials, components and other items belong to a third party.

1.08 Classification Of Excavated Materials

1.08.1 Topsoil

Topsoil shall consist of a material containing vegetable root system existing in a thin layer on the natural ground surface complying with Technical Specifications.

1.08.2 Approved Material

Approved material shall consist of all material complying with Technical Specifications or which, in the opinion of the Engineer, is suitable for incorporation in the construction.

1.08.3 " Rock"

Rock is defined as all materials, which in the opinion of the Engineer, require blasting or the use of metal wedges and sledgehammers, or the use of compressed air drilling for their removal and which cannot be extracted by ripping with a tractor of at least 300 brake hp with a single, rear mounted, heavy-duty ripper. Tractor shall be in good order, operating weight forty (40) tones, operated by qualified operator.

1.08.4 Power of The Engineer

Should any difference of opinion arise between the Contractor and the Engineer, as to the classification of the material, the Engineer's decision shall be final.

1.09 Removal of Top Soil

Where embankment/subgrade will be constructed on natural ground, removal of topsoil depth shall be directed by the Engineer, shall be stripped after clearing and grubbing. In the fill areas containing humus or other deleterious materials harmful to the stability of road, the Engineer may order for a depth greater than 300 mm within the area designated. The stripped area shall be compacted as per section 1.28. The stripped materials shall be stockpiled for use on the surfaces before turfing and surplus material shall be disposed off as directed by the Engineer to a site identified by the Contractor and approved by the Engineer at any distance from the work site.

Where the removal of topsoil has not been specifically directed, any top soil excavated shall be deemed to be part of the general excavation.

1.10 Dewatering

During construction of the roadway, the roadbed shall be maintained in such a condition that it is well drained at all times. In order that the embankment, subgrade, sub-base and/or base may not be subject to wetting, during or after construction, the Contractor shall at all times, and especially at an early stage of the work be required to provide adequate drainage by scheduling ditch work and outlet construction so as to prevent such wetting. The Contractor shall clean and trim all such drainage ditches from time to time during the work or when directed by the Engineer, so that there may be a free water flow throughout the whole period of work. The Contractor shall immediately repair damage attributable to wetting through failure to provide such measures.

No separate payment shall be made for this work as these are deemed to be included in the relevant items of the Bill of Quantities.

1.11 Excavation

1.11.1 "Excavation" shall consist in the loosening, digging, loading, hauling and disposal of normal, soft, ripable, loose, unsuitable and boulders materials to the lines, levels, slopes and widths shown on the Drawings or as directed by the Engineer. It shall include compaction, finishing and shaping of all surfaces formed by such excavations in accordance with these Technical Specifications.

Should the Contractor over-excavate on the sides and in the event that the sides shall be reprofiled as per the drawings, the Contractor shall reinstate the over excavated areas with mass concrete and costs associated with these remedial works shall be deemed to be included in the Contractor's quoted price.

The Contractor shall take special care for the saving of all suitable excavated materials for embankment or subgrade construction.

- 1.11.2 Removal of existing structures, site clearance, removal of topsoil and removal of unsatisfactory material shall be carried out in proper sequence so that one operation does not interfere with another. Sufficient time shall be allowed between each operation for any measurement required by the Engineer to be carried out and the Contractor shall not proceed with any other operation until such time as any measurement has been agreed and approved.
- 1.11.3 where a firm foundation is not encountered at the bottom of the excavation due to presence of soft, spongy or other unstable material, the Contractor shall, at his own expense, remove such unstable material and replace with approved material thoroughly compacted to a density not less than 95% B. S. Heavy Maximum Dry Density.
- 1.11.4 All excavations shall be carried out in such a manner that the back slopes are neatly trimmed to the lines shown on the Drawings or as directed by the Engineer.
- 1.11.5 Where excavation reveals a combination of suitable and unsuitable materials, the Contractor shall, wherever the Engineer considers it practicable and so directs, carry out the excavation in such manner that the suitable materials are excavated separately for use in the works without contamination by the unsuitable material.
- 1.11.6 In wet weather clay cuttings shall not be excavated and shall not be taken down to less than 25 cm above final level of the subgrade.
- 1.11.7 The Contractor shall take all necessary precautions to prevent slips and falls to the sides of the excavation, but if any should occur, the Contractor shall remove, at his own expense, all such fallen or displaced materials and replace if required with suitable material compacted to a density not less than that of the adjoining ground at his own expense.
- 1.11.8 The Contractor shall ensure adequate barricading/shoring and protective measures against excavated faces for depths exceeding 1.5m, at his own expense, and any additional costs associated with the remedial measures shall be deemed to be included in his quoted price.

1.12 Road Excavations

Road excavations will be carried out in order to cart away unsuitable materials from existing pavement to widen carriageway or shoulder or adjust level of existing road.

They shall consist in excavation of any material from pavement or subgrade to such a depth as shown on the Drawings or as directed by the Engineer.

The works include:

- Dismantling and removal of existing cats' eyes
- Scarifying, loosening and digging asphaltic material including crusher run from the carriageway shoulder or verge
- Loading, carting away and disposal of all materials in spoil tips, temporary stockpiles or in subgrade of new pavement as directed by the Engineer
- Shaping and Compaction of the bottom of the excavation to 95% B.S. Heavy Compaction or as directed by the Engineer.

Excavation in any other material except bituminous materials shall be paid as normal excavation.

1.13 Borrow Pits

- 1.13.1 Before opening of any borrow pits for the removal of material for forming embankments, the Contractor shall submit his proposals for the carrying out of the work, in writing, for the Engineer's approval.

The proposals shall state the location of the proposed borrow-pit, the thickness of topsoil or unsuitable material to be removed, the depth of suitable material to be excavated, the type or types of material to be secured and the areas for stockpiling topsoil to be reused to cover the borrow pit area. Any modification that the Engineer may require shall be made by the Contractor.

The approval of the borrow pit area by the Engineer shall not relieve the Contractor of his obligations to ensure that all the material used as fill is as approved by the Engineer.

The Contractor may be required to mix the materials excavated by bulldozing into stockpiles and face loading by shovel into lorries.

- 1.13.2 The Contractor shall be responsible for the access to any borrow pits, quarries or stockpiles.

Any cost, rent royalties or fees which can arise in connection with access to such areas shall be borne by the Contractor and are assumed to be included in his quoted price.

- 1.13.3 On completion of the excavation of borrow pit material, the Contractor shall leave the borrow pit in a tidy condition, topsoil being replaced to cover completely the borrow pit area as directed by the Engineer. Where borrow pits are required to be drained, the Contractor shall do so at his own expense and in a manner as approved by the Engineer.

1.14 Use of Explosives

Blasting is strictly forbidden.

1.15 Preparation of the Formation

The preparation of the formation shall not commence until all subgrade drainage has been completed and side drains or channels are capable of removing water from the immediate vicinity of the formation.

Preparation shall proceed as set out below.

- (a) Formations on Soil

After removal of all mud and slurry, dust and deleterious material and any protective layer, the moisture content of the soil extending to 150 mm below the formation shall be adjusted to within minus one and plus two per cent of the optimum moisture content as determined by BS 1377. If the soil is too dry, water shall be added by sprinklers and mixed in by rotary cultivators. Soil which is too wet may be dried by aerating with rotary cultivators if the weather conditions are suitable. Alternatively, the soil extending to 150 mm below formation may be removed and replaced by acceptable material. The formation shall then be rolled with at least four passes of a smooth wheeled roller having a load of between 4.4 and 6.0 tonnes per metre width of roll or by an equivalent pneumatic tyred roller. The rolling shall continue until the dry density of the soil over a depth of 150 mm below formation is at least 98 per cent of the maximum dry density as determined in BS 1377 using heavy (4.5 kg) rammer or such greater density as may be shown on the drawings or specified elsewhere.

Trimming and regulation shall then be carried out to bring the formation to the correct level and grade and finally, the formation shall be re-rolled with a smooth wheeled roller having a load of not less than 2.5 tonnes per metre width of roll.

1.16 Preparation Prior To Embankment Construction

- 1.16.1 The construction of embankment shall not commence until the work under sections 1.00 to 1.10 of these Technical Specifications has been completed as directed.

If after topsoil stripping the ground is considered unacceptable by the Engineer, the Contractor shall excavate to such depths as required and dispose of the material to spoil tips as directed.

- 1.16.2 The Contractor shall execute all works necessary to drain the natural ground prior to forming of the embankment. Should any subsequent embankment filling be adversely affected through lack of such drainage, the Contractor shall remove and replace it at his own expense.
- 1.16.3 Prior to placing fill material in embankments, the Contractor shall compact the top 30 cm of the natural ground in accordance with section 1.18 and section 1.22.

1.17 Proof Rolling Section

Before commencing any embankment construction, the contractor shall, at his own expense, carry out compaction trials by establishing proof rolling sections. The purposes of these trials are to determine, for each main type of materials to be used in embankment, subgrade, sub base, base and bituminous courses, the proper compaction plant to be used, the number of passes and the thickness of loose material for each layer, in order to achieve the required degree of compaction and a minimum value for the deflection under a 8.2 tons axle load.

The trial stretch shall be of such length and width as directed by the Engineer and in no case shall be less than one lane in width and 100 m in length.

The Contractor shall submit to the Engineer for approval a procedure for carrying out these compaction trials, supplemented by any necessary laboratory and in-situ tests.

These trials and tests shall be completed before the Works with the corresponding

materials will be allowed to commence.

No payment shall be made for these trials and the costs thereof shall be deemed to be included in the other rates and prices.

1.18 Preparation of Natural Ground

The natural ground or the surface of an earth/gravel road after removal of top soil as per section 1.09 on which the embankment / subgrade is to be constructed shall be prepared in accordance with the following requirements:

When an existing earth/gravel road, referred to as natural ground on which subgrade is to be constructed falls below within 0.3 m of the subgrade level, and if existing material is suitable for subgrade, the natural ground shall be prepared as subgrade preparation in earth cut as per section 1.21.

When the natural ground or an existing earth / gravel road, referred to as natural ground on which the embankment is beyond 0.3 m of the subgrade level and existing material is suitable for construction of embankment, the natural ground shall be prepared as embankment by loosening and recompacting the existing natural ground to a depth of 300 mm or as directed by Engineer, before placing new embankment and subgrade layers.

1.19 Filling and Compaction of Embankments and Fills

Materials for constructing the embankments shall be approved fill material obtained from the excavations, cuttings and approved stockpiles or borrow pits. Embankments shall be constructed in layers parallel to the final grade. The compacted thickness of layers of fill material shall not exceed 250 mm and shall not be less than 100 mm. Rockfill may be used in the bottom layers of the embankments and each layer should not exceed 600 mm in thickness. The maximum particle size in a layer of fill shall not have any linear dimensions greater than 150 mm for normal fill material and 400 mm for rockfill.

The top 600 mm embankment shall consist of normal material and not rock. Where rock has been placed below this layer, the Contractor shall blind each layer of the rock with approved fine material to prevent later downwards percolation of fine particles from the upper layers and the whole layer then compacted by an approved method. More fine materials shall be added and the layer again compacted until the voids are then completely fill.

Where directed, the Contractor shall excavate benching on natural sideslopes greater than 1 in 3 steps not less than 3 m wide prior to the construction of embankments. The existing slopes shall be benched by cutting steps at right angles to the slope as directed by the Engineer. The material so excavated shall be used as fill material for forming embankment, or carted to spoil as directed by the Engineer. All fills shall be compacted to a density of 98% BS Heavy Compaction at +1% to -2.0% of optimum moisture content for the full design width and depth. In addition, the top 300 mm of fill shall be compacted to 98% BS Heavy Compaction at +1% to -1.5% of optimum moisture content for the full design width.

In tipping and forming the embankments the Contractor shall make allowance in the height and width of these for consolidation and shrinkage. On completion of the

Contract, the dimensions of the embankments shall be to the profile shown on the drawings and the necessary allowance being made for the surface finish. No sand slurry, mud, peat, organic, soft or otherwise unsuitable material, shall be placed in embankments.

1.20 Construction of Embankment

- 1.20.1 All fill material shall be supplied from the general excavation wherever possible, or from approval borrow pits or quarries.
- 1.20.2 No material shall be deposited until the ground shall have been prepared in accordance with section 1.15 and approved by the Engineer.

The material shall be neatly and evenly spread over the area of the embankment to such an extent that the embankment is composed of fully compacted material for the widths required in uniform horizontal layers in accordance with section 1.15. The layers shall be kept shaped and trimmed and levelled by approved equipment. The surface of the layers shall at all times be maintained to such camber or cross falls as will shed water and prevent ponding. No subsequent layers shall be placed until each layer has been properly shaped, compacted and approved by the Engineer. If before the approval of a layer, damages, if any, such as cracking, rutting, corrugations, potholes, softening, erosion etc, are caused to the lower layer for any reasons whatsoever, such damages shall be made good by the Contractor at his own cost to the satisfaction of the Engineer before placing of materials for overlying layer. The methods employed for making good of damages as above shall include scarification with recompaction or reconstruction using new materials, as directed by the Engineer. Embankments shall be formed according to the Drawings or as directed by the Engineer. Side slopes shown on the Drawings are indicative only of the expected slope required for the material used and may be altered to suit the requirements of the material where directed by the Engineer.

- 1.20.3 Compaction shall not proceed until the moisture content of the material has been adjusted in accordance with section 1.15. Any adjustments involving the incorporation of additional moisture shall be carried out by approved plant and shall be so arranged that the required moisture content shall be uniform throughout the layer to be compacted and shall remain uniform during compaction. The removal of excess moisture content shall be carried out by spreading out the material for aeration by mechanical means and remixing it at regular intervals. Should circumstances arise when the removal of excess moisture cannot be achieved, work on the compaction of the material shall be suspended until the conditions of weather and drainage are such as permit the required moisture content to be attained. The contractor's attention is drawn to the fact that no claim for extension of time and / or additional costs will be entertained for any stoppage of work arising for the conditions of weather and drainage preventing the drying of the material and it will be assumed that the contractor's rates and prices shall provide for such stoppages.

The contractor may opt to use imported fill from borrow pits to replace any material with an excess moisture content in order to avoid stoppage of the work. However, the cost of such replacement shall be borne entirely by the contractor, unless same has been specifically ordered by the Engineer.

Where soft area has resulted from negligence on the part of the Contractor, it shall be removed and replaced with suitable material at his own expense.

Watering and compaction plant shall be approved by the Engineer prior to the commencement of the Work but such approval shall not relieve the Contractor of his responsibility to provide suitable and adequate plant for the construction of the works.

1.20.4 Rock Embankment And Boulders Embankment

The embankment shall be built in layers not exceeding 50 cm in thickness of loose material. Top 150 mm of rock fill embankment shall be well-graded granular material (crusher run), having maximum size of particle of 100 mm. This will act as top of sub-grade. There should be a minimum of 175 mm thick sub-base cushion over the rock fill.

The Contractor shall take special care to minimise segregation of material during handling and placing.

Compaction shall be carried out as follows: -

First pass : Using a pressure-type roller

Following passes : Using a vibrating roller with an out-of-balance weight of 10 tons at least or other approved plant.

Compaction control shall be carried out by survey method (levelling) or as directed by the Engineer.

The interstices between the lumps shall be filled with smaller lumps, aggregates and sand as directed by the Engineer. Compaction shall be as directed by the Engineer.

Each layer shall be approved by the Engineer.

1.21 Subgrade

The subgrade is defined as the surface on which the sub-base is placed or on which the base is placed and where no sub-base is required as shown on the Drawings or as directed by the Engineer.

The subgrade, once it has been finally shaped and compacted and approved by the Engineer, shall be protected from damage and kept well drained at all times. Storage or stockpiling of plant or materials on the finished subgrade shall not be permitted.

Where the subgrade is damaged by the Contractor's own vehicles or vehicle belonging to the general public or by rain or from any other cause, then the damaged or deformed material shall be dug out and shall be replaced with approved compacted material at the Contractor's expense.

1.22 Embankment against Sloping Ground

When embankment is to be placed and compacted on hill sides, or new embankment is to be compacted against existing embankment, where the slopes are steeper than 4:1 (H: V), continuous horizontal benches each at least 300 mm wide shall be cut into the old slope for ensuring adequate bond with the fresh embankment/subgrade material to be added. The material obtained from cutting of benches could be utilised in the widening of the embankment/subgrade. However, when the existing slope against which the fresh material is to be placed is flatter than 4:1 the slope surface may only be scarified instead of resorting to benching.

Where the width of the widened portions is insufficient to permit the use of usual wider rollers, compaction shall be carried out with the help of tandem rollers, small vibratory rollers, mechanical tampers or other approved equipment. Benching of slopes shall be considered incidental to the work and shall not be measured separately.

1.23 Embankment and Subgrade Around Structures

To avoid interference with the construction of abutments, wing walls or return walls of culvert/bridge structures, the Contractor shall, at points to be determined by the Engineer suspend work on embankments forming approaches to such structures until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of interference or damage to the structures.

Unless directed otherwise, the filling around culverts, bridges and other structures up to distance of twice the height of the road from the back of the abutment shall be carried out independent of the work on the main embankment. The fill material shall not be placed against any abutment or wing wall unless permission has been given by the Engineer but in any case not until the concrete or masonry has been in position for 14 days. The embankment and subgrade shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of the work in this regard shall be approved by the Engineer.

Where it may be impracticable to use power rollers or other heavy equipment, the compaction shall be carried out by mechanical tampers or other methods approved by the Engineer. Care shall be taken to see that the compaction equipment does not hit or come too close to any structural member so as to cause any damage to them or excessive pressure against the structure. Payment shall not be measured separately and deemed to be included in other rates and prices.

1.24 Construction of High Embankments and Embankments on Soft Foundation

Where the embankment exceeds 6 metre in height or where directed by the Engineer, the embankment shall be constructed in stages as instructed by the Engineer. The subgrade layer, that is the top 500 mm of the embankment, shall be constructed only after the Engineer is satisfied that the embankment is stable and no more consolidation settlement is expected to take place.

On soft foundations, such as in marshy areas, the embankment work shall be given priority in construction operation so that sufficient time is available for the

ground to consolidate prior to application of the pavement layers. For such cases, the Engineer may order surcharging of embankments by the addition of fill to such levels as determined by him for effecting quick consolidation of sub-strata. The surcharge shall be removed only when the Engineer is satisfied that no more settlement is possible. Removal of the surcharge shall be to a level 500 mm below the subgrade level. The stripped embankment surface shall be scarified to an average depth of 100 mm and compacted to the designated density. Only after this operation the subgrade layer shall be constructed. The surcharge fill shall be deemed as if additional embankment has been constructed and measured accordingly. Removal of the surcharge and recompacting the surface of the stripped embankment shall be considered incidental to the work and shall not be measured separately.

1.25 Subgrade Preparation in Earth Cuts

The objective of this operation is to ensure that the subgrade and its foundation comprise suitable material and specified density, that it is compacted to the specification limits and that it is levelled, shaped and made to a condition fit for receiving subsequent pavement layers.

For this purpose, the material in earth cut to be used as subgrade shall be tested for conformity to Section 1.08 of Specification for Materials. If found suitable, the surface shall be loosened to a depth of 200 mm or as directed by the Engineer, the moisture content adjusted, shaped to the specified levels and cross fall, and compacted to the density specified in section 1.28 hereto, considering top 500 mm as subgrade.

If the material is found unsuitable, the same shall be sub-excavated to a depth of 500 mm below subgrade level or as ordered by the Engineer, replaced by suitable material and compacted to the specified degree.

Where a strata of boulder mixed with soil is met with, the same shall be sub-excavated to a depth of 500 mm or as directed by the Engineer and replaced by suitable subgrade material.

1.26 Subgrade Preparation in Rock Cuts

The rock cut for subgrade shall be made true to the designated line and levels in the drawing. The gaps/holes and unevenness so created in the process of rock cutting shall be made up to the required depth through levelling, shaping and compaction of crushed stones conforming to sub-base quality.

1.27 Tolerances

- 1.27.1 The finished subgrade shall be properly shaped and compacted to a smooth surface which shall not show any departure from the required cross section greater than within the range -2 cm to +2 cm at any point. When measured with a 3 meters straight edge, deflections shall not be greater than 2 cm.

If for two consecutive working days, more than 10% of the measurements do not comply with these requirements, the Work shall be stopped in order to examine

and improve the methods and equipment used and if necessary substitutes any defective equipment.

- 1.27.2 The deflections measured under 8.2 tons axle load shall not exceed the maximum value determined during the proof rolling section as described in section 1.17 hereto.

1.28 Compaction of Earthworks

- 1.28.1 The moisture content of fill material of natural ground during compaction shall never exceed B. S. Heavy Optimum Moisture Content (OMC) for the densities specified in section 1.15 hereof of more than 2%.

- 1.28.2 The compaction requirements are as follows: -

(Heavy Maximum Dry Density: H.M.D.D.)

- (a) Compaction of the top 30 cm of natural ground under the embankment: not less than 90% B.SH.M.D.D.
- (b) Compaction of the top 30 cm of cuts under the pavement structure: not less than 95% B.SH.M.D.D.
- (c) Compaction of embankment except for the top 30 cm: not less than 90% B.SH.M.D.D.
- (d) Compaction of the top 30 cm of the embankment other than rock or boulder embankment: not less than 95% B.SH.M.D.D.

1.29 Side Slopes

The Contractor shall construct at his own expense temporary kerbs and downspouts to protect the embankment's side slopes from erosion due to surface water.

All side slopes shall be neatly trimmed and the finished slopes shall not vary by more than 5 cm from the required cross section. Steep slopes in cuttings shall be cleared of all loose and insecure fragments.

All excess material including accumulation, at the foot of side slopes of embankments, of boulders, lumps or other rubbish shall be taken to tip.

No sharp change in the inclination shall be left, edges being rounded off to provide gradual change and discourage erosion.

Any slips or falls of materials shall be removed and the faces retrimmed at the Contractor's expense.

The side slopes given on the Drawings whether for cut or for embankment are subject to variation by the Engineer according to the nature of the soil.

1.30 Earthworks for structures

1.30.1 Excavation

Foundation excavation shall include the removal of all material, of whatever nature, necessary for the construction of the foundations and sub-structures in accordance with the plans or as directed by the Engineer.

It shall include the construction of all cribs, cofferdams, dewatering, etc., which may be necessary for the excavation of the work. It shall also include the subsequent removal of cofferdams and cribs and the placement of necessary backfill as specified. It shall also include stock-piling of the suitable excavated material for return as backfill and compaction as specified, and the disposing of excavated material that is not required for backfill, in a manner or in locations so as not to affect the waterway of the channel and be unsightly.

All sub-structures, where practicable, shall be constructed in open excavation and, where necessary the excavation shall be shored, braced, or protected by cofferdams in accordance with approved methods.

Foundation excavation shall be classified according to Clause 4.8 of the Specification. Separate measurement and payment shall be made of each class of material respectively.

Excavations shall be kept free from water. The bottom of the excavation shall be thoroughly cleaned of loose material, mud and water and carefully trimmed and shaped to the correct levels and dimensions and, after approval in writing by the Engineer, the Contractor shall lay a blinding layer of concrete Class 15 to receive the concrete floor or footing, tamped to a smooth finish, providing all forms and screeds and any sump holes for drainage and pumping. Any pockets of soft soil in the bottoms shall be removed and replaced with Class 15 concrete. The Contractor shall make good with Class 15 concrete any additional excavation below the bottom of the foundations to remove material that the Contractor allows to become unsuitable, the cost of which shall be borne by the Contractor.

Pumping from the interior of any foundation enclosure shall be done in such a manner as to preclude the possibility of the movement of water through any fresh concrete. No pumping will be permitted during the placing of concrete, or for a period of at least 24 hours thereafter, unless it is to be done from a suitable sump separated from the concrete work by approved means. Pumping to dewater a sealed cofferdam shall not commence until the seal has set sufficiently to withstand the hydrostatic pressure.

1.30.2 Cofferdams

(i) General

Cofferdams for foundation construction shall be carried to adequate depths and heights, be designed and constructed to the Engineer's satisfaction and be made as watertight as is necessary for proper performance of the work that must be done inside them. In general, the interior dimension of

cofferdams shall be such as to give sufficient clearance for the construction of forms and the inspection of their exteriors, and to permit pumping outside of the forms. Cofferdams that are tilted or moved laterally during construction shall be righted, reset or enlarged so as to provide necessary clearance.

When conditions are encountered which, in the opinion of the Engineer, render it impracticable to dewater the foundation before placing concrete he may require the construction of a concrete foundation seal of such dimensions as may be necessary. The foundation shall be then pumped out and the balance of the concrete placed in the dry. During the placing of a foundation seal, the elevation of the water inside the cofferdam shall be controlled to prevent any flow through the seal and if the cofferdam is to remain in place, it shall be vented or ported at low water level.

(ii) Protection of concrete

Cofferdams shall be constructed so as to protect fresh concrete against damage from water, from any source whatsoever.

No timber or bracing shall be left in cofferdams in such a way as to extend into the sub-structure, without written permission from the Engineer.

(iii) Drawings required

For sub-structure work, the Contractor shall submit drawings showing his proposed method of cofferdam construction and other details. Such drawings shall be approved by the Engineer before construction is commenced.

The drawings shall be submitted at least 2 weeks in advance of the time the Contractor intends to commence the construction of the cofferdam. Such approval shall not relieve the Contractor of his responsibility for the safety and adequacy of the structure so approved.

(iv) Removal on completion

Unless otherwise provided, cofferdams or cribs, with all sheeting and bracing, shall be removed after the completion of the sub-structure, care being taken not to disturb or otherwise injure the completed structure.

1.30.3 Backfill to structures

Up to the rock line, materials for foundation fill shall consist of lean concrete of Class 15 and as required by the Engineer.

Above the rock line, all materials used for backfill shall be crusher run 0/31.5 stabilised with cement to produce compressive strength at seven days of 150 mm cubes of not less than 8 N/mm² and not greater than 10 N/mm².

All spaces excavated and not occupied by abutments, or other permanent work

shall be backfilled with approved material up to the surface of the surrounding ground, with a sufficient allowance for settlement. All backfill material shall be placed in horizontal, uniform layers not exceeding 200 mm in thickness, and not less than 75mm

after compaction, and shall be brought up uniformly and simultaneously on all sides of the structure. Each layer of backfill shall be compacted to a density of not less than 95% B.S. Heavy Compaction.

For filling to structures above existing ground level, the Contractor shall so arrange his programme for the construction of structures and earthworks that the filling behind and around any structure is carried but concurrently with, and as part of, the earthwork operation.

1.30.4 Cement stabilised fill to earth retaining structures

All materials used for compaction against earth retaining structures shall be of a quality acceptable to the Engineer, free from large lumps, wood or other extraneous matter. Granular fill shall consist of well-graded crusher 0/31.5 stabilised with cement to produce a compressive strength of between 8 and 10 N/mm² at 7 days on cubes of 150 mm.

The fill behind abutments, wingwalls and culverts shall be deposited in well-compacted horizontal layers not exceeding 200 mm in thickness and not less than 75 mm in thickness after compaction and shall be brought up uniformly and simultaneously on all sides of the structure. Each layer of the backfill shall be compacted to a density of not less than 90% of B.S. Heavy Compaction. The material to a depth of 1500 mm below the soffit of the approved slab or finished road level shall be compacted to 95% B.S. Heavy Compaction, and shall consist of a graded crushed stone of a similar quality as the road sub base.

No backfill shall be placed against any abutment, wingwall or culvert until permission has been given by the Engineer and not until the concrete has been in place 14 days or until the cubes results show the specified strength, whichever is the later.

The material shall not contain more than 0.2 % of sulphate ions as determined by B.S. 1377 unless special precautions to the approval of the Engineer are taken to protect the concrete.

1.30.5 Mixing of Backfill Material

The cement stabilised crusher run material to be used for backfilling to structures and earth retaining structures may be mixed in place or in a plant.

Mixing in Place

The Constructional Plant and method shall include:

- (a) A cement spreader or approved method which will spread cement uniformly on to the material and provides the required proportion of cement per cent by weight to provide the specified compressive strength with a

tolerance of plus or minus 0.5 per cent.

- (b) A rotary mixer fitted with tines and capable of mixing the cement uniformly into the material for the full depth of the layer in a single pass. The mixer shall be capable of adjustment to control the depth of processing and shall be equipped with a water spray bar. The spray bar shall be regulated to spray water onto the material at a predetermined rate fixed in relation to the speed of travel of the mixer and providing the required proportion of water per cent by weight, with a tolerance of plus or minus 1.0 per cent. Alternatively, a bowser which is similarly equipped may be used.

The first pass of the mixer shall be made to mix in the cement without adding water; one or more further passes shall be made, mixing in the required amount of water.

Each pass of the mixer shall overlap the adjacent pass at longitudinal joints by at least 100 mm and at traverse joints by 1.0 metre.

Plant Mixing

The mixing plant shall be capable of producing uniformly mixed material having the required proportion of cement per cent by weight to achieve the specified compressive strength with a tolerance of plus or minus 0.5 per cent and the required proportion of water per cent by weight with a tolerance of 1.0 per cent.

Twin shaft paddle mixers or gyratory pan mixers shall be used for material containing more than 50 per cent of particles passing a 5.0 mm sieve and for material containing more than 6.0 per cent of particles passing 0.15 mm sieve.

Quality Control

Test cubes shall be made cured and tested at the rate of one group of three cubes for every 1000m² of base laid. The average strength of each group of three shall not be less than the strength specified.

1.30.6 Measurement and payment for earthworks for structures

The unit of measurement for earthworks shall be cubic metre. The volume paid for will be as indicated below.

Where the structure excavation is performed within road excavation, the quantity of excavation to be paid shall be the actual number of cubic metre of in situ material excavated within a volume banded by vertical planes parallel to the neat lines of the footing of the structure and the planes of the bottom and side slopes of the road excavation. **No extra payment will be made for working space, the cost of which is deemed to be included in the excavation rates.**

Where the structure excavation is performed in new road embankment the quantity of excavation to be paid shall be the actual quantity of cubic metres of in situ material excavated prior to the embankment construction within a volume banded by vertical planes parallel to neat lines of the footing or structure (no allowance will be made for working space) and the lower limit shall be the level of the road subgrade while the upper limit shall be the original ground stripped of topsoil.

In case of independent footings the quantity of additional excavation to be paid shall be the actual number of cubic metres of in situ material excavated within a volume banded by vertical planes banded by neat lines of the footing, with no allowance for working space, and the planes of the bottom of the footing foundation and the road subgrade.

For raft foundation, the quantity of additional excavation to be paid shall be as for independent foundations but the planes of the bottom shall be the foundation of the raft.

No allowance shall be made for structure excavation where road excavation cannot be executed prior to the structure excavation.

1.31 Measurement of Earthworks

Prior to construction of any earthwork or excavation the levels of the existing ground shall be agreed between the Contractor and the Engineer. If the Contractor fails to take the requisite level, then the ground levels shown on drawings or determined by the Engineer shall be taken as correct.

All excavation for earthworks for cuttings and embankments will be measured as the net volume in m³ of the compacted embankments as measured off the cross-section drawings, called "Fill", and the net volume of the spoil heaps measured from ground levels before spoiling and ground levels after spoiling, called "Spoil".

If a cutting is over excavated, then the volume of overcut measured in cut when compared to the standard cross section, shall be deducted from the volume of spoil as measured.

SPECIFICATION FOR EXCAVATION, UNDER FLOOR/ HARDCORE FILLING

SPECIFICATION FOR EXCAVATION, UNDER FLOOR/HARDCORE FILLING

TABLE OF CONTENTS

	Page No.
1.00 General.....	1
1.01 Scope.....	1
1.02 Definitions	1
1.03 Responsibility	2
2.00 Excavation	2
2.01 Inspection of Site.....	2
2.02 Dealing with Water	2
2.03 Shoring and Strutting.....	2
2.04 Excavate to Reduce Level & to Dimensions	3
2.05 Rock.....	3
2.06 Blasting	3
2.07 Bottoms of Excavations to Receive Foundations.....	3
2.08 Under Floor Filling.....	4
2.09 Materials Found in Excavations.....	4
2.10 Hardcore Filling.....	4
2.11 Crusher Run for Ground Floor Slab.....	5
(1) Crusher Run Material	5
(2) Grading of Crusher Run	5
(3) Mixing and Spreading	5
(4) Compaction and Slushing	6
(5) Compaction Standards.....	6
(6) Drainage of Crusher Run Base	7
(7) Tolerances in Crusher Run Layers.....	7

SPECIFICATION FOR EXCAVATION, UNDER FLOOR/HARDCORE FILLING

1.00 General

1.01 Scope

This specification shall apply to:

- (a) excavation to building foundations,
- (b) under floor filling
- (c) hardcore filling

1.02 Definitions

- (a) The Contractor shall mean the Main Contractor or his appointed representative.
- (b) Approved or accepted shall mean approved or accepted in writing by the Engineer.
- (c) Architect/Engineer shall mean the approving authority such as the Architect, the Engineer or their appointed representative.
- (d) Satisfactory shall mean to the satisfaction of the Engineer.
- (e) Required shall mean required by these specifications and/or by contract documents.
- (f) Submitted shall mean submitted in writing to the Engineer by the Contractor.
- (g) Instructed shall mean instructed in writing by the Engineer.
- (h) Failure to comply with specification shall mean failure to comply satisfactorily with all or any of the requirements of these specifications and the contract documents.
- (i) Exposed construction shall mean that exposed to weather when completed.
- (j) Drawings shall mean the latest issue of the drawings issued to the Contractor.
- (k) Instructions by the Architect/Engineer shall include the instructions confirmed in writing within a week by the Contractor.

1.03 Responsibility

No approval or acceptance by the Engineer or their representative shall in any way relieve the Contractor of his responsibility for the construction in accordance with drawings, the quality of materials, the standard of workmanship, the strength, durability and appearance of the concrete works.

The Contractor's rates or price for all measured items shall include for carrying out the works in accordance with the terms and requirements of this specification. In the case of any items not covered by this specification the acceptable quality of materials and standard of workmanship shall be no less than generally accepted in the trade applicable to the item concerned.

2.00 Excavation

2.01 Inspection of Site

The Contractor is deemed to have visited the site and to have ascertained the nature of the material to be excavated, and likely accumulation of rainwater, prior to submission of his offer as no claims will be allowed on the grounds of ignorance of conditions under which works will be executed.

The Contractor should ascertain the nature of ground to be excavated/disturbed, carted away, thereafter likely to cause any problem of dust nuisance to the Environment. All remedial measures to stop blowing of dust such as by watering etc will be deemed to have been included in his price.

2.02 Dealing with Water

The Contractor's attention is drawn to the depths below ground level on the foundations and to the water level requiring him to deal with water. Unless otherwise specified the Contractor will be required by pumping or other means to the Engineer's approval to keep the excavations dry during construction.

2.03 Shoring and Strutting

The Contractor's attention is drawn that the rate for excavation includes for any shoring and/or strutting required to the sides of the excavation to walls footings, column bases, etc.

Also the rate includes for propping/strutting of caves in excavation where required.

The structure of the adjacent or nearby building or buildings shall be shored as required by the drawings and/or instructions of the Engineer before commencing excavation in proximity of the existing structure. The Contractor's attention is drawn to the need to carry out the excavation in stages approved by the Engineer.

2.04 Excavate to Reduce Level & to Dimensions

Excavate site as shown on drawings to form the foundations to width and depth indicated, the bottom of all excavation to be clean perfectly level, and/or stepped as shown or as instructed.

The price of excavation is to include for excavation (and their removal from site) of all materials encountered, upholding the sides of excavations; to that effect, the Contractor must visit the site of works to assess the nature of the subsoil likely to be encountered.

The price of excavation is to include for excavation required for working space, keeping excavation dry during construction, shoring and strutting, as well as for any overbreak due to nature of soil/rock, method of excavation or any other reason.

The ground below basement slab, column bases and stripfooting to walls will be excavated to exact required level, i.e. last 150 mm depth by hand and where found in sand and/or loose stratum, it shall be compacted with 8 passes (i.e. 4 in each direction) with 1.25 ton vibrating roller or mechanical tampers before blinding.

Any overbreak due to nature of soil/rock/boulders, method of excavation or due to any other reasons, excavations to widths or depths greater than those shown on the drawings or as instructed by the Engineer shall be filled by the Contractor at his own expense in such depths or width of excavation beyond that instructed or shown, with concrete grade 15/20 to the satisfaction of the Engineer.

2.05 Rock

"Rock" means any hard material, which in the opinion of the Engineer can be removed only by use of compressors or by wedging and the Engineer's opinion shall be final. Decomposed rock, tuff or other material which can be removed by pick, traxcavator or other mechanical plant will not be classed as rock. All material classified as rock may, if approved by the Engineer, be used as hardcore filling and the measured quantities of imported hardcore will be adjusted accordingly. All rock so used must be broken to the required size as hereafter described for hardcore before being used.

Boulders of a dimension 400 mm or less and/or of volume 0.064 m³ or less will not be classed as "Rock".

2.06 Blasting

No blasting will be permitted.

2.07 Bottoms of Excavations to Receive Foundations

The Contractor shall report to the Engineer when secure bottoms to the excavations have been obtained. Any concrete or other work executed before the excavations have been inspected and approved, shall if so directed, be removed and new work substituted after the excavations have been approved, all at the Contractor's expense. Note that inspection by the Engineer shall be carried out only during working weekdays (Monday to Friday) as from 8.00 a.m. to 5.00 p.m.

The surface of the bottoms to excavations shall be levelled or graded to falls as required, compacted as specified under 2.04 above just prior to blinding. Bottom formed in clay or silty stratum shall not to be left exposed before inspection by the engineer. Upon approval, a layer of concrete class 15/20 blinding (maximum 20 mm gauge aggregate) or concreted with mass concrete as shown on drawing shall be placed and finished to a smooth surface with a wood float.

To receive tanking membrane, all corners and edges are rounded off or filled with 25 mm radius with cement sand (1:3) mortar.

2.08 Under Floor Filling

Where shown approved filling under the thickness of hardcore shall be made of any of the followings or mixed:

1. Excavated material of decomposed rock when stacked/stored separately from material other than rock
2. Sand
3. Stones of size not exceeding 225 mm
4. Pieces of concrete blocks and site cast concrete mixed of size not exceeding 225 mm

The stone/excavated decomposed rock fill should not contain clay/silty soil in excess of 10% by volume if found mixed.

The layers of approved fill shall be well watered, compacted as specified under 2.10 before placing the layer of hardcore.

2.09 Materials Found in Excavations

No material found in the excavations is to be used in the works without the written permission of the Engineer.

2.10 Hardcore Filling

Hardcore where shown under floors, etc. shall be good hard stone ballast to the approval of the Engineer broken to pass not greater than a 150 mm ring or to be 75% of the finished thickness of the layers being compacted whichever is the lesser and graded so that it can be easily and thoroughly compacted by rolling. Crusher run may be used instead of hardcore, with prior approval of the Engineer.

The hardcore is to be laid in layers each of a consolidated thickness not exceeding 225 mm and well watered and rolled with a vibrating roller (minimum 1¼ tons) or a ten ton roller, each layer for minimum of 8 passes until no visible settlement is noted. Where rolling is impossible, compaction shall be by hand or mechanical tampers. Thereafter, top surface of the hardcore shall be levelled or graded to falls as required and blinded with similar material broken to 25 mm gauge and surfaced with a 15 mm layer of rock sand, well watered and rolled. Rolling for minimum 4 passes until no visible settlement of the top is noted.

2.11 Crusher Run for Ground Floor Slab

(1) Crusher Run Material

The crusher run shall be made from approved blue basalt rock and shall contain particles that are roughly cubical in shape and free from excess of flat or elongated particles or clay, topsoil or other deleterious materials and shall be to the Engineer's approval.

(2) Grading of Crusher Run

The crusher run underneath the ground floor slab shall conform to one of the three following grades in the table below as mentioned on the drawings:

Nominal Size of the Sieve (mm)	Percentage Passing by Weight	
	0 - 31.5 mm	0 - 20 mm
50	100	-
31.5	92 - 100	100
20	78 - 91	90 - 100

The Los-Angeles value shall not exceed 32 for 0 - 31.5 mm and 30 for 0 - 20 mm.

The sand equivalent value shall be more than 50 for 0 - 31.5 mm and 60 for 0 - 20 mm.

The flakiness index shall not exceed 40%.

All the material shall be non-plastic.

Note: The frequency of testing shall be at least:

Sieve analysis : 1 per 900m² of placing, one at the start of work

Sand equivalent : 1 per 1000 m³ of placing, one at the start of work

Where the crusher run material is deficient in fine aggregate, and in the opinion of the Engineer the Contractor has made every reasonable effort to produce the required grading, the Engineer will allow admixing of crusher fines.

The percentage of added fines will be decided by the Engineer, and shall in any case not exceed 15 per cent by weight of the mixture. The plasticity index of fines shall not be greater than 6 and the liquid limit not greater than 20.

No extra payment will be made for providing and mixing in of such fines or change in the grade of the crusher run.

(3) Mixing and Spreading

Every reasonable effort shall be made to prevent segregation after mixing and during the dumping and spreading operation.

Where the addition of fine material is necessary it shall be thoroughly mixed in with the crusher run aggregate before the introduction of any water that might be required.

Water shall be added as necessary so that compaction of the spread material is carried out within the range of -2% to 1% of the optimum moisture content.

The batching and mixing plant and method of operation shall be to the Engineer's approval.

Upon completion of mixing, the material shall, without delay, be spread by approved mechanical means.

The crusher run shall be laid and compacted in layers not exceeding 225 mm. Where a greater depth is required, the material shall be laid in two or more layers.

(4) Compaction and Slushing

As soon as possible after spreading each layer, compaction shall be carried out. During compaction, care shall be taken to maintain the moisture content evenly at the required amount. The main compaction shall be carried out with a vibratory roller (minimum 1 ¼ tons) or a 10 tons roller. Compaction shall be continued until:

- (a) The specified density is achieved when measured by a Nuclear Moisture/density gauge (Type ELE-CPN Nuclear gauge or MC3 Portaprobe moisture/density gauge or approved equivalent), or other approved mean.

Rolling shall be carried out in a longitudinal direction and shall commence from the outer edge of the building and progress inwards towards the other edge with a minimum of four passes until no visible settlement is noted.

Any irregularities that show up during rolling shall be corrected by loosening the surface and removing or adding material as required.

No dynamic compaction or the use of a vibratory roller will be allowed in areas closer than 100 m from existing buildings. If the Contractor wishes to use dynamic compaction or vibratory rollers in these areas, he will have to submit a method statement for monitoring vibrations for the Engineer's approval.

No approval or acceptance by the Engineer or their representative shall in any way relieve the Contractor of his responsibility for the construction in accordance with drawings, the quality of materials, the standard of workmanship, the strength, durability and appearance of the civil works.

(5) Compaction Standards

The terms used for compaction shall be ascribed to them the meaning given in British Standards B.S. 1377, Part I, General.

The standard of compaction used throughout the work shall be the British Standards test as described in B.S. 1377, Part 4. Wherever the text of the specification the expression "X% B.S. Compaction" is used, it shall mean a standard of compaction such that the dry density of the compacted material is X% of the maximum dry density ascertained from the aforementioned British Standard Compaction Test.

(6) Drainage of Crusher Run Base

It is essential to provide free drainage paths maintained in good working order so that water passing through the crusher run layers can drain away.

Any soft spots which subsequently appear in the subgrade due to moisture accumulation shall be removed together with the overlying layers and replaced to the required standard at the Contractor's expense.

(7) Tolerances in Crusher Run Layers

The thickness of the crusher run layer shall not vary by more than -0 mm or +10 mm.

The final surface of the crusher run layer shall not vary by more than + 6 mm when measured by 3 m straight edge.

SPECIFICATION FOR MATERIALS

Table of Contents

1.00	Quality of Materials.....	1
1.01	Approval of Source of Supply.....	1
1.02	Submission of Samples and Test Certificates	1
1.03	Defective Materials	2
1.04	Handling and Storage of Materials	2
1.05	Storage and Handling of Pipes.....	3
1.06	Borrow Pits and Spoil Tips	4
1.07	Boulders of Basalt.....	4
1.08	Materials for Embankment	5
1.09	Subgrade in Cut.....	5
1.10	Material For Surfacing Side Slopes, Verges.....	5
1.11	Gabions	6
1.12	Material For Drainage Layer (0/100)	7
1.13	Stone Aggregate Generally	7
1.14	Grading Limits for Sub-Base and Granular Base.....	7
1.15	Material For Sub-Base Course.....	8
1.16	Material For base Course.....	8
1.17	Material For Bituminous Course.....	8
1.18	Material for Wearing course 0/14	10
1.19	Material for Bituminous Surface Treatments	11
1.20	Coloured Asphalt.....	11
1.21	Material for Concrete.....	12
1.22	Manholes	12
1.23	Filter Material	13
1.24	Water	13
1.25	Stone Work.....	13
1.26	Cement stabilized graded crushed stone sub base 0/31.5	14
1.27	Bedding Material for Pipes	15
1.28	Manufactured Materials for Sewer Reticulation	15
1.29	Manufactured Materials for Water Reticulation.....	16
1.30	Covers and Frames for Valve Chambers	18
1.31	Manhole Stepirons	18
1.32	Sluice Valves	18
1.33	Air Relief Valves.....	18

1.34	Other Valves	18
1.35	Surface and Valve Boxes	19
1.36	Mechanical Joints	20
1.37	Flow Meters	20
1.38	Fire Hydrants	20
1.39	Pipe Tapping Saddles	20
1.40	Flanges and Bolting for Pipes, Valves and Fittings	20
1.41	Bolts, Nuts and Washers	20
1.42	Flexible Couplings and Flange Adaptors	20
1.43	Manufactured Materials for Roadwork	20
1.44	Precast Concrete Units	21
1.45	Geomembrane	22
1.46	Cement	22
1.47	Steel Reinforcement	23
1.48	Mould Oil	24
1.49	Material for Forms, Falsework and Centering	24
1.50	Concrete Pipes	24
1.51	Concrete Porous Pipes	24
1.52	Precast Concrete	24
1.53	Admixtures	25
1.54	Bitumen Products	25
1.55	Hydrated Lime	26
1.56	Precast Concrete Slabs	26
1.57	(Glazed Vitrified Clay) Pipes and Fittings	26
1.58	Ducts For Cables	26
1.59	Hand Parapets	26
1.60	Guard Rails	26
1.61	Pedestrian Handrails	27
1.62	Bollards	27
1.63	Precast Concrete Kerbs, Channels, Edgings and Quadrants	27
1.64	In situ kerbs	28
1.65	Materials and Colour For Road Signs	28
1.66	"Cats' Eyes" Reflectors	28
1.67	Road Marking	29
1.68	Geotextiles	36

1.69	Cast Iron Gully	37
1.70	Polystyrene	37

SJPCE LTD

SPECIFICATION FOR MATERIALS

1.00 Quality of Materials

All materials used in the Works shall be of the qualities and kinds specified and shall be approved by the Engineer. They shall comply with the requirements of the current amended editions, at the date of invitation to tender, of the European Standard (BS EN) British Standards (hereinafter abbreviated to B.S) published by the British Standards Institution, or AASHTO and ASTM Specifications as specified in the Technical Specifications. All materials may be checked both at the source and on Site and approval of any material at its source does not necessarily imply that it will be approved on site.

All materials shall be delivered on to the site in sufficient period before they are required for use in the Works, so that such samples as the Engineer may wish are taken for testing and approval, and the Contractor shall furnish any information required by the Engineer on the materials. Each supplier must be willing to admit the engineer or his representative to his premises for the purpose of obtaining the samples.

No materials of any description shall be used and no approved source of supply may be changed without prior sanction by the Engineer.

Samples of the approved materials will be retained by the Engineer until the completion of the Contract. The Contractor shall provide suitable labelled boxes or bags for the storage of these samples.

Materials used in the Works shall conform to the samples approved by the Engineer.

1.01 Approval of Source of Supply

Before ordering any materials, the Contractor shall submit, for the approval of the Engineer, the name of the Manufacturer of all items to be used in the Works and the source of supply of all materials to be used and the relevant Agreement Certificate. The Contractor shall ensure that the materials proposed conform to the Specification and Drawings prior to submission for approval of Engineer.

The approval in writing of the Engineer shall be obtained before relevant items are obtained. The information regarding the names of suppliers may be submitted at different times, as may be convenient, but no source of supply shall be changed without the Engineer's prior approval.

Two copies of each order for materials are to be delivered to the Engineer and if any variation from the Standard or type of materials is subsequently found necessary, it shall be approved in writing by the Engineer.

1.02 Submission of Samples and Test Certificates

As soon as possible after the Contract has been awarded, the Contractor shall submit to the Engineer a list of suppliers from whom he proposes to purchase the materials necessary for the execution of the Works. Each supplier must be willing to admit the Engineer, or his representative, to his premises during ordinary working hours for the purpose of obtaining samples of the materials in question. Alternatively, if required by the Engineer, the contractor shall deliver the samples of the materials to the Engineer's

office. Samples shall be taken in accordance with the relevant British Standards where applicable. Materials subsequently supplied shall conform within any specified tolerances to the quality of samples, which have been approved.

The information regarding the names of the suppliers may be submitted at different times, as may be convenient, but no sources of supply shall be changed without prior approval.

When any material or article is required to comply with a British Standard, such material or article or its container shall bear the stamp of the registered certification trademark of the British Standards Institution. Alternatively, the Contractor shall submit to the Engineer test certificates from a Standards laboratory indicating compliance with the relevant British Standard.

The Contractor shall provide all facilities to test the materials, workmanship and the finished products at the manufacturer's works and the cost thereof shall be deemed to be included in the rates tendered. The tests shall be carried out in accordance with the procedures laid down in the relevant Standard Specification.

When the Contractor delivers the items on the site, these will be inspected visually by the Engineer or his representative for any damage during transportation. Physical tests especially to check any damage during transport may be carried out as appropriate at the Contractor's expense.

Any British Standard or British Standard Code of Practice referred to in the Documents relating to the Contract or any other British Standard or British Standard Code of Practice that may be substituted therefore shall be held to be the latest edition published two months prior to the last date for submission of tender. All relevant particulars and conditions in British Standards or British Standard Codes of Practice relating to standard of material, quality and workmanship, shall be complied with and, except as otherwise noted, all tests specified shall be conformed to. In cases where no particular specification is given for any article or material to be used under the Contract, the relative British Standard or British Standard Code of Practice, where one exists, shall apply.

Other equivalent national standard specifications may be submitted for the above at the sole discretion of the Engineer if requested by the Contractor.

1.03 Defective Materials

All materials which do not comply with the requirements of the Specification will be rejected and all such materials, whether in place or not, shall be immediately removed from the site by the Contractor at his own expense.

1.04 Handling and Storage of Materials

1.04.1 The Contractor shall make his own arrangements for the storage space and yards.

1.04.2 All materials for use in the Works shall be handled with due care and whenever not in immediate use, stored or stockpiled as follows or as directed by the Engineer.

1.04.3 Stockpiling of Aggregates & milling materials

Approved aggregates or milling materials shall be stockpiled at approved locations; prior

to stockpiling, the site shall be cleaned, levelled and well drained by the Contractor, who shall if required by the Engineer, also lay suitable hard surfacing.

Special care shall be taken to avoid segregation, contamination and mixing of different classes of aggregates. Stockpiles shall be built by layers of about 80 cm high. Material to be loaded shall be taken from the upper layer and never from the toe of the stockpile. Fine aggregates shall be allowed to drain until a uniform moisture content is reached before it is used.

Coral sand for concrete shall be washed as necessary and as required by the Engineer.

1.04.4 Buildings for Storage

The siting of the buildings for storage shall be approved before construction commences. All buildings shall be adequate for the complete protection of the materials to be kept therein and precautions shall be taken against fire particularly with regard to the storage of inflammable materials.

1.04.5 Storage of Cement

Cement shall be stored in well ventilated, watertight buildings with floors raised 50 cm above ground level and cement shall be within 15cm of the sides of the buildings to ensure circulation of air. Each consignment shall be kept separately and the contractor shall use the consignments in the order in which they are delivered on site. When being conveyed to the site in lorries or other vehicles, they shall be properly covered with tarpaulins or other effective waterproof coverings. Cement, which has become unsuitable through absorption of moisture shall be rejected and removed from the site by the Contractor at his own expense.

1.05 Storage and Handling of Pipes

During transportation the Contractor shall ensure that any precautions specified by the manufacturers of pipes for handling of their products are strictly adhered to.

The vehicles on which pipes are to be transported shall have a body of such length that the pipes do not overhang. During handling, the pipes shall not be dropped or allowed to strike one another or be rolled freely down inclines and they shall not be dragged on the ground.

All materials including couplings and joints, which are likely to deteriorate or be damaged by exposure to the elements, shall be stored in a weatherproof building. All UPVC pipes and fittings shall be stored in a covered area such that they are not exposed to direct sunlight for an appreciable length of time. Pipes shall be stacked lengthways, clear of the ground and to a height of 2.0 m or less having regard to the recommendations of the Manufacturer and the adequacy of the Contractor's stacking arrangements. The first layer shall be placed on a firm foundation of timber set level and the pipes firmly anchored to prevent spreading. Subsequent layers shall be placed using timber spacers. Timber spacers and nests shall be such that pipe flanges or sockets do not take any load.

End covers and protection shall not be removed until incorporation of the pipes and fittings into the Works.

Sufficient space shall be left between stacks to enable plant to pass between without causing damage to pipes.

Each consignment of each material shall be stored separately so as to provide easy access for inspection. After they have been approved by the Engineer, consignments shall be used in the order in which they were delivered on Site.

1.05.1 Storage of Steel Reinforcement

Steel reinforcement shall be stored, sheltered and supported by wooden blocks so as to prevent sagging. Bars shall be stored in separate lots according to diameter and quality.

1.05.2 Bulk Storage for Bitumen and Cement

The Contractor may use bulk storage for bitumen and cement provided he can satisfy the Engineer that the capacities are adequate.

1.05.3 Top Soil

Topsoil to be used later for verges or to cover embankment slopes and borrow pits shall be stockpiled on well-drained ground to be approved by the Engineer.

1.06 Borrow Pits and Spoil Tips

1.06.1 The Contractor will be required to obtain naturally occurring materials for the works from sources outside the area occupied by the permanent works.

The Contractor will also be required to locate, prove and propose for the Engineer's approval sources of fill materials and spoil tips. The approved sources for fill materials shall be designated "Borrow Pits". The fill materials proposed shall satisfy the requirements of sections 1.06.1 and 1.06.2. In case naturally occurring stones such as 'Grabbeaux' or similar materials are proposed as borrow pit material, such material shall be clean, free from dust and organic matter, besides satisfying the requirements of sections 1.06.1 and 1.06.2 as regards maximum size and shall be subject to the approval of the Engineer. Any material which is rejected by the Engineer shall be immediately removed from the site and replaced at the Contractor's expense.

No additional cost shall be paid for substituted material such as 'Grabbeaux' or other in place of borrows pit material.

1.06.2 The Contractor is required to make all arrangements for land and access thereof in compliance with section 1.13 of the Specification Site Clearance and Earthworks.

1.07 Boulders of Basalt

Only clean, dense and not altered boulders of basalt shall be used for production of aggregates.

The Contractor shall submit for the approval of the Engineer and before crushing is started the method he intends to follow for the selection of boulders of basalt conforming to these requirements.

1.08 Materials for Embankment

Two types of materials shall be considered: -

- Materials for construction of the main body of the embankments
- Selected materials: -
 - for construction of the top 30 cm of embankment.
 - for filling of holes and depressions and shaping of the surface where excavations have been carried out in soils where exists an important percentage of basaltic boulders.

1.08.1 Materials for Construction Of the Main Body Of The Embankments

The materials shall comply with the following requirements: -

- Plasticity Index: not more than 30%
- Liquid limit: not more than 70%
- Maximum Size: 300 mm
- Swelling: not more than 3%

1.08.2 Selected Materials

The materials shall comply with the following requirements: -

- Plasticity Index: not more than 25%
- Maximum Size: 100 mm
- C.B.R. value after 4 days soaking, at 95% of the B.S Heavy Maximum Dry Density: not less than 15% (C.B.R. specimen prepared at B.S Heavy Optimum Moisture Content + 2%)
- Swelling: not more than 1%

1.09 Subgrade in Cut

In accordance with the definition of subgrade in section 1.18 of the Specifications of Site Clearance and Earthworks, the plasticity index of materials in the top 30 cm of subgrade in cut shall not be more than 25%.

If they do not comply with this requirement, they shall be removed as directed by the Engineer and replaced by selected materials.

1.10 Material For Surfacing Side Slopes, Verges

Surfacing materials for side slopes and verges shall consist of approved, suitable top soil obtained from the general excavations or from other approved sources and shall be free from all sticks, roots and stones of 3 cm in greatest dimension. Top soil shall not be handled when it is so wet that it will become densely compacted during its placement.

1.11 Gabions

Where shown on the drawings or as directed by the Engineer, the Contractor shall excavate, trim to line and level, provide and erect gabions including providing selected rock, crushed if necessary, packed and compacted inside the gabions.

Gabions shall include gabion mattresses and gabion boxes and for the purposes of construction and method of measurement and payment, no distinction shall be made between them.

Gabions shall be "Maccaferri" boxes and / or "Reno" mattresses both with diaphragms at one metre centres, or similar approved. The maximum mesh size shall be 100 mm x 120 mm for boxes and 60 mm x 80 mm for mattresses. The wire used for the construction of gabions shall unless otherwise instructed by the Engineer comply with the requirements below.

		Diameter (mm)	Galvanising (g/m ²)
Mesh	Box	3.4	275
	Mattress	2.7	260
Binder	Box	2.2	240
	Mattress	2.2	240
Selvedge	Box	3.9	290
	Mattress	3.4	275

All wire shall be to BS 1052 having a tensile strength of not less than 40 Kg/mm², and PVC coated.

Galvanising shall comply with the requirements of BS 443

Gabions shall be constructed to the shapes and dimensions as shown on the drawings or as directed by the Engineer. Gabions, as constructed shall be within a tolerance of $\pm 5\%$ on the height or width instructed and $\pm 3\%$ on the length instructed.

The alignment of the gabion shall be correct within a tolerance of 100 mm of the instructed alignment and the level of any course of gabion shall be correct to within a tolerance of 50 mm of the instructed level. In addition, adjacent gabions shall not vary by more than 25 mm in line and / or level from each other.

The surface upon which gabions are to be laid shall be compacted to a minimum dry density of 95% MDD (AASHTO T99) and trimmed to the specified level or shape.

Joints in gabions shall be stitched together with 600 mm minimum lengths of binder wire, with at least one stitch per 50 mm, and each end of the wire shall be fixed with at least two turns upon itself.

Adjacent gabions shall be stitched together with binder wire along all touching edges.

Gabion boxes shall be laid with broken bond throughout to avoid continuous joints both horizontally and vertically. Pre-tensioning of gabions shall be subject to the approval of the Engineer.

Gabions shall be hand packed with broken rock of 150 mm minimum dimension and 300 mm maximum dimension. The sides shall be packed first in the form of a wall, using the

largest pieces, with the majority placed as headers with broken joints to present a neat outside face. The interior of the gabion shall be hand packed with smaller pieces. The whole interior and top layers shall be packed with smaller pieces and the top layers shall be finished off with larger pieces. The whole interior and top layers shall be packed tight and hammered into place.

The Contractor shall place filter fabric ('Terram' or similar approved) behind and below gabion faces in contact with existing or backfilled ground. The Contractor shall ensure that the filter fabric is not damaged during the construction or backfilling around the gabion works and any damaged or torn fabric shall be replaced at the Contractor's expense. The filter fabric shall be installed in accordance with the manufacturer's instructions and the filter fabric shall not be left exposed to sunlight for more than 3 weeks.

At the back face and ends of completed gabion work, the existing soil shall be backfilled, thoroughly compacted against the sides of the gabions and finished flush with the top surface of the gabion.

On completion of gabion construction, the exposed horizontal faces of the gabions shall be protected with 50 mm thick class 15 concrete to discourage vandalism.

1.12 Material For Drainage Layer (0/100)

Quality and source of supply of materials to be used for drainage layer shall be submitted to the agreement for the Engineer: -

Coarsely crushed basalt materials or spalls can be used.

- The materials shall be clean and free from impurities and vegetable matter (not more than 1%)
- Maximum Size: not more than 100 mm
- Proportion of particles less than 2 mm: not more than 10%

1.13 Stone Aggregate Generally

The stone for use in the works shall be obtained from approved quarries or stockpiles of basalt boulders operated by the Contractor or by an approved Sub-Contractor and consisting of hard, tough, heavy, compact basalt, or other approved rock washed before crushing if necessary, broken, screened and graded as specified hereafter, to the satisfaction of the Engineer and free from flat, flaky, elongated, soft or decomposed pieces, excess dust and any dirt or acids or other deleterious substances.

Aggregates for different purposes are classified hereafter.

1.14 Grading Limits for Sub-Base and Granular Base

The gradation of the materials shall be within the limiting curves given in sections 1.15 and 1.16 hereof and shall be approximately parallel to these limiting curves.

1.15 Material For Sub-Base Course

The grading limits for crushed basalt sub base course shall be within the following limits:

NOMINAL SIZE OF SIEVE (MM)	PERCENTAGE WEIGHT PASSING
50	100
20	65-90
10	35-62
5	27-46
2	14-34
0.5	5-20
0.2	3-14
0.08	2-10

The Los Angeles Value shall not exceed 32 and the sand equivalent value shall be more than 50.

1.16 Material For base Course

The grading of crushed basalt shall be within the following limits: -

NOMINAL SIZE OF THE SIEVE (MM)	PERCENTAGE WEIGHT PASSING
30	100
20	75 - 100
10	47 - 75
6.3	35 - 60
2	18 - 38
0.5	7 - 22
0.2	4 - 15
0.08	2 - 10

The Los Angeles value shall not exceed 30. The

Flakiness Index shall not exceed 40%.

The Sand Equivalent Value shall be more than 60.

1.17 Material For Bituminous Course

1.17.1 Classes of Aggregates

Aggregates for bituminous course shall be obtained by mixing 3 or more classes d mm/D mm of materials defined for each class, by the maximum size (D mm) and minimum size (d mm) of particles.

Dimensions D and d will be chosen in the following series of sieve sizes: 2 - 6.3 - 10 - 14- 20.

Crusher run 0/20 may be used for the production of bituminous course provided that all

the required specifications are satisfied.

Before the Works are started, the Contractor shall submit to the Engineer's approval the gradation curve of reference for material of each class.

The gradation curve of reference for each class shall satisfy the following requirements: -

- Percentage by weight of material retained by sieve D mm: not more than 10%
- All material shall pass sieve 1.25 D mm
- Percentage by weight of material passing sieve d mm: not more than 10 %
- All material shall be retained by sieve 0.63 d mm
- Percentage by weight of material passing sieve $\frac{D \text{ mm} + d \text{ mm}}{2}$: within the range $\frac{1}{3} - \frac{2}{3}$

The total variations, by percentage, around the gradation curve of reference for each class of material such as proposed by the Contractor at the commencement of the Works shall not exceed the following values.

SIEVES (MM)	CLASSES						
	0/2	0/4	2/6,3	4/6,3	6,3/10	10/14	6.3/14
0,08	+ - 4	+ - 3					
0,20	+ - 6	+ - 4					
0,63	+ - 7	+ - 5					
1,25	+ - 7	+ - 6	0				
2,00	-10	+ - 6	+10				
2,50	0	+ - 6	+ - 6	0			
4,00		-10	+ - 7	+10			
5,00		0	-10	+ - 8	0		0
6,30			0	-10	+10		+10
8,00				0	+ - 12	0	+ - 8
10,00					-15	+10	+ - 8
12,50					0	+ - 12	+ - 8
14,00						-15	-15
18,00						0	0

According to the characteristics of the crusher plant, the Contractor may be allowed to submit for the Engineer's approval production of classes 0/3 instead of 0/2.

Coral sand shall not be used. Crushed basalt sand shall be used.

1.17.2 The job standard mix shall be within the following limits: -

i) Bituminous Base Course (Binder Course)

NOMINAL SIZE OF THE SIEVE (MM)	PERCENTAGE WEIGHT PASSING
25	100
20	95 - 100
16	91 - 99
12.5	75 - 91
10	51 - 79
5	38 - 57
2	23 - 38
0.6	10 - 19
0.08	5 - 7

1.17.3 Other Requirements

The Flakiness Index shall not exceed 35 %. The Los Angeles

Value shall not exceed 30.

The Sand Equivalent Value on 0/2 portion shall be more than 60.

1.17.4 Filler

Filler (portion of material passing No. 200 B. S. Sieve) shall consist of Portland Cement or dust of crushed basalt.

The Plasticity Index shall not be measurable. Passing 0.08 mm > 80%

Passing 0.20 mm = 100%

1.18 Material for Wearing course 0/14

1.18.1 Materials for wearing course and reshaping shall comply with the requirements of section 1.54 hereto.

1.18.2 The job Standard Mix such as defined in section 1.15 of Specifications for Roadworks shall be within the following limits:

NOMINAL SIZE OF THE SIEVE (MM)	PERCENTAGE WEIGHT PASSING
14	100
12.5	100
10	80 - 95
5	40 - 55
0.63	15 - 30
0.080	6 - 10

1.18.3 The Flakiness Index shall not exceed 25.

The Los Angeles Value shall not exceed 25.

The Sand Equivalent Value on 0/2 shall be more than 60.

The Percentage of particles < 0.5 mm, obtained by washing 1 kg of coarse aggregate, shall not exceed 2 %.

(1) The Los Angeles shall be measured on 6/10 and 10/14 or 6/14 materials after removal of flaky portion.

1.19 Material for Bituminous Surface Treatments

Aggregates used shall be hard, tough and free from vegetable matter, dirt, lumps or ball of clay, adherent film of clay or any other matter which will prevent the adherence of the bitumen and, if required by the Engineer, shall be mechanically washed with an adequate supply of clean water.

1.19.1 The Chippings shall comply with the following grading: -

- First Application: 10/14 mm
- Second Application: 4/6 mm

The requirements for gradation curves are given in section 1.14.

1.19.2 The other requirements for chippings are as follows: The Los Angeles

Value shall not exceed 25

The Flakiness Index shall not exceed 20

The Proportion of particles less than 0.5 mm size shall not exceed 1%.

1.19.3 The sand used for the sealing coat will be 0/3 mm crushed basalt sand, carefully washed in order to have a portion of filler (<0.08 mm) lesser than 8%.

The Sand Equivalent Value shall exceed 75%.

1.20 Coloured Asphalt

1.20.1 Type of Mix

It shall be coloured cold asphalt 0/6mm (with 2% pigment in total mix).

1.20.2 Cold Bin Settings

The asphalt should be constituted of 70% 4/6mm and 28% 0/4.

1.20.3 Bitumen Content

The percentage of bitumen by dry aggregates shall be 8.5%.

The grading of aggregates shall be one within the limits set out in BS 882 and the grading, once approved, shall be adhered to throughout the Works and not varied without the prior approval of the Engineer. Fine Aggregate shall be clean, crushed rock sand and coral sand of hard quality and shall be free from lumps of stone, earth, loam, dust, salt, organic matter of any other deleterious substances. Coral sand shall be washed in running water to the satisfaction of the Engineer. It shall be graded within the limits given in BS 882 for the fine aggregate.

1.21 Material for Concrete

1.21.1 Coarse Aggregate

Coarse aggregate shall consist of crushed basalt, complying with BS 882. The aggregate shall be clean, hard, free from soft, friable, porous, elongated pieces, free from impurities which may adversely affect the strength or durability of the concrete or attack the reinforcement. Aggregate shall be washed if so directed.

The aggregate shall comply with the following requirements.

Sub Class 1: The combined grading of aggregates for use in reinforced concrete, where shown on the Drawings or where directed by the Engineer, shall be uniformly graded from 20 mm down to 5 mm according to BS 882. The Flakiness index shall not exceed 35. The Los Angeles value shall not exceed 30.

Sub-Class 2: The combined grading of aggregate for mass concrete, where shown on the Drawings or where directed by the Engineer, shall be uniformly graded from 40 mm down to 5 mm according to BS 882. The flakiness index shall not exceed 35. The Los Angeles value shall not exceed 35.

1.21.2 Fine Aggregate

Fine aggregate complying with the grading zones of BS 882 shall consist of approved sand clean from clay, organic matter, and other impurities; and it shall be washed if so directed.

The sand equivalent values shall be as follows: -

For class 25 and above concrete the sand equivalent value shall exceed 7

For class 15 concrete the sand equivalent value shall exceed 70. Coral sand shall not be used.

Crushed basaltic sand shall be washed.

1.22 Manholes

Unless otherwise particularly specified or directed, manholes shall be constructed in Grade C25 concrete. Roof slabs shall be reinforced as detailed on the drawings.

Benching and channels of manholes shall be in grade C20 concrete finished with 20mm thick cement mortar on top of the channels and benchings.

Where applicable, half round pipe shall be set in the floor of the manhole to form the channel.

Where precast concrete manholes are permitted to be used they shall comply with BS 5911 and be constructed in accordance with the manufacturer's instructions. Individual rings and cover slabs shall have an approved watertight joint. Under roads and paved areas precast concrete manholes shall be surrounded with 150mm of Concrete Grade C20.

The maximum allowable lift of concrete in the construction of walls shall be 1.2m.

The cost of forming key joints as directed by the Engineer shall be deemed to be included in the rates for concrete in manholes.

The ends of all pipes are to be properly built in and neatly finished off, and pipe sockets are to be cut off.

The tops of the chambers and shaft walls are to be level all round to give a proper bearing to the cover slabs which shall be securely bedded and pointed in cement mortar.

Manhole chambers shall be subjected to water test as directed by the Engineer. The chambers to be tested shall be filled with water and allowed to stand full for 48 hours. They shall then be tested and deemed to be watertight if the drop in water level is not more than 12mm in a further 24 hours. Any chambers, which fail the test, shall be repaired and made watertight at the Contractor's expense and retested to the satisfaction of the Engineer.

1.23 Filter Material

Filter material for under drains shall consist of sand or granular material to be approved by the Engineer.

1.24 Water

Water shall be free from oil, acid, alkali, earth, vegetable or organic matter, or other deleterious substances in suspension or solution which may have a harmful effect on the Works. Water used for concrete, mortar shall comply with the requirements of B.S. 3148 and shall be tested if there is any doubt as to its suitability. If water is not available from a public supply, the Engineer's approval shall be obtained regarding the source of supply and manner of its use. Contaminated water shall not be used.

1.25 Stone Work

(a) Generally

Stone for use in masonry work shall consist of sound undecomposed basalt obtained from approved boulders and be of even texture and colour.

(b) Stone for Pitching and Stone Facing

Stone for pitching to drains, inlets and outlets, embankments and around structures shall consist of sound, undecomposed basalt with thickness not less than 15 cm and facing dimensions not less than 22 cm.

(c) Stone For Rip Rap

Stone for use as riprap shall consist of reasonably well-shaped, hard, dense, and durable rock. Separate lumps of stone shall weigh generally between 10 and 80 kg of which 80% shall be 20 kg or larger and not more than 10% less than 10 kg.

(d) Hardcore

Hardcore filling where required shall be clean hard quarry chips, clean basalt, hard broken stone or other approved material broken to 75mm gauge. All fillings shall be laid in layers not exceeding 150mm thick well packed, rammed and blinded on top with fine stone or other approved fine material and watered to receive concrete.

1.26 Cement stabilized graded crushed stone sub base 0/31.5

The graded crushed stone sub base shall be as per the requirements of road sub base in the Specifications. The Contractor shall propose a job mix formula and carry out trials. The graded crushed stone sub base shall be transported in suitable clean vehicles to prevent loss of fines and closely covered with impermeable sheeting during transit to prevent loss of moisture, and shall not be laid when its temperature exceeds 35°C.

Cement stabilised graded crushed stone sub base shall not be laid during rainfall as this will affect the moisture content and remove cement and fine material. Upon completion of compaction the surface shall be covered closely with plastic sheeting weighted down to prevent it being removed by the wind and the whole arranged to prevent loss of moisture.

Cement stabilized graded crushed stone sub base shall be laid by bob cat or by hand in a uniform layer without segregation, so that compaction shall be completed within sixty minutes of commencement of mixing. Care shall be taken to compact effectively adjacent to structures using small compaction if necessary in confined spaces. The thickness of each layer shall not exceed 200 mm and shall receive the required number of passes.

On completion of the compaction the surface shall be well cleaned, free from movement under compaction and free from compaction planes, ridges, cracks or loose material. In situ density tests shall be made on each compacted layer in accordance with BS 1924 and the next layer shall not be laid until it is at least seven days old or as instructed by the Engineer.

The minimum 7-day compressive strength (150 mm test cubes) shall be 4.5 to 10.0 N/mm² sampled at mixing point, and the in situ dry density shall be 95% of the maximum cube dry density.

The cement content shall not in any case be less than 3%.

MANUFACTURED MATERIALS

1.27 Bedding Material for Pipes

(1) Granular Material for Bedding of Pipe

The sand used for the bedding of the pipes shall be either coarse free-draining coral sand or rock sand. The sand shall not contain more than 20 per cent of material finer than 0.075 mm. The sand shall not contain particles larger than 6 mm or any organic matter which shall be removed by washing before using it as bedding material.

(2) Selected Backfill Material

The selected fill material shall consist of fine material selected from the excavation or imported on Site and passing a sieve having 10 mm apertures. It shall be free from all foreign material or vegetable matter or any other material which may be harmful to the pipes. The sieving of the selected fill material shall not be carried out on rainy days when the wet material become plastic.

(3) Concrete Protection

Concrete Protection to pipe where indicated on the drawing shall be of Grade 15/20 as per the Specification for concrete.

1.28 Manufactured Materials for Sewer Reticulation

(1) Asbestos Cement

Asbestos cement pipes, joints and fittings for sewerage shall conform in every respect to the requirements of BS 3656: 1973 and shall be Class H.

All joints in asbestos cement pipes shall be flexible joints with sleeves and rubber rings unless otherwise specified. The effective length shall be 4 metres.

(2) Concrete Pipes

Concrete pipes shall comply with BS 556 for concrete cylindrical pipes and fittings and shall have spigot and socket joint with rubber rings. Rubber rings shall comply with BS 2494 – Part II. The standard nominal effective length shall be 2.5 metres.

(3) Vitrified Clay Pipes

Vitrified clay pipes for foul sewerage shall comply with BS 65 and 540 and shall be of 'British Standard' Extra strength quality. All pipes and fittings shall be plain-ended with the flexible sleeve joints. The lengths of straight pipes shall normally be 1.2 m or 1.5 m. The Contractor shall state the actual length being supplied.

(4) Unplasticised Polyvinyl Chloride Pipes

Unplasticised Polyvinyl chloride pipes for sewers shall conform in every respect to the requirements for BS 3506: 1969 and shall be Class B as given in Table 1 of the above BS.

All joints in the pipes and fittings shall be flexible joints complying with the requirements of BS 4346: Part 2: 1970 and shall be either "Integral formed on pipe end" or "Moulded coupler" as shown in Fig. 1 of the BS. The Contractor shall state the type of joint provided. Rubber sealing rings supplied with the pipes and fittings shall comply with BS 2494, Part II. The effective length shall be 3 metres.

(5) Cast Iron Manhole Covers, and Frames

Manhole covers and frames shall conform with the requirements of BS EN 124: 1994 and shall be of the grade and dimensions shown on the drawing.

(6) Cast Iron Manhole Stepirods

Stepirods shall be galvanized malleable cast iron in accordance with BS 1247 and shall be of General Purpose Pattern with a 120 mm tail length.

1.29 Manufactured Materials for Water Reticulation

(1) Ductile Iron Pipes

Ductile iron pipes and fittings with push-in joints shall be manufactured in accordance with BS 4772: 1980 "Ductile Iron Pipes and Fittings".

Joints shall be approved flexible type joints with rubber joints rings in accordance with BS 2494 – Part II.

Flanged pipes and fittings shall comply with BS 4772: 1980 "Ductile Iron Pipes and Fittings", and flange joints shall comply with BS 4504 "Flanges and Bolting for Pipes, Valves and Fittings".

Flanges will generally be drilled to BS 4504: Table 16/11 unless otherwise specified in the Drawings.

Ductile Iron pipes and fittings shall have approved external protective coatings as specified in BS 4622 and internal cement mortar coatings as specified in BS 4772.

(2) Spun Iron and Cast Iron Pipes

Straight iron pipes and fittings with spigot and socket joints shall be spun iron pipes manufactured in accordance with BS 4622 "Grey Iron Pipes and Fittings".

Joints shall be approved flexible type joints with rubber joint rings.

Flanged cast iron pipes and fittings shall comply with BS 4622 and flange joints shall comply with BS 4504 "Flanges and Bolting for Pipes, Valves and Fittings" and BS 4865 "Dimensions of Gaskets for Pipe Flanges".

Cast iron pipes and fittings shall have approved external and internal protective coatings as specified in BS 4622.

(3) Concrete Pipes

Reinforced concrete pipes and special fittings for drainage purposes shall have "Cornelius" type or similar approved spigot and socket flexible joints and shall comply with BS 556: 1966 "Concrete Cylindrical Pipes and Fittings including Manholes, Inspection Chambers and Street Gullies".

Unreinforced concrete pipes with ogee joints shall comply with BS 4101: 1967 "Concrete Unreinforced Tubes and Fittings with Ogee Joints for Surface Water Drainage".

(4) PVC Pipes

PVC pipes shall be unplasticised PVC and manufactured in accordance with either BS 3505: 1968 "Unplasticised PVC for Cold Water Services" or BS 3506: 1969 "Unplasticised PVC Pipes for Industrial Purposes", whichever is applicable.

All joints and fittings shall be approved and shall comply with BS 4346: "Joints and Fittings for use with Unplasticised Pressure Pipes", and shall be of the Flexible Type.

(5) Polyethylene Pipes

Please refer to specification for water supply works.

(6) Polyethylene Fittings

Please refer to specification for water supply works.

(7) Polyethylene Pushfit Fittings

Please refer to specification for water supply works.

(8) Polyethylene Adaptor and Reducing Connector

Please refer to specification for water supply works.

(9) Transition fittings – Polyethylene/Other Pipe Connections

Please refer to specification for water supply works.

(10) Flanged Adaptors

Please refer to specification for water supply works.

1.30 Covers and Frames for Valve Chambers

Please refer to specification for water supply works.

1.31 Manhole Stepirons

Step irons shall be galvanized malleable cast iron in accordance with B.S 1247 and shall be of the design type stated below:

Type A: General purpose pattern with a 120 mm tail length.

1.32 Sluice Valves

Sluice valves shall be manufactured in accordance with BS 5163 "Double Flanged Cast Iron Wedge Gate Valve for Waterworks Purposes" or B.S 5151 "Cast Iron Gate Valves for General Purposes". Unless otherwise stated they shall have inside screw and waterworks finish.

Sluice valves shall be suitable for operation against a maximum working pressure of 10 bars.

Sluice valves shall be fitted with cap tops operated by a common tee-key. Each valve shall have a non-rising spindle and be clockwise closing with the direction of closing cast onto the valve casing.

Except where the drawings show otherwise, sluice valves shall be installed with their operating spindles vertical.

1.33 Air Relief Valves

(a) Double Orifice Air Valve

Please refer to specification for water supply works.

(b) Single Orifice Air Valve

Please refer to specification for water supply works.

1.34 Other Valves

(a) Check Valves

Please refer to specification for water supply works.

(b) Flap Valves

Please refer to specification for water supply works.

(c) Butterfly Valves

Please refer to specification for water supply works.

(d) Pressure Reducing Valves

Please refer to specification for water supply works.

(e) Ball Float Valves

Please refer to specification for water supply works.

(f) Gate Valves

Please refer to specification for water supply works.

All gate valves, if specifically required, for working pressure between NP16 and NP25 shall conform to BS 5150: 1974 "Cast Iron Wedge and Double Disc Gate Valves for General Purposes", but shall also conform to B.S. 5163 in respect of general design, construction, materials and fittings as specified above, except that the flanges shall be drilled to B.S. 4504 : Table 25/11 and the valves need not be tested "open-ended".

1.35 Surface and Valve Boxes

Fire hydrant chamber covers shall be manufactured in accordance with BS 750 and shall be suitable for heavy duty. They shall be 600mm x 450mm clear opening, marked with letters F.H. and incorporate a lift out cover chained to the frame.

Air valve chamber covers shall be cast iron with 600mm x 450mm clear opening incorporating a lift out, ventilated cover lettered "A.V." and be suitable for heavy duty.

Sluice valve chamber covers shall be cast iron with a 600mm square clear opening incorporating a lockable lid and be suitable for heavy duty.

Sluice valve surface boxes shall be cast iron with a 100mm clear opening x 100mm deep incorporating chained lift out or hinged over lettered "W" and be suitable for heavy duty.

All covers and boxes shall be of Brickhouse Broads manufacture or similar, and shall be manufactured in accordance with BS 497 Part I.

1.36 Mechanical Joints

Please refer to specification for water supply works.

1.37 Flow Meters

Flow meters shall be of the in-line helical rotary (Waltmann) type as manufactured by Kent Meters Ltd or similar approved complete with gaskets, nuts and bolts.

1.38 Fire Hydrants

Please refer to specification for water supply works.

1.39 Pipe Tapping Saddles

Saddles shall be either of cast iron or gunmetal construction, supplied with bolts, nuts, sealing ring and all accessories to make a complete connection. They shall be suitable for mounting on ductile iron pipes to B.S. 4772 or as otherwise indicated in Bill of Quantities. The tapping shall be internally threaded to the nominal diameter given in the Bill of Quantities.

1.40 Flanges and Bolting for Pipes, Valves and Fittings

Please refer to specification for water supply works.

1.41 Bolts, Nuts and Washers

Please refer to specification for water supply works.

1.42 Flexible Couplings and Flange Adaptors

Please refer to specification for water supply works.

1.43 Manufactured Materials for Roadwork

(1) Bitumen

Please refer to Section 1.54 hereof

(2) Types of Bitumen

Please refer to Section 1.54 hereof

(3) Cutback Grade Bitumen

Please refer to Section 1.54 hereof

1.44 Precast Concrete Units

Precast concrete units shall be provided by specialist supplier or may be manufactured by the Contractor if the Contractor's samples and workmanship are approved.

(1) Precast Concrete Blocks

Precast concrete blocks conform to BS 6073 Part 1: 1981. Blocks shall be solid or hollow, of the sizes required and shall be obtained from an approved manufacturer.

Unless shown otherwise on drawings, concrete blocks shall have an average compressive strength from a sample of 10 blocks of 3.5 N/mm² on gross area. No individual block shall have a compressive strength less than 2.8 N/mm² on gross area.

The face of concrete blocks to be plastered shall have a reasonable dense fair finish from moulds.

(2) Non-Structural Precast Concrete

Units shall be made to the form, surface finish and dimensions specified or shown on the drawings. Any units damaged during manufacture, hoisting or fixing will be rejected.

The Contractor must allow for any moulds, for any light reinforcement which may be necessary to prevent breakage or damage in handling, for casting in specified lengths, for hoisting and, unless otherwise described, for bedding and jointing where necessary in 1:3 cement: sand mortar.

(3) Structural Precast Concrete

Materials and workmanship shall be in accordance with British Code of Practice CP 116 and to BS 8110 : Part 1: 1985.

The precast units shall be cast under cover and shall so remain for at least 7 days during which period they shall be kept damp or otherwise efficiently cured. No units shall be erected until 21 days after casting except with the written approval of the Engineer.

No units shall be erected until it has been approved by the Engineer as being free from defects.

All precast units shall be marked to show which face should be on top. Lifting hooks are to be attached only to those positions shown on the drawings or as specified by the Engineer.

1.45 Geomembrane

The manufacturer shall have at least five (5) continuous year experience in manufacturing polyethylene geomembrane.

The installation shall be carried out by a specialised trained person.

The contractor shall provide copy of quality control certificates (thickness, density, tensile properties, seam properties) for the geomembranes prior to ordering for approval by the Engineer.

The geomembrane shall be Linear Low Density Polyethylene and shall be supplied in rolls. The surface of the smooth geomembrane shall not have striations, roughness, pinholes or bubbles.

The geomembrane shall be stored so as to be protected from puncture, dirt, grease, moisture and excessive heat.

All surfaces on which the lining is to be laid must be prepared so that no damage to the lining is possible.

Prior to liner installation, the subgrade shall be compacted to minimum of 90% BS Heavy in accordance with the specifications. Weak or compressible areas which cannot be satisfactory compacted should be removed and replaced with properly compacted fill.

The surface of the embankment must be checked by the lining supplier. If need be, a non woven geotextile membrane must be provided.

The anchor trench shall be excavated to the line, grade and width shown on the drawings prior to liner system placement.

The rolls shall be deployed using a spreader bar assembling attached to a loader bucket or any other methods as approved by Engineer.

Approved seaming processes are fusion and extrusion welding. On side slopes, seams shall be oriented in the general direction of maximum slope. In corners and odd-shaped geometric locations the number of field seams shall be minimized.

Geomembrane panels must have a finished minimum overlap of 4 inches for fusion welding and 6 inches for extrusion welding. Non-destructive field test seams shall be conducted on the liner to verify that seaming conditions are satisfactory.

The contractor must check with the Manufacturer of the geomembrane and ensure that he prices for all items that may be required for the proper fixing of the membrane in addition to details shown by the Engineer.

1.46 Cement

General

The cement shall be of approved manufacture and shall be delivered in bags with seals unbroken, or if delivered in bulk, it shall be delivered in approved containers.

Test Certificates from the manufacturers or supplier shall be submitted for each

consignment and shall indicate the results of the tests for compressive strength, setting time, soundness and fineness carried out in accordance with the requirements of the relevant British Standard, but the Engineer may require further tests to be made after the cement is delivered to the site.

If such certificates are not available, samples shall be taken from different bags or containers of the consignment, suitably packed, and sent for testing in accordance with B. S. to an approved laboratory, or where directed by the Engineer.

The Engineer may require further tests to be made if any cement is stored on site for a longer period than three months.

The failure of any sample to satisfy the requirement of the relevant British or other approved Standard shall entitle the Engineer to reject the entire consignment from which it was taken.

Cement Received Through Importing Agents

Each consignment of cement received through importing agents shall be accompanied by a further certificate stating that no cement has been rebagged or the percentage of rebagging (which shall not exceed 10 %) as the case may be.

The Contractor shall state the name of the local supplier or importing agent and the approval of the Engineer, in writing, shall be obtained before the order of any consignment.

Ordinary Portland Cement

Cement shall be manufactured by an approved firm and comply in all respects with the requirements of the B.S. 12

1.47 Steel Reinforcement

Steel reinforcement shall comply with the requirements of B.S. 4449 and B.S. 4461. The steel shall be free from oil, grease, dirt and paint and any loose rust shall be removed before use.

No heating except for fishtailing and no welds except in reinforcing fabric shall be made in any bar without permission in writing from the Engineer. All bending shall be done in an approved machine with the steel cold and in accordance with B.S. 4466.

The Contractor shall supply the Engineer with a certificate stating the origin and process of manufacture and test sheets, signed by the maker, giving the results of each of the tests applied. If and when required, he shall also grant all necessary facilities to the Engineer for the selection of test pieces and shall cause these to be prepared and submitted where directed for test. The Engineer shall have the option of testing and approving at the works of the suppliers of all or any of the steel required under the Contract, and the Contractor shall advise the Engineer when the whole or any of the steel is ready for test at the Works, in order to conform with the provisions of the B.S. as regards Test and Inspection.

1.48 Mould Oil

Mould oil shall be of an approved proprietary brand and shall be used in accordance with the Manufacturer's recommendation or as directed by the Engineer.

1.49 Material for Forms, Falsework and Centering

All timber used for forms, falsework and centering shall be sound wood, well seasoned and free from loose knots, shakes, large cracks, warping and other defects. Before use on the work, it shall be properly stacked and protected from injury from any source. Any timber, which becomes badly warped or cracked, prior to the placing of concrete shall be rejected. Forms, which are unsatisfactory in any respect, shall not be used. All shuttering for all outside surfaces above final ground level shall be either tongued and grooved or provided with a suitable lining to produce a smooth surface finish and shall be termed thin facing shuttering. Other shuttering shall be termed normal shuttering.

Irrespective of nature or position, all joints in shuttering shall be sufficiently tight to prevent leakage of liquids from concrete.

If the Contractor proposes to use steel shuttering, he shall submit to the Engineer, dimensioned drawings of all the component parts, and give details of the manner in which it is proposed to assemble or use them. Steel shuttering will only be permitted if it is sturdy in construction and if the manner of its use is approved by the Engineer.

Struts and props shall, where required by the Engineer, be fitted with double hardwood wedges or other approved devices so that the moulds may be adjusted as required and eased gradually when required. Wedges shall be spiked into position and any adjusting device locked before the concrete is cast.

1.50 Concrete Pipes

Concrete pipes shall comply with the requirements of B.S. 556. Where pipes are manufactured on site, all the clauses in this specification shall be applicable to the manufacture and testing of concrete pipes.

Notwithstanding any of the requirements outlined above, for routine control purposes, the cube compressive strength shall satisfy the requirements of Class 30 concrete as shown in Section 1.11 of Specifications for Testing.

1.51 Concrete Porous Pipes

Concrete porous pipes for French drain shall comply with the requirements of B.S. 1194.

1.52 Precast Concrete

Precast kerbs, slabs, channel edging and quadrants shall comply with the requirements of B.S. 340 and with the Drawings.

Where the Contractor is permitted to carry out precasting on site, the precast units shall in addition to complying with the relevant B.S., be manufactured in steel moulds on a vibrating table or as directed by the Engineer.

1.53 Admixtures

Unless agreed by the Engineer, neither admixtures nor cement containing additives shall be used.

1.54 Bitumen Products

1.54.1 The following types of bitumen products will be used: -

- For the bituminous concrete, straight run bitumen penetration grade 35/50 shall be used.
- For the prime coat, cut back bitumen MC 30, ECI 50 or other equivalent shall be used.
- For the tack coat, cutback bitumen RC 3000 (or cut back 400/600) or rapid setting bitumen, emulsion (with 60% of residual bitumen) shall be used.

1.54.2 Bitumen products shall comply with AASHTO or ASTM requirements. Some of the requirements for different grades of bitumen are indicated hereunder: -

GRADE	80/100	60/70	35/50
Softening Point, °C	41 - 51	43 - 56	47 - 60
Penetration Test, mm	80 - 100	60 - 70	40 - 50
Density (25 C), g/cm ³	1 - 1,07	1 - 1,1	1 - 1,1
Flash Point, °C	>230	>230	>250
Ductility (25 C), cm	>100	>80	>60
Solubility CS 2	>99,5	>99	
Loss of heating	>99,0	>99,0	>99
163 C, 5 h	>2 %	< 1%	<1%
Penetration of residue from rolling thin film over test at 25	< 1%		
100 gas % of original	> 70%	>70%	>70%

1.54.3 Emulsions shall be of the cationic type. They shall comply with the following specifications: -

- The water content shall not exceed the required nominal rate by more than 1 % of the weight of emulsions.
- The sensitivity to temperature, of the emulsion shall be such that its viscosity shall not decrease by more than 30 % if the temperature increases from 20 degrees to 40-degree C.
- The emulsion shall not contain free particles likely to obstruct the sparge pipes.

Any bitumen or bitumen emulsion delivered in leaking containers or deteriorated in the containers may be rejected.

During the course of the contract, the Contractor shall, at his own expense, satisfy the Engineer from time to time that the bitumen and bitumen products being used are in accordance with the Specification. Any laboratory testing that he arranges to satisfy this Clause shall be carried out in an approved laboratory.

1.55 Hydrated Lime

Lime for stabilisation shall be Hydrated Calcium Lime (not Magnesium) and shall generally comply with B.S. 890, Class B, and with a free lime content of 50%.

The proportion of filler shall be more than 90%.

Locally manufactured limes may be proposed for the approval of the Engineer. The Contractor shall submit with all consignments, at his own expense, the manufacturer's certificate certifying that they comply with B.S. 890, or his chemical analysis.

1.56 Precast Concrete Slabs

Precast concrete slabs shall be "Trief" interlocking concrete blocks, type Super Trief Blocks (125 mm - (5 in) - thick with a finish) or similar.

1.57 (Glazed Vitrified Clay) Pipes and Fittings

Clay pipes shall conform to the requirements of BS 65 and 540 or EN 598 as appropriate. The pipes shall be supplied with Type 1 sockets and supplied complete with the manufacturer's flexible joint.

1.58 Ducts For Cables

Ducts for cables shall have a smooth internal bore without any sharp edges to the ends of the pipes, and shall be either: -

- (i) G.V.C. ducts with self-aligning flexible sleeve joints manufactured in accordance with the tolerances, permeability and strength requirements of BS 65 and 540 or EN 598 as appropriate. The internal ends of ducts shall be radiused to 3 mm minimum, or
- (ii) U.P.V.C. ducts complying with Class B or C or BS 3506 or with BS 4660.

1.59 Hand Parapets

Hand parapets shall comply with B.S. 4360 and as shown on the Drawings.

1.60 Guard Rails

Guardrails shall be installed as shown on the Drawings or as directed by the Engineer. The posts shall be spaced at a standard interval of 2 metres. Posts shall be plumbed. The top of the post shall be set to the design level with a tolerance of 2 cm.

Guard Rails supplied by the Contractor shall be accompanied by relevant documents

including Performance criteria, impact resistance and fixing methods etc; for the proposed guardrails and a Certificate from the manufacturer stating that the materials supplied conform to the following.

The steel posts shall conform to the requirements of AASHTO M183 and galvanizing shall be in accordance with AASHTO M111. The guard rails shall be galvanised, corrugated sheet steel beams conforming to the requirements of AASHTO M180-78 Class A, with a base metal nominal thickness of 2.67 mm and Type 1, with zinc coated of 550 g/m2 minimum-spot and of W-Beam shape. The guardrail must have been submitted to the official crash test.

The fittings i.e bolt and nuts shall conform to or exceed requirement of ASTM A 307 and shall be hot dip zinc coated in accordance with the requirements of AASHTO M232M, Class C. The guardrails shall be supplied and delivered completed with bolted warning reflectors, steels, posts and metallic spacing device and bolts etc.

Posts and Spacers

Structural steel used for these components conforms to ASTM A36 specification, quality S235J, according to EN 10027- 1 standard.

Base Metal Specification to AASHTO M180-89

Properties	
Tensile strength, minimum	490 N/mm2
Yield stress, minimum	345 N/mm2
Elongation, % min	15%

1.61 Pedestrian Handrails

Pedestrian handrails shall be provided as shown on Typical Drawing. Individual panels supplied shall take into account horizontal and vertical alignment of the ground where hand railing is to be located, and the change in direction of the hand railing at road junctions.

Support posts for the panels shall be fixed in the ground as shown on the Drawings.

1.62 Bollards

Bollards shall be precast with Class 25 concrete to the dimensions shown in the Drawings or as directed by the Engineer and shall in all respects comply with the requirements for precast concrete. They shall be bedded in Class 15 concrete.

Bollards shall be painted as directed by the Engineer.

1.63 Precast Concrete Kerbs, Channels, Edgings and Quadrants

1.63.1 Precast concrete kerbs, edgings and quadrants shall comply with section 1.44 hereto and shall be laid and bedded in a layer of mortar not less than 10 mm thick on a Class 15 concrete foundation. Kerbs shall be backed with Class 15 concrete.

1.63.2 All precast kerbs shall be butt jointed and all joints shall be mortared.

1.63.3 For radii of 12 m or less, kerbs of appropriate radius shall be used.

1.63.4 Any unit of kerb, channel edging and quadrant deviating more than 3 mm in 3 m from line and level shall be made good by lifting and relaying.

1.64 In situ kerbs

1.64.1 The kerbs shall be compacted with regular sides, edges, arises and chamfers finished to a surface free from blowholes and dragging and shall be impervious.

1.64.2 The surface regularity of the top of the kerbs shall comply with the tolerances for the wearing course as specified in this Specification. The horizontal alignment shall not deviate from that shown on the Drawings by more than 3 mm in 3 m.

1.64.3 The concrete shall comply with relevant clause of section 8 of this specification and shall be Class 30.

The exposed surfaces of kerbs shall be cured by treating with an approved aluminised curing compound immediately after laying, unless other methods of curing are approved by the Engineer.

1.64.4 Kerbs shall remain firmly secure on the surface on which they are laid and shall be cast at least one week prior to the laying of the layer they are to contain. They shall be cut and moulded whilst green to form expansion and contraction joints. The joints shall then be filled.

1.65 Materials and Colour For Road Signs

Permanent traffic signs shall be reflectorised and shall comply in all respects with GN 154 of 1990, the Contract Drawings and Section 7 of the Specifications.

The Contractor shall, at his own expense if and when required by the Engineer, provide a manufacturer's and/or an approved laboratory's test certificate showing that the road signs comply with this Clause.

Standard colours to be used for Signs, Posts and Fittings shall be as described in the relevant BS as follows:

Red	BS 381 C No. 537
Blue	BS 4800 No. 0-013
Yellow	BS 381 C No. 355
Grey for posts, fittings and black for signs	BS 2660 No. 9-101
Cream	BS 381 C No. 352
Black White	BS 873 C 3b and 3c

1.66 "Cats' Eyes" Reflectors

The white lensed road-mounted reflectors used in the Works shall be those known as "Cats' eyes" of the pin-type such as Prismo II or similar, or an alternative complying with BS 873 Part IV previously submitted to and approved by the Engineer.

Mounting on these reflectors shall comply in all respects with the manufacturer's instructions for use, and also with the British Department of the Environment Manual for Road systems.

Cat's eyes using the glued method of fixing will not be accepted.

1.67 Road Marking

1.67.2 Paint

The paint to be used for road surface marking shall be specifically manufactured for such purposes. It shall be suitable for applying by brush, low pressure spraying equipment and high pressure spraying equipment to give a chemically stable film of uniform thickness.

It shall be stored and applied in accordance with the manufacturer's instructions. Unless otherwise agreed by the Engineer, paint shall be applied without the use of thinners or other additives.

1.67.3 Paint shall comply with the Technical Specifications. The setting out of lines and symbols shall be made by the Contractor according to Typical Drawings. For junction and roundabout, the contractor shall submit to the agreement of the Engineer working drawing at least fifteen days before starting works.

1.67.4 Prior to application, the road surface shall be thoroughly cleaned of dust, dirt and all loose material. Painting on wet surface is forbidden.

1.67.5 The application of paint shall preferably be done by a purpose made machine, but the Engineer may approve brushing. All application shall be strictly adhered.

The spraying rate for cold paint will vary with the roughness of the surface, but shall be such to give continuous coverage. Immediately after application of the cold paint, ballotinis shall be spread on top.

The minimum dry film thickness and the rate of ballotinis shall be in accordance with the manufacturer's instructions. The guarantee period of products shall be at least twelve months.

Warning signs shall be erected when painting is in progress and traffic shall not be allowed to pass over wet paint. Any painting disfigured by traffic or any painting not to the satisfaction of the Engineer, shall be wiped out and repainted at the Contractor's expense.

Colour

1. White

The colour of white markings shall when laid be approximately to BS colour No. 102 of BS 381 C.

The pigment used shall be titanium dioxide type A Anatase or type R (Rutile) complying

with BS 239.

2. Yellow

The colour of yellow markings shall when laid be approximately to BS colour No. 355 of BS 381 C.

Chlorinated Rubber Paints

1. Maximum % by weight of chlorinated rubber - 20%
2. Maximum % by volume of pigment at 20 degree C - 50%
3. Minimum colouring (prime) pigment content % by weight paint 16 %, yellow paint 10 %
4. Surface drying time determined in accordance with BS 3900 part C2, less than 5 minutes
5. Hard drying time determined in accordance with BS 3900 Part C3, less than 15 minutes
6. Adhesion to concrete or bituminous surfacing must, in the opinion of the Engineer, be good.
7. Reflectorisation shall be surface reflectorisation.

Testing to determine drying times in accordance with BS 3900 parts C2 and C3 shall be carried out on test panels prepared in accordance with BS 3900 part A 3.

Reflectorisation

Internal Reflectorisation

Internally reflectorised paint shall be specifically manufactured for this purpose and shall contain ballotini to the general requirements of BS 3262 part I with a luminance factor of not less than 7%, skid resistance of not less than 45, and heat stability of not less than 65%. The ballotini shall meet the following grading requirements: -

<u>BS TEST SIEVE</u>	<u>% PASSING</u>
212 micron	100
150 micron	75 - 100
75 micron	0 - 25
65 micron	0 - 10

The quantity of ballotini beads shall be between 18 and 22% by weight of total mix or such other quantity as the Engineer shall direct.

Surface Reflectorisation

Surface reflectorisation shall be by application of ballotini beads to the wet paint film. The ballotini shall comply with the general requirements of BS 3262 part I and shall

comply with the following grading requirements: -

<u>BS TEST SIEVE</u>	<u>% PASSING</u>
0.850 mm	100
0.600 mm	80 - 100
0.300 mm	18 - 35
0.150 mm	0 - 10
0.075 mm	0 - 2

The ballotini shall be spread on the wet paint at between 0.7 and 0.9 kg/litre of paint or at such other rate, as the Engineer shall direct.

1.67.6 Hot applied thermoplastic road marking materials

The material for hot applied thermoplastic road marking shall be in accordance with BS 3362, and suitable for spraying.

The material shall be of a type approved by the Engineer, and if not on the current approved list, samples and technical data shall be submitted to the Engineer at least four (4) months prior to the proposed use.

Colour

1. White

The colour of white markings shall when laid be approximately to BS colour No. 102 of BS 381 C.

The pigment used shall be titanium dioxide type A Anatase or type R (Rutile) complying with BS 239.

2. Yellow

The colour of yellow markings shall when laid be approximately to BS colour No. 355 of BS 381 C.

Composition

The thermoplastic material shall consist of light coloured aggregate, pigment and extender bound together with resin plasticised with oil as necessary, in approximately the following proportions:

Aggregate 40%, Ballotini 20%, Pigment 10%, Extender 10%, Binder 20%

Glass beads, less than 1.0 mm in diameter, dispersed in the mix (EN 1423: 1998, EN 1424: 1998)

Pigment used is Titanium Dioxide (Rutile) Extender used is chalk or Lithopone Binder softening point shall be 55°C Reflectorisation shall be Internal Reflectorisation

1.67.6 Traffic Signs

All traffic signs shall comply with the "GN 154 of 1990 for Traffic Signs". Height or diameter of signs is given on Typical Drawing. Locations of traffic signs shall be specified by the Engineer.

1.67.6.1 Generals

The sign panels shall be manufactured either from:

- (a) steel sheets with zinc-aluminium coating (Galfan)' which is a flat carbon steel product coated on both sides with a zinc-aluminium alloy. Its composition is: 95% zinc and 5% aluminium. The coating is applied by means of a continuous hot dip galvanising process : or
- (b) Glass Reinforced Polyester (GRP) sheets as per the following specifications.

1.67.6.2 GRP sheets for permanent and temporary signage

Long term strength and durability – minimum maintenance

GRP developed to provide high rigidity and strength, combined with lightness and ease of handling.

The sheets are to be unaffected by high or low temperatures and by the extremes of tropical weather and the panels shall have a minimum life span of 12 years.

High impact resistance

GRP panels should pass the impact test specified under BS EN 12899- 1 for road traffic signs.

Minimum surface preparation

Panels shall only require wiping clean prior to the application of self- adhesive vinyl. The panels shall be grey colour to eliminate the need to surface paint the reverse face, which shall be UV protected.

Immune to corrosion

Panels shall not rust or corrode from road salt or chemically aggressive conditions which otherwise would result in deterioration of the sign.

Compatible with industry standard reflective films and fixing systems

GRP should be compatible with 3M, Scotchlite and Nikkalite reflective films and riveting systems.

Compliant with regulatory standards

GRP should meet all the requirements of BS EN 12899-1 following accelerated weathering tests. Regulatory and warning signs up to 2 m² manufactured in accordance with NCI guidelines from one sheet of GRP should be compliant.

Signs and Materials for fixing

The signs shall have a minimum thickness of 3.2 mm +/-5% and are to be fixed on 80 mm diameter galvanised steel pipes or 75 x 75 mm galvanised steel tube sections.

The sign plates shall accommodate Aluminium rails (dimensions shall be as per the drawings; any acceptable minor deviations shall be to the Engineer's approval) at the rear side for fixing purposes. The fixing method shall be such that it shall be possible to adjust the direction of the traffic signs at any time on site without having to move the post in its concrete base.

Material for fixing, such as brackets, sockets, caps, clips, screws, bolts, nuts and washers shall be inox (stainless steel) or any steel alloy that does not corrode, rust or stain and should be to the Engineer's approval. The Anti-Rotational Clip (ARC) complete with bolt assembly shall be of A1S1 grade 304 stainless steel. Bolt heads shall be square shape and as per the drawings. Brass or copper will not be allowed for use in contact with Aluminium.

Bidders may check details, materials and shape of the required clips, rails, bolts and nuts at the store of the TMRSU before bidding.

1.67.6.3 Reflective sheeting on Road Signs (Diamond Grade) as per ASTM D 4956

The reflective sheeting used on road signs shall consist of spherical lens elements embedded with a transparent plastic having a smooth, flat outer surface with a protected pre-coated adhesive which shall be pressure sensitive for manual application or tack free heat activated for mechanical vacuum-heat application. The reflective sheeting must conform to the performance specifications of ASTM D 4956.

The reflective sheeting shall be sufficiently flexible so as to permit application over and conformance to a moderate embossed surface. It shall show no damage when bent 90° over a 50 mm diameter mandrill.

The sheeting shall be solvent resistant so as to be capable of withstanding cleaning with petrol, diesel fuel, mineral spirits, turpentine and methanol.

The sheet shall show no cracking or reduction in reflection after being subjected to the dropping of a 25 mm diameter steel ball from a height of 2 meters onto its surface.

The adhesive shall permit the reflective sheeting to adhere securely within 48 hours after application at temperatures of up to 95°C.

The reflective material shall be weather resistant and, following cleaning, shall show no definite fading, darkening, cracking, blistering or peeling and not less than 75% of the specified wet or dry minimum brightness values when exposed either to an accelerated weathering period of 12 hours or a natural exposure of 7 years, in accordance with an approved testing procedure

Photometrics.

The photometrics of the Diamond Grade retro-reflective sheeting should be as follows.

Daytime Color (x, y, Y %)

The chromaticity coordinates and total luminance factor of the retro- reflective sheeting should conform to the table below.

Color Test – Fluorescent Sheeting

Conformance to standard chromaticity (x,y) and luminance factor (Y%) requirements shall be determined by instrumental method in accordance with ASTM E 991 on sheeting applied to smooth aluminium test panels cut from Alloy 6061-T6 or 5052-H38. The values shall be determined on a HunterLab ColorFlex 45/0 spectrophotometer. Computations shall be done for CIE Illuminant D65 and the 2° standard observer.

Color Test – Ordinary Colored Sheeting

Conformance to standard chromaticity (x,y) and luminance factor (Y%) requirements shall be determined by instrumental method in accordance with ASTM E 1164 on sheeting applied to smooth aluminium test panels cut from Alloy 6061-T6 or 5052-H38. The values shall be determined on a HunterLab ColorFlex 45/0 spectrophotometer. Computations shall be done for CIE Illuminant D65 and the 2° standard observer.

Daytime Colour specification limits¹

Color	x	y	x	y	x	y	x	y	Daytime Luminance Limit (Y %) Min. Max.	
White	0.30 3	0.30 0	0.36 8	0.36 6	0.34 0	0.39 3	0.27 4	0.32 9	27	
Yellow	0.49 8	0.41 2	0.55 7	0.44 2	0.47 9	0.52 0	0.43 8	0.47 2	15	45
Red	0.64 8	0.35 1	0.73 5	0.26 5	0.62 9	0.28 1	0.56 5	0.34 6	2.5	15
Blue	0.14 0	0.03 5	0.24 4	0.21 0	0.19 0	0.25 5	0.06 5	0.21 6	1	10
Green	0.02 6	0.39 9	0.16 6	0.36 4	0.28 6	0.44 6	0.20 7	0.77 1	3	12
Brown	0.43 0	0.34 0	0.61 0	0.39 0	0.55 0	0.45 0	0.43 0	0.39 0	1	9
FY	0.47 9	0.52 0	0.44 6	0.48 3	0.51 2	0.42 1	0.55 7	0.44 2	40	
FYG	0.38 7	0.61 0	0.36 9	0.54 6	0.42 8	0.49 6	0.46 0	0.54 0	60	
FO	0.58 3	0.41 6	0.53 5	0.40 0	0.59 5	0.35 1	0.64 5	0.35 5	20	

The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 Colorimetric System.

FY: Fluorescent Yellow

FYG: Fluorescent Yellow Green FO: Fluorescent orange

The minimum reflective brightness values of the diamond grade retro-reflective sheeting

-4° Entrance Angle²			
	Observation Angle³		
	0.2	0.5	1.0
White	580	420	120
Yellow	435	315	90
Red	87	63	18
Green	58	42	12
Blue	26	19	5
Brown	17	13	4
Fluorescent Yellow	350	250	72
Fluorescent Yellow Green	460	340	96
Fluorescent Orange	175	125	36
30° Entrance Angle²			
	Observation Angle³		
	0.2	0.5	1.0
White	220	150	45
Yellow	165	110	34
Red	33	23	7
Green	22	15	5
Blue	10	7	2
Brown	7	5	1
Fluorescent Yellow	130	90	27
Fluorescent Yellow Green	180	120	36
Fluorescent Orange	66	45	14

² Entrance Angle – the angle from the illumination axis to the retro-reflector axis. The retro-reflector axis is an axis perpendicular to the retro-reflective surface.

The brightness of the reflective sheeting when totally wet by rain shall not be less than 90% of the values.

All diamond grade traffic signs should be provided with protective anti-graffiti sheeting.

A **warranty certificate** for the reflective sheeting is to be obtained from the Local Supplier of the road signs and submitted to the Engineer and should be at least for 5 years.

1.67.6.4 Colours for Road Signs

Standard colours to be used for signs, posts and fittings shall be as described in the relevant BS as follows:-

Red	BS 381C No. 537
Blue	BS 4800 No. 0.013
Grey for post fittings and	BS 2660 No. 9-101 Back of signs
	BS 2660 No. 9-101
Black and White	BS 873 C 3b and 3c

Rust inhibitive paint shall comply with BS 2523: Lead Based Priming Paints.

1.67.6.5 Road Sign Posts and Bases

All posts shall receive on coast of rust protective primer before being erected and fixed in foundations.

The foundation of posts shall be of Class 25 concrete. The volume of foundation shall be not less than 0.25 m³. The post shall be surrounded at sides and bottom by a minimum of 150 mm of concrete. The top of the foundation shall be set to the design level with a tolerance of 2 cm.

1.67.6.6 Rust Inhibitive Priming and Finishing Paint

All posts to be of galvanised iron and to be painted with two coats of rust inhibitive priming paint, one coat of undercoat and one coat of gloss paint to a colour specified by the Engineer.

All welded joints to be treated with cold galvanised paint. Back of the traffic panels are to be grey in colour.

1.68 Geotextiles

General Characteristics

Geotextile shall be of the non-woven type having the following characteristics:

Mass per unit area	≥250 g/m ²	≥200 g/m ²
Tensile strength	≥20 KN/m	≥15 KN/m
Penetration load (CBR) at rupture	3 KN	2.5 KN
Elongation	≥50%	≥50%
Pore size 090 (dry)	≤100 Mm	≤100 Mm
Permeability (10 cm head)	130 l/s/m ²	160 l/s/m ²

Subgrades

Geotextiles shall be delivered in rolls wrapped in a protective layer of plastic to avoid degradation from direct sunlight, ingress of dust, mud and water during storage.

Laying at subgrade level

- ◆ Prior to laying of geotextiles, the site will be well graded and sharp objects such as rocks, stumps of trees or bushes which might puncture or tear the fabric shall be removed. Any significant hollows or unevenness in the site should be filled.

During the rolling out into position of the geotextile, sufficient allowance shall be made in order to provide an overlap at least 500 mm between adjacent sheets. The edges of the geotextiles shall be properly weighted to maintain the position of the geotextile before covering with sub base materials or other fill. Once the geotextile is laid it shall not be trafficked until an adequate layer of fill is placed over it. Blades or buckets of construction plant must not be allowed to come in to contact with the fabric during filling operations.

For drainage applications, all sharp stones and projections shall be removed from the bottom and walls of trenches before lining of trenches with geotextiles.

The edges of the fabric shall be laid on the ground at the edges of the trench and held by small piles of aggregates.

During the filling process, no attempt shall be made to restrain the top of the fabric.

Upon completion of filling of the trenches, the free lengths of fabric shall be wrapped over the drainage layer. The overlaps shall be at least 500 mm.

Jointing / cutting

The minimum overlap shall be 500 mm. In applications where the geotextile is subject to tensile stress, the overlap shall be increased by 100 mm. Overlaps shall be sown or stapled as per the manufacturer's recommendations. Stitching should be at least 50 mm back from the free edges of the fabric.

1.69 Cast Iron Gully

Cast iron gully shall of Grade A type and shall comply with the requirements of B.S. 497.

1.70 Polystyrene

The board shall be formed of polystyrene base resin in an extrusion process and shall be homogeneous and essentially unicellular. It shall conform to the requirements of ASTM 11230.

SPECIFICATION FOR TESTING

SPECIFICATION FOR TESTING

Table of Contents

1.00	General	1
1.01	Provision And Operation Of Laboratory	1
1.02	Additional Tests	2
1.03	Inspection and Testing of Manufactured Materials	2
1.04	Tests on Suspect Materials and Workmanship	3
1.05	Location of Materials	3
1.06	Sampling of Materials	3
1.07	Testing of Naturally Occurring Materials	4
1.08	Testing of Aggregates	5
1.09	Tests for Water Purity	5
1.10	Tests for Manufactured Materials	5
1.11	General Control and Tests During Construction	7
1.12	Frequency of Tests	12
1.13	Frequency for Other Manufactured Materials	12
1.14	Alteration in Frequency of Tests	12
1.15	Apparatus of the Laboratory	12
1.16	Control of Surfaces	13
1.17	Responsibility of the Contractor	13

SPECIFICATION FOR TESTING

1.00 General

The Contractor shall carry out on the Site tests for selection and control of materials and workmanship in accordance with the Technical Specifications and as instructed by the Engineer. Such instructions shall in no way affect the responsibility of the Contractor to ensure that all materials and workmanship are in accordance with the Contract.

1.01 Provision And Operation Of Laboratory

1.01.1 General

Permission to commence any major construction operations shall not be given by the Engineer until the Contractor provides sufficient proof that it has made necessary provisions under the Contract for a laboratory in full working order, suitably equipped and staffed.

1.01.2 Laboratory

The Contractor shall provide a laboratory fully equipped to carry out all tests required for the selection of materials, design of mixes, control of materials and workmanship, in compliance with the requirements of these Technical Specifications. The Contractor shall also appoint and employ qualified laboratory technicians for the duration of the Contract and adequate semi-skilled and unskilled labour. The Contractor shall ensure that at all times during the currency of the Contract, he has sufficient quantity of apparatus, equipment, chemicals and other materials, and is adequately staffed to carry out any and all of the tests by the methods described hereunder, and at the speed and in volume required by the progress of the works, and the Engineer's instructions.

All tests shall be carried out by the Contractor's technicians, but the Engineer shall be allowed free access at all times to the Laboratory and testing facilities. The Laboratory shall be under the direct control and supervision of the Engineer.

The Contractor shall provide and maintain all labour, tools and equipment that may be required for the digging of trial pits and collection of samples in connection with all tests.

All tests to be performed shall be in accordance with Standard Specifications of the B.S., LCPC, AASHTO and ASTM as specified in these Technical Specifications.

All tests including crushing of concrete cubes shall be carried out in the laboratory.

The Contractor shall provide and maintain all essential services including lighting, clean water and sinks with adequate drainage facilities. The Contractor shall provide such work benches, tables and chairs as required by the Engineer.

The Contractor shall maintain the building in a clean and tidy condition and shall be responsible for the security of the building and its contents at all times.

1.01.3 Design of Mixes

The Contractor shall carry out tests to establish proper proportions and characteristics of mixes as described in of these Technical Specifications.

1.01.4 Tests on Materials

The Contractor shall carry out tests to ensure that all materials to be used in the Works are in accordance with the Technical Specifications.

1.01.5 Tests on Workmanship

The Contractor shall carry out tests at the frequencies specified herein, or as directed by the Engineer to ensure that all workmanship is in accordance with the Technical Specifications.

1.01.6 Tests Carried out by a Nominated Testing Authority

Whenever the facilities of the Contractor's laboratory are determined to be inadequate by the Engineer to carry out control tests on materials or workmanship, such tests shall be carried out at the Contractor's expense by any other testing laboratory which shall be nominated by the Engineer, and the Contractor shall be fully responsible for any delays in the testing or work which may ensue.

1.01.7 Test Results

All samples and records shall be preserved for as long as the Engineer may direct and they shall be kept and labelled in an orderly fashion to his satisfaction. The results of all tests shall be entered on standard forms, samples of which will be provided by the Engineer and two legible copies of each completed form shall be delivered to him with the minimum of delay. No material shall be incorporated in or rejected from the Works until the results of all relevant tests have been approved.

1.02 **Additional Tests**

In addition to the tests required under other articles hereof, the Engineer shall have power to order independent tests of all materials to be carried out by some person appointed by him at such place as he may determine and from the result of such tests there shall be no appeal. No payment shall be made for these additional tests and the costs thereof shall be deemed to be included in other rates and prices.

1.03 **Inspection and Testing of Manufactured Materials**

Whenever considered desirable by the Engineer, inspectors may be sent to the factory to test the materials or to supervise their manufacture. Materials shall be tested before leaving the factory as well as after delivery to the site and the Engineer shall be at liberty to reject materials notwithstanding the preliminary test at the factory. Should the Engineer not decide to send an inspector to the manufacturer's works, the Contractor shall obtain from the manufacturer certificate of test, proof sheets, mill sheets etc. showing that the materials have been tested in accordance with the requirements of these Specifications relating thereto and shall provide adequate means of identifying the

materials on site with the corresponding certificates etc..., but neither the omission of the Engineer to send an inspector nor the production of the manufacturer's certificate of test shall affect the liberty of the Engineer to order further tests on samples selected from the materials delivered to the site and to reject after delivery materials found to be unsuitable or not in accordance with these Technical Specifications.

1.04 Tests on Suspect Materials and Workmanship

Where so directed, tests other than the tests specified herein, shall be carried out on the completed works or portions thereof at any time until the final handing over certificate has been issued. Where there is any doubt that the work has not been carried out in accordance with the provisions of the contract or the Engineer's instructions, such tests shall be carried out jointly by the Engineer and the Contractor, or at the request of either party, by an independent Testing Authority which shall be nominated by the Engineer.

1.05 Location of Materials

The Contractor shall be responsible for locating all naturally occurring materials to be used in the works.

The Contractor shall open up trial pits and carry out tests, to locate materials suitable for use in the works, all as directed. The frequency of the trial pits shall be at the discretion of the Engineer.

1.06 Sampling of Materials

1.06.1 General

Samples of materials to be tested shall be carried out in accordance with the methods hereinafter described, or as referred to in the appropriate method of testing. In all other cases, the method shall be as directed.

1.06.2 Trial Pits

Trial pits, dug by hands, shall have a minimum plan area of 1 metre by 1 metre.

Samples shall not be taken from the spoil of the trial pit but shall be obtained from equal increments taken from each face of the pit, each increment being a representative sample of the material taken from any single horizon. The four increments so obtained shall be thoroughly mixed by turning over three times and then quartered or riffled down to the size required for testing.

1.06.3 Stockpiles

The surface material of the stockpile shall be removed before sampling. At least twelve equal portions shall be taken from different parts of the stockpile, and thoroughly mixed by hand before being quartered down or riffled down to the size required for testing.

1.07 Testing of Naturally Occurring Materials

1.07.1 Preparation of Disturbed Samples for Testing

The preparation of disturbed samples for testing shall be carried out in accordance with the procedure given in B. S. 1377.

1.07.2 Tests on Naturally Occurring Materials

The tests shown below shall be conducted in accordance with the relevant British Standard or

Moisture Content	: B. S. 1377 Test 1A
Speedy Moisture Content	: as directed by the Engineer
Liquid Limit	: B. S. 1377 Test 2A or 2 B
Plastic Limit	: B. S. 1377 Test 3
Plasticity Index	: B. S. 1377 Test 4
Specific Gravity	: B. S. 812
Bulk Density	: B. S. 812
Particle Size Distribution	: B. S. 1377, Test 7A
Particle size analysis by Hydrometer method discretion of Engineer)	: B.S 1377 Test 7D (If required at the
Sand Equivalent	: AASHTO T 176

All sieving shall be done by the wet method. Dry sieving may only be carried out with the specific permission of the Engineer.

1.07.3 Compaction Tests

The tests shall be carried out in accordance with B. S. 1377 test 13. Compaction tests should be carried out at intervals of 50 metres on the compacted subgrade, crusher run layers and asphaltic concrete layers, or as directed by the Engineer, under the relevant sections of these Specifications. Coring for asphaltic concrete works should be carried out at intervals of 50 metres, for a minimum of 2 Nos if road is <75m long, or as directed by the Engineer.

1.07.4 California Bearing Ratio Test

The test shall be carried out in accordance with B. S. 1377 test 1 dynamic compaction method 1.

All C.B.R. Specimen shall be prepared at B. S. Heavy Optimum Moisture Content and at B. S. Heavy Optimum Moisture Content + 2%.

All C.B.R. tests on unstabilised soils are to be carried out after 4 days soaking.

1.08 Testing of Aggregates

1.08.1 Sampling of Aggregates

The sampling of aggregates shall be carried out in accordance with the procedure given in B. S. 812 Section 1.

1.08.2 Tests on Aggregates

Sieve Analysis	:	B. S. 812
Amount passing No. 200 B.S. Sieve	:	B. S. 812
Flakiness Index Test	:	B. S. 812
Specific Gravity	:	B. S. 812
Bulk Density	:	B. S. 812
Los Angeles Abrasion Test	:	AASHTO Designation T 96-49
Sand Equivalent Test	:	AASHO T 176
Moisture Content	:	B. S. 812
Speedy Moisture Content	:	as directed by the Engineer

1.09 Tests for Water Purity

The tests shown below shall be conducted in accordance with the relevant British Standard BS EN 1008:2002.

1.10 Tests for Manufactured Materials

Each batch of cement delivered to site must be accompanied by a Manufacturer's Certificate giving results of tests proving its compliance with the requirements of BS 12 or BS 4027 as appropriate. The tests shall be carried out in accordance with BS 12 or BS EN 197-1: 2011 as appropriate together with the tests for determining the percentage of alkali in the Cement expressed as Na₂O.

In addition to the above the Engineer may order that any cement which has been stored on site for more than one month shall be tested in accordance with BS 12 or BS EN 197-1: 2011 as appropriate, and used only when it meets the design requirement.

Further, the Engineer may require the Contractor to take samples from cement bins or bagged cement and to carry out the following tests:

1.10.1 Ordinary and Rapid Hardening Portland Cement

<u>TEST</u>	<u>BRITISH STANDARD</u>
Compressive Strength Test	: B.S.4550 Part 3 Section 3.4
Consistency of Standard Cement Paste	: B.S. 4550 Part 3 Section 3.5
Initial and Final Setting	: B.S. 4550 Part 3 Section 3.6
Soundness Test	: B.S. 4550 Part 3 Section 3.7
Fineness Test	: B.S. 4550 Part 3 Section 3.3

1.10.2 Bituminous Materials

Sampling Bituminous Materials	: AASHTO T
40 Penetration Test	: AASHTO T 49
Softening Point	: AASHTO T 53
Ductility Test	: AASHTO T 51
Viscosity	: AASHTO T 201/T 59
Solubility Test	: AASHTO T 44
Distillation	: AASHTO T 78
Residue from Distillation	: AASHTO T 59
Flash Point	: AASHTO T 48/T 79

1.10.3 Tests on Steel Bars and Wire

All reinforcement shall be supplied with a manufacturer's test certificate showing that it has been tested and found to comply with the relevant standards BS 4449, 4482, 4461, 4483, 2691, and 4360. If required by the Engineer, the Contractor shall provide samples free of charge for testing at an approved laboratory. No payment shall be made for these tests and the costs thereof shall be deemed to be included in other rates and prices.

1.11 General Control and Tests During Construction

1.11.1 Description

The Contractor shall be responsible for the quality of all materials to be included in the permanent works.

The Engineer or his representative shall inspect the materials and works from time to time during and after construction and get the quality of the materials and Works tested by himself, by his Testing and Quality Control Units or by any other agency deemed fit by him generally as per the requirements stipulated in the Specifications. Additional tests may also be conducted where, in the opinion of the Engineer, need for such tests exists, in the absence of clear indications and frequency of tests for any item procedures and tests as directed by the Engineer shall be followed.

The Contractor shall provide necessary co-operation and assistance in obtaining the samples for tests and carrying out the field tests as required by the Engineer from time to time. This shall include provision of labour, attendant and assistance necessary in connection with the tests.

For the work of embankment, subgrade and pavement, construction of subsequent layer of same or other layer over the finished layer shall be done after obtaining permission from the Engineer.

Similar permission from the Engineer shall be obtained in respect of other items of work prior to proceeding with the next stage of construction.

For cement, bitumen, mild steel deformed bars, high tensile steel, prestressing materials, bearings, and similar other materials essential tests are to be carried out at the manufacturers' plants or at laboratories other than the site laboratory. The Contractor shall also furnish the test certificates to the Engineer. For testing of cement concrete at site during construction, arrangement for supply of samples, sampling, testing and supply of test results shall be made by the Contractor as per the frequency and number of tests as stipulated in these Specifications or as approved by the Engineer.

The method of sampling and testing of materials shall be as required under relevant clauses stipulated in these Specifications or as approved by the Engineer.

Where the Engineer consider that for the interest of the quality on materials or workmanship, modifications, if any, are necessary, such shall be carried out as per direction of the Engineer by the Contractor at his own expenses.

1.11.2 Field Moisture Content Test

This test shall be carried out in accordance with B. S. 1377, Part 2, Test 1 or by using a Speedy Moisture Tester as directed by the Engineer. When using the latter method, it must be noted that the instrument requires calibration for each type of material being tested.

To improve the accuracy of the instrument, at least six small ball bearings should be placed in the Speedy Tester and these will assist in breaking up the soil, so allowing the calcium carbide to react with the moisture more readily.

1.11.3 In-Situ Dry Density Control

The test shall be carried out using the sand-cone method or the rubber- balloon method or nuclear density and/or moisture method as directed by the Engineer.

In case the nuclear densometer is used, at each test location the average of four readings taken at positions rotated by 90° will be used. A

check/comparison test using the sand replacement method (sand cone or the rubber balloon test methods) will be carried out at a 50 test interval. Initial calibration of the instrument will be done by carrying out at least fifty tests in parallel with the sand replacement method for each different material encountered. The check tests will be used to update the initial calibration of the instrument. The instrument shall have a valid calibration certificate before the initial site calibration mentioned above is carried out.

1.11.4 Measurement of Deflection under a 8.2 Ton Axle Load

This test shall be carried out using the Benkelman beam along the centreline and at offsets of 2.5 m, from the centre line and at each profile and half profiles intervals on both sides on each layer in the construction of pavement construction layers on embankment, main body of the embankment, sub grade in cut and fill, the carriageway i.e. strengthening layers and finished level or as directed by the Engineer.

1.11.5 Bituminous Concrete and Road Base

Sampling of Bituminous Mixture	: AASHTO T 41
Bulk Density	: as directed by the engineer
Bitumen Content	: AASHTO T 58
Marshall	: ASTM D 1559
Duriez/LCPC	: Mode operation LCPC

The samples for Marshall tests shall be compacted with 50 blows on each face.

1.11.6 Surface Treatment

As directed by the Engineer

1.11.7 Concrete

Sampling	: B. S. 1881
Slump Test	: B. S. 1881
Compressive Strength Test	: B.S. 1881
Indirect Tensile Strength	: B. S. 1881
Compressive Strength of Concrete Pipes	: B. S. 556

1.11.8 Plate Load Test

Plate Load Test is a field test for determining the ultimate bearing capacity of soil and the likely settlement under a given load. The Plate Load Test basically consists of loading a steel plate placed at the foundation level and recording the settlements corresponding to each load increment. The test load is gradually increased till the plate starts to sink at a rapid rate. The total value of load on the plate in such a stage divided by the area of the steel plate gives the value of the ultimate bearing capacity of soil. The ultimate bearing capacity of soil is divided by suitable factor of safety (which varies from 2 to 3) to arrive at the value of safe bearing capacity of soil. For better understanding, this Plate Load Test can be sub-divided into the following heads,

1. *Test set-up*
2. *Procedure*
3. *Interpretation*

1. Test Setup:

A test pit is dug at site up to the depth at which the foundation is proposed to be laid. The width of the pit should be at least 5 times the width of the test plate. At the centre of the pit a small square depression or hole is made whose size is equal to the size of the test plate and bottom level of which corresponds to the level of actual foundation. The depth of the hole should be such that the ratio of depth to width of the loaded area is approximately the same as the ratio of the actual depth to width of the foundation. The mild steel plate (also known as **bearing plate**) used in the test should not be less than 25 mm in thickness and its size may vary from 300 to 750 mm. The plate could be square or circular in shape. Circular plate is adopted in case of circular footing and square plate is used in all other types of footings. The plate is machined on side and edges.

2. Testing Procedure:

The load is applied to the test plate through a centrally placed column. The test load is transmitted to the column by gravity loading or reaction loading method.

(i) Gravity loading or reaction loading method:

In case of gravity loading method, a loading platform is constructed over the column placed on the test plate and test load is applied by placing dead weight in the form of sand bags, pig iron, concrete blocks, lead bars etc. on the platform. Many a times a hydraulic jack is placed between the loading platform and the column top for applying the load to the test plate – the reaction of the hydraulic jack being borne by the loaded platform. This form of loading is termed as reaction loading.

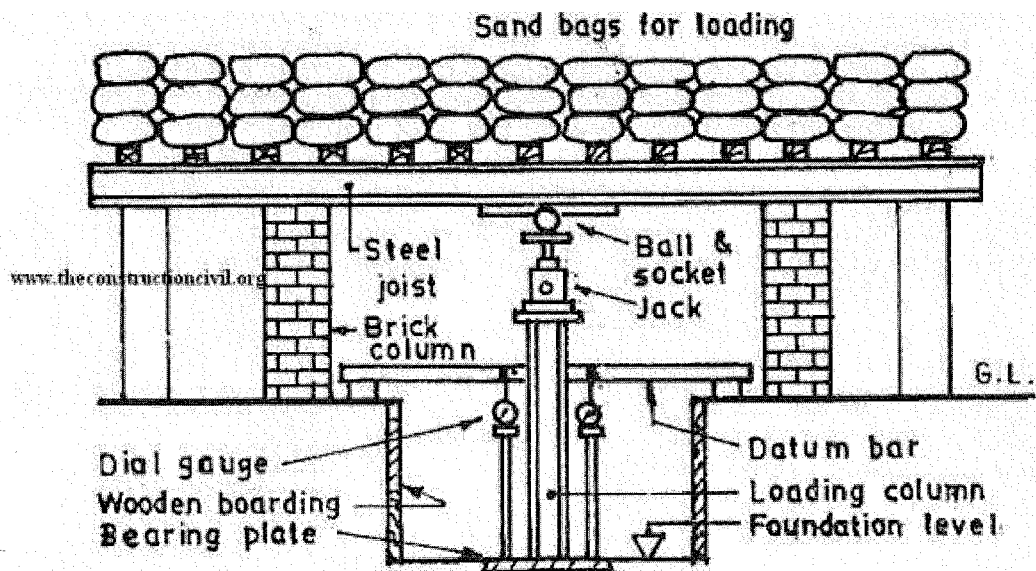


Fig. Plate Load Test - Reaction by Gravity Loading

Section A-A

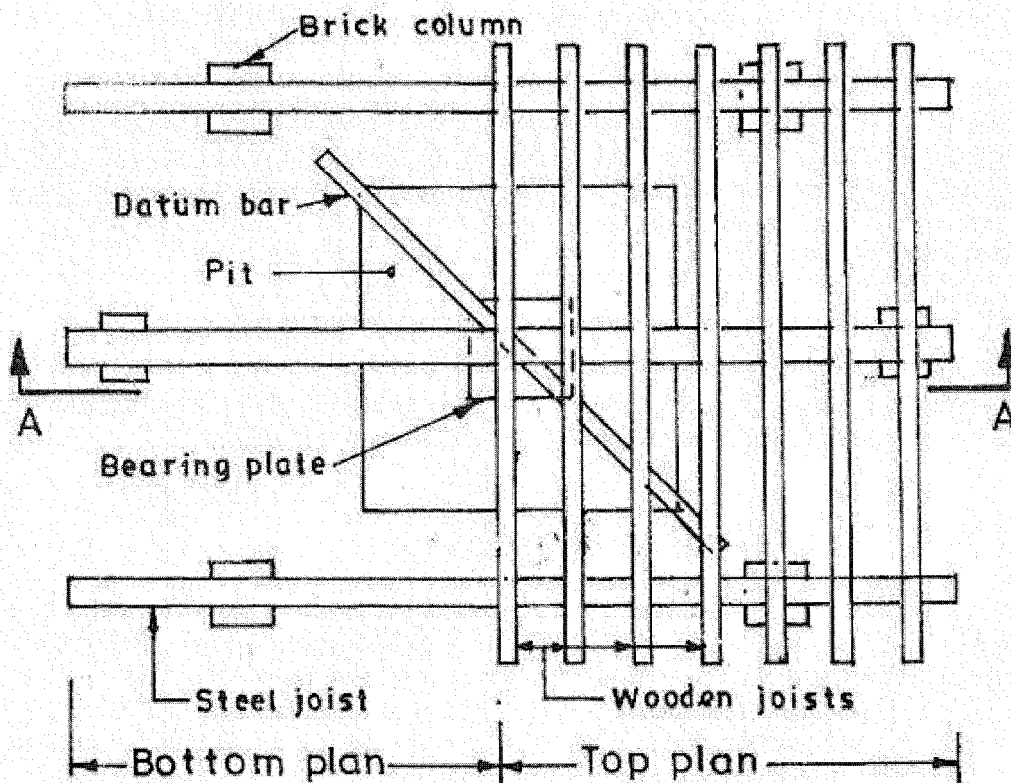


Plate load Test Method – Reaction by gravity loading

3. Interpretation of Results:

The load intensity and settlement observations of the plate load test are plotted in the form of load settlement curves.

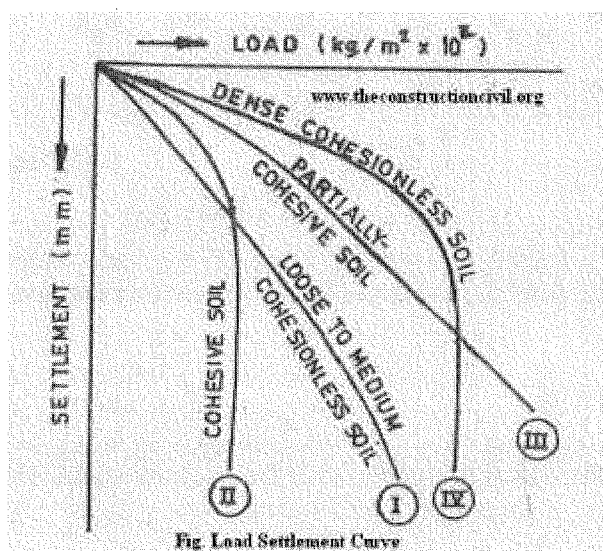


Fig. Load Settlement Curve

Load Settlement Curves

The figure below shows four typical curves applied to different soils. **Curve I** is typical for loose to medium non cohesive soils. It can be seen that initially this curve is a straight line, but as the load increases it flattens out. There is no clear point of shear failure.

Curve II is typical for cohesive soils. This may not be quite straight in the initial stages and leans towards settlement axis as the settlement increases.

Curve III is typical for partially cohesive soils.

Curve IV is typical for purely dense non-cohesive soil.

The safe bearing capacity is obtained by dividing the ultimate bearing capacity by a factor of safety varying from 2 to 3. The value of safe bearing capacity thus arrived at, is considered to be based on criterion of shear failure. Safe bearing capacity (SBC) based on permissible settlement. As indicated earlier the settlement of footing is also related to the SBC of the soil. The value of ultimate bearing capacity and hence the SBC in this case, can be obtained from the load settlement curves by reading the value of load intensity corresponding to the desired settlement of test plate. The value of permissible settlement (S_f) for different types of footings (isolated or raft) for different types structures are specified in the I.S. code. The corresponding settlement of test plate (S_p) can be calculated from the following formula,

$$S_f = S_p \left\{ \frac{[B (B_p + 0.3)]}{[B_p (B + 0.3)]} \right\}^2$$

Where,

B = Width of the footing in mm

B_p = Width of the test plate in mm

S_p = Settlement of the test plate in mm

S_f = Settlement of footing in mm

1.12 Frequency of Tests

The frequency of tests for soils and aggregates, steel, bituminous materials, water, reinforcement, cement, and of quality control test outside shall be as shown in the tables on pages 14 to 17.

1.13 Frequency for Other Manufactured Materials

For all other manufactured materials, the frequency of testing shall be as indicated in the relevant British or other approved Standards, or as directed by the Engineer.

1.14 Alteration in Frequency of Tests

Notwithstanding any provision in these Technical Specifications as to the frequency of tests, the Engineer shall be empowered to alter the number, type or nature of such tests, as may in his opinion, be necessary for the proper execution of the works. The Engineer shall be at liberty to increase the frequency of testing, and repeat tests which, in his opinion, are unsatisfactory and vary the nature and type of test.

1.15 Apparatus of the Laboratory

With reference to section 1.01.2, the laboratory shall be equipped to carry out at least the following tests: -

Sieve Analysis Atterberg

Limits Proctor

Specific Gravity Moisture

Content Bulk Density Sand

Equivalent

Field Moisture Content

In-Situ Dry Density (Rubber balloon or sand-cone method or nuclear gamma densometer method)

Slump for fresh concrete

Measures of Deflections using a Benkelman Beam Measure of Temperature (0 – 400 °C)

All other necessary tests may be carried out by Nominated Testing Authority.

1.16 Control of Surfaces

The Contractor shall provide straight edges, templates for checking the finish of the surfaces. They shall be maintained in good condition during all the works.

1.17 Responsibility of the Contractor

Where the approval of the Engineer is required under these Technical Specifications, such approval shall not relieve the Contractor of his duties or responsibilities under the Contract.

A.L.D.= Average Least Dimension
S.E.= Sand Equivalent Test
S.G.= Specific Gravity
CR=Crushing Ratio
D.M.= Deleterious Matter

M.D.D.= Max Dry Density Heavy
O.M.C.= Moisture Content
S.A.= Sieve Analysis
U.C.= Uniformity Coefficient
B.F.C.= Backfill/fill to culverts and structures including excavated surface to receive culvert or structure

L.A.A.= Los Angeles Abrasion Test
F.I.= Flakiness Index Test
S.C.B.R.= Soaked California Bearing Ratio Test
S.S.S.= Sodium Sulphate Solution

A.M.A.= Absorbion in Mixed Aggregates
S.S.= Soluble Salts
A.C.V.= Aggregate Crushing Value

Tests	O.M.C.	M.D.D Heavy	S.G. Real & Apparent	S.A.,Dmm Bit Mixes only	Atterberg Limits	S.E.	ALD	Soaked C.B.R.	F.I.	LAA,SSS,A.C .V.,CR for bitmixes &sub&base only	Angularity,C leanliness,D. M.	Voids,SS,D M,AMA, U.C.
Soil and Aggregate												
Original Ground prior to Bulk Earthworks	Z	Z		C								
Bulk Earthworks	A	A		C	1/2000 cu.m							
Subgrade upper 300mm of embankment	X	X		C	1/5000 sq.m			Y				
Sub-base	E	E	E	F	F	1/5000 cu.m			F	G		
Base	E	E	E	F	F	1/3000 cu.m			F	G		
B.F.C	C	C										
Bituminous mixes			G	G	G aggrs. only	G			G	G		G
Concrete per grade			Each 250 tons fine aggregate, Each 500 tons coarse aggregate	Each 250 tons fine aggregate, Each 500 tons coarse aggregate	G				G	G		
Surface treatment				G1	G1	G & G1	G		G & G1	G	G1	

WHERE:

A= each new material encountered & at least once per 150m³ of compacted material placed

C = each new material encountered & two per source

E= at least once per 400 m² of each compacted layer

F= once per 500m³ of material produced

G= 2 per each new source and whenever the Engineer considers that the aggregate properties may have altered

G1= twice daily when surface dressing work is in progress

X= each new material encountered & at least once per 500m² of each layer compacted subgrade

Y= once per 500m² of each layer

Z= each new material encountered & at least once per 1000m² of each layer compacted ground but at a maximum interval of 10m along the alignment

Part of the Works Field Test	Original Ground	Bulk Earthworks	Subgrade	Subbase/ Base	Bituminous Mixes from CORES	Surface Treatment, prime & tack coat	Concrete	B.F.C.			
Insitu density	K	K	B	H				N			
M.C.	D	D	D	L							
S.A.	D	D	D	L	1/1000 m ²	M					
Bitumen content					1/1000 m ²	1/10000 lit					
Slump							1/batch				
Compressive strength (7days & 28days)+density							as directed by Engineer				
S.E.					2/day	M					
Voids+Density					1/1000m ²						
Spray Rate(Tray Test)						2/section sprayed					

WHERE:

B= at least once per 250m² of each layer of compacted subgrade but with a minimum of 6 tests

per profile D= at least once per 150m³ of compacted material or at least three tests per section

H= once per 200m² of each compacted layer but with a minimum of 6 tests per profile

K= at least once per 150m³ of compacted material or at least three tests per profile whichever is the more

frequent L= twice per 1200m² of each compacted layer

M= 2 tests per day

N = each new material encountered & twice per 10m³ of material compacted but a minimum of two tests per section

Material \ Test	A	B	C	Test for Cement	Water Purity	Indirect Tensile Strength	Bend Strength
Steel reinforcement						As directed by the Engineer	As directed by the Engineer
Straight Run Bitumen	minimum 1 or 1/20 tons						
Cut back bitumen		minimum 1 or 1/15 tons					
Bitumen Emulsion			minimum 1 or 1/10 tons				
Water for Concrete					As directed by the Engineer		
Cement				As directed by the Engineer			

A=

See Specifications
Table in Item 2.34.2

B=

Kinematic viscosity AASHTO
Flash point AASHTO
Distillation AASHTO
Water AASHTO
Asphalt residue AASHTO
Tests on residue from distillation
Penetration AASHTO 434
Ductility AASHTO
Solubility AASHTO
434 STV viscosity BS3235

C=

Residue on 0.710mm sieve BS 434
Residue on 0.150mm sieve BS 434
Stability to mixing with coarse aggregate BS 434
Stability to mixing with cement BS 434
Binder content BS 434
Engler viscosity BS 434
Redwood II viscosity BS

Storage stability (short period) BS 434
Storage stability (long period) BS
Particle charge BS 434

Part of the works	Mixing Plant	Concrete	Bituminous mixes
Bitumen Content			Q
Grading			Q & Q1
Marshall Stability			Q
Flow			Q
Voids in Mineral Aggregates			Q
Voids in mix			Q
Voids filled with bitumen			Q
Absorbed water			Q
Slump		each batch	
Water Cement ratio		each batch	
Compressive strength 7 & 28 days		3 cubes each batch	
Density		for each cube	Q
Moisture Content		Each 250 tons fine aggregate, Each 500 tons coarse aggregate	
Water		BS 3148	

WHERE:

Q= every 4 hours or part thereof of mixing time

Q1= grading of cold feed mixed aggregates at least once per day during mixing

SPECIFICATION FOR CONCRETE

SPECIFICATION FOR CONCRETE

TABLE OF CONTENTS

	Page No.
1.00 General.....	1
1.01 Scope.....	1
1.02 Definitions.....	1
1.03 Responsibility.....	1
2.00 Concrete.....	2
2.01 Code of Practice for Concrete Work.....	2
2.02 Cement.....	2
2.03 Aggregates.....	2
2.04 Quality of Mixing Water.....	3
2.05 (a) Admixtures.....	3
2.05 (b) Floor Hardeners.....	3
2.06 Reinforcement Materials.....	4
2.07 Fixing Reinforcement.....	4
2.08 Position and Correctness of Reinforcement.....	4
Superstructure.....	5
2.09 Concrete Mixes.....	6
2.10 Requirements for Designed Mixes.....	11
2.11 Requirements of Nominal Volumetric Mix.....	12
2.12 Ready Mixed Concrete.....	13
2.13 Waterproof Concrete.....	14
2.14 Quality Control of Concrete Production.....	14
2.15 Failure to comply with requirements.....	16
2.16 Mixing Concrete.....	16
2.17 Conveying.....	17
2.18 Depositing.....	17
2.19 Placing Concrete Under Water.....	18
2.20 Precautions of Mixing and Placing.....	18
2.21 Compaction of Concrete.....	18
2.22 Vibration of Concrete.....	19
2.23 Curing and Protection.....	19
2.24 Faulty Concrete.....	20
2.25 Construction Joints.....	20
2.26 Expansion/Contraction Joint.....	21
2.27 Waterbars.....	22
2.28 Embedded Items in Concrete.....	23
2.29 Formwork.....	23
2.30 Stripping Formwork.....	25
2.31 Making Good.....	26
2.32 Surface Finishes from Formwork or Moulds.....	26
2.33 Grades of Finish on Free Surfaces.....	27
2.34 Tolerances.....	28
2.35 Precast Concrete.....	29
2.36 Predalle.....	30
2.37 Composite Floor Slabs.....	31
2.38 Waffle Slab Construction.....	32
2.39 Post Tensioning with Bonded Tendons.....	34
2.40 Post Tensioning with unbonded tendons.....	40
2.41 Notes Concerning Measurements and Pricing Concrete Work.....	41

SPECIFICATION FOR CONCRETE

1.00 General

1.01 Scope

This specification shall apply to:

- non reinforced mass concrete, and reinforced concrete to the buildings including site works

1.02 Definitions

- (a) The Contractor shall mean the Main Contractor or his appointed representative.
- (b) Approved or accepted shall mean approved or accepted in writing by the Engineer.
- (c) Architect/Engineer shall mean the approving authority such as the Architect, the Engineer or their appointed representative.
- (d) Satisfactory shall mean to the satisfaction of the Engineer.
- (e) Required shall mean required by these specifications and/or by contract documents.
- (f) Submitted shall mean submitted in writing to the Engineer by the Contractor.
- (g) Instructed shall mean instructed in writing by the Engineer.
- (h) Failure to comply with specification shall mean failure to comply satisfactorily with all or any of the requirements of these specifications and the contract documents.
- (i) Exposed construction shall mean that exposed to weather when completed.
- (j) Drawings shall mean the latest issue of the drawings issued to the Contractor.
- (k) Instructions by the Architect/Engineer shall include the instructions confirmed in writing within a week by the Contractor.

1.03 Responsibility

No approval or acceptance by the Engineer or their representative shall in any way relieve the Contractor of his responsibility for the construction in accordance with drawings, the quality of materials, the standard of workmanship, the strength, durability and appearance of the concrete works.

The Contractor's rates or price for all measured items shall include for carrying out the works in accordance with the terms and requirements of this specification. In the case of any items not covered by this specification the acceptable quality of materials and standard of workmanship shall be no less than generally accepted in the trade applicable to the item concerned.

2.00 Concrete

2.01 Code of Practice for Concrete Work

All workmanship, materials, tests and performance in connection with the concrete work shall be in conformity with the British Standard Code of Practice BS 8110 for the Design, Materials and Workmanship for "The Structural Use of Concrete" and BS 8007 : 1987 "Code of Practice for Design of Concrete Structures for Retaining Aqueous Liquids" where not inconsistent with these Preambles.

2.02 Cement

Cement unless otherwise specified shall be Portland Cement of strength class 42.5 N complying with the requirements of BS 12 : 1991 and a manufacturer's certificate of Test in accordance with BS 12 : 1991 shall be supplied for each consignment delivered to the site.

Cement may be delivered to the site either in bags or in bulk.

If delivered in bags each bag shall be properly sealed and marked with the manufacturer's name and shall be stored in a weatherproof shed of adequate dimensions with a raised floor. Each consignment shall be kept separate and marked so that it may be used in the sequence in which it is received. Any bag found to contain cement which has set or partly set, shall be completely discarded and not used in the works. Such bag/bags shall be removed from site within 24 hours. Bags shall not be stacked more than 1.5 m in height.

If delivered in bulk the cement shall be stored in waterproof silo either provided by the cement supplier or by the Contractor but in either case the silo shall be to the approval of the Engineer.

2.03 Aggregates

Aggregates shall conform with the requirements of BS 882 : 1992 and the sources and types of all aggregates are to be approved in all respects by the Engineer before work commences.

The grading of aggregates shall be one within the limits set out in BS 882 and as later specified and the grading, once approved, shall be adhered to throughout the works and not varied without the express prior approval of the Engineer.

Fine aggregate shall be clean, washed, crushed rock sand and coral sand; coral sand where not available can be replaced by similar or of approved size (sugar size) rock sand, of hard quality and shall be free from lumps of stone, earth, loam, dust, salt, organic matter and any other deleterious substances. The maximum quantities of material passing the 75 μ m sieve shall not exceed the values given in Table 6 of BS 882 : 1992. Coral sand shall be washed in running water to the satisfaction of the Engineer. It shall be graded within the limits of Zone C or M of Table 4 of BS 882.

Coarse aggregate for concrete shall be crushed blue basalt stones to the approval of the Engineer. It shall be hard, clean and roughly cubical in shape, non porous, free from dust, decomposed stone, clay, earthy matter, foreign substances or friable, thin, elongated or laminated pieces. It shall be graded within the limits of Table 3 of BS 882 for graded aggregate. The flakiness index shall not exceed 40.

If in the opinion of the Engineer the aggregate meets with the above requirements but is dirty or adulterated in any manner it shall be screened and/or washed with clean water, if he so instructs, at the Contractor's expense.

Aggregates shall be delivered to the site in their prescribed sizes or gradings and shall be stock-piled separately on paved areas or boarded platforms in separate units to avoid intermixing, excessive segregation and contamination with other materials. On no account shall aggregates be stock-piled on the ground. Fine aggregate shall be allowed to drain until it has reached a uniform moisture content before it is used.

Moisture/water content in fine and coarse aggregates will be measured daily and the amount of free water is taken into account before adding water to arrive at the w/c ratio of the approved design mix of the concrete.

2.04 Quality of Mixing Water

Water of chemical composition acceptable for drinking is suitable for concrete.

The water used for making and curing concrete and mortar shall be free from objectionable quantities of silt, organic matter, alkali, salt or other impurities. In particular, inorganic matter in solution shall not exceed 500 parts per million by weight and in suspension shall not exceed 30 parts per million by weight and the total alkali bicarbonate/carbonate content of the water shall be less than 1000 parts per million by weight.

The water shall be from an approved source and shall contain no deleterious matter which significantly affects the setting time or strength or durability of the concrete or which has any effect on the appearance of the hardened concrete by discoloration or efflorescence or prevents the achievement of the approved test cube strengths at 28 days for the appropriate grade of concrete.

The Contractor shall test the water which he proposes to use and shall submit the records of such tests to the Engineer before placing any concrete in the permanent works.

The Contractor shall make regular tests of the water during concrete construction works. The water shall be sampled at the point of discharge into the mix and the frequency of sampling shall be as approved by the Engineer.

2.05 (a) Admixtures

Concrete admixtures complying with BS 5075 or ASTM C494 shall be allowed with the prior approval of the Engineer. "Plasticiser" where used will be added to the mixing water in proportion recommended by the manufacturer and strictly in accordance with their written instructions, to achieve better workability. No additional cost will be paid for the use of the plasticiser.

2.05 (b) Floor Hardeners

Where floor hardener is specified for concrete floor, it shall be 'Sika' Chapdur Premix or approved equivalent and shall be used as per manufacturer's instruction.

2.06 Reinforcement Materials

Steel reinforcement shall be plain mild steel bars or high yield deformed bars complying with MS 10 (2002), or cold worked deformed bars complying with MS 10. Steel reinforcement shall be cut from straight bars free from kinks and bends or other damage and cold bent by experienced competent workmen. At the time of incorporation in the works the reinforcement shall be clean and free from loose mill scale and loose rust.

Bars of diameter 20 mm or greater shall be bent in a bending machine designed for the purpose and approved by the Engineer. Bending and cutting shall be in accordance with BS 4466 unless otherwise specified or ordered by the Engineer.

The Contractor shall supply the Engineer with the certificates of the manufacturer issued in compliance with MS 10 for all the required tests, including the rebend test, in respect of each consignment delivered to site.

Steel fabric reinforcement shall comply with MS 34 & MS 35.

Steel reinforcement shall be stored sheltered and supported by wooden blocks so as to prevent sagging. Bars shall be stored in separate lots according to diameter and quality. No claim on account of non availability of bars up to 12 metre lengths will be allowed.

2.07 Fixing Reinforcement

Reinforcement shall be accurately bent to the shapes and dimensions shown on the drawing and in accordance with BS 4466. Reinforcement must be cut and bent cold and no welded joints will be permitted unless so detailed and approved by the Engineer.

Reinforcement shall be accurately placed in position as shown on the drawings and shall be secured against displacement by using No 18 S.W.G annealed binding wire or suitable clips at intersections and laps, and shall be supported by approved concrete, plastic or metal supports, steel chairs, spacers or metal hangers to ensure the correct position and cover before concreting and shall be kept in the same position during concreting. However, metal supports, chairs, etc. shall have minimum 12 mm cover made of concrete blocks, or shall have approved plastic shoes.

2.08 Position and Correctness of Reinforcement

No concreting shall be commenced until the Engineer has inspected the reinforcement in position and until he has approved the same. The Contractor shall give two clear days notice of his intention to concrete. The minimum period between two inspections shall be 24 hours. Note that inspection by the Engineer shall be carried out only during working weekdays (Monday to Friday) as from 8.00 a.m. to 5.00 p.m. Prior to informing the Engineer for inspection, the Contractor's representative must have inspected the works and ensured that these works have been completed in accordance with the drawings and specifications. He must submit the appropriate signed checklists together with his request for inspection to the Engineer.

Irrespective of whether any inspection and/or approval of the fixing of the reinforcement has been carried out as above, it shall be Contractor's sole responsibility to ensure that the reinforcement complies with the details on the drawings and is fixed exactly in positions shown therein and in the position to give the prescribed cover.

The Contractor will be held entirely responsible for any failing or defect including crack in any portion of the reinforced concrete structure and including any consequent delay, claims, third party claims, etc., where it is shown that the reinforcement, has been incorrectly positioned or it is incorrect in size or quantity with respect to the detailed drawings.

Unless otherwise permitted by the Engineer, reinforcement shall not be bent after being embedded in hardened concrete.

Unless otherwise instructed concrete cover to reinforcement bars in any face shall be as per Table 2.0.8.

Table 2.08

	A For all members of structures located more than 300 m away from the sea and at altitude less than 350 m, above Mean Sea Level and for internal members fully covered to weather for structures located in B (mm)	B For external members exposed to weather for structures located in proximity of sea within 300 m from sea and for structures at altitude greater than 350 m (mm)
<u>Substructure</u>		
(a) Foundations against earth face	75	75
(b) Foundations against blinding	50	50
(c) Columns & walls below ground or against water face	40	40
(d) Ground beams	30	35
(e) Slab on hardcore	30	35
<u>Superstructure</u>		
(f) Columns :		
> 200 mm	35	35
200 mm or less	25	30
(g) Beams and walls	30	35
(h) Suspended slabs	20	25

The above cover shall be decreased by 5 mm for concrete surfaces to be finished with cement mortar rendering/screed.

For underground work likely to be affected by sea water, the above cover shall be increased by 25 mm.

For post-tensioned slabs, the minimum cover to polyethylene sheaths of unbonded tendons or to metal ducts for bonded tendons should not be less than 25 mm.

2.09 Concrete Mixes

(1) Grades of Concrete

The grades of structural concrete to be used in the permanent works shall be those shown designated in Tables 2.09 (A) and 2.09 B in which the class designation includes two figures. The first figure is the nominal strength at 28 days expressed as N/mm² and the second figure is the maximum nominal size of aggregate in the mix.

(2) Design of Proposed Mixes

The Contractor shall design all the concrete mixes called for on the drawings, and bills of quantities making use of the ingredients which have been approved by the Engineer for use in the permanent works and in compliance with this Specification.

- (i) The aggregate portion shall be well graded from the nominal maximum size to small sizes downwards.
- (ii) The cement content shall be such as to achieve the strengths called for in Table 2.09 (A) but in any case not less than the minimum necessary for impermeability and durability shown in Table 2.09 (B).
- (iii) The workability shall be consistent with ease of placing and proper compaction having regard to the presence of reinforcement and other obstructions.
- (iv) The water-cement ratio shall be the minimum consistent with adequate workability but in any case not greater than that allowable for impermeability and durability shown in Table 2.09 (B) taking due account of any water contained in the aggregates.
- (v) The drying shrinkage determined in accordance with BS 1881 shall not be greater than 0.05%.
- (vi) The ratio of fine aggregates to total aggregates based on mass shall be within the following limits given in Table 2.09 given below

Table 2.09

Maximum Nominal Size of Aggregate in the Mix (refer 2.09 (i) above)	Minimum Ratio	Maximum Ratio Normal Concrete	Max Ratio for Pumped Concrete
10 mm	0.45	0.55	0.55
14 mm	0.40	0.50	0.50
20 mm	0.35	0.45	0.47
40 mm	0.30	0.40	0.43

Table 2.09 (A)

CONCRETE GRADES AND STRENGTHS

GRADE OF CONCRETE	CHARACTERISTIC COMPRESSIVE STRENGTH AT 28 DAYS (N/mm ²)	COMPRESSIVE STRENGTH COMPLIANCE REQUIREMENTS			
		Any individual test result (N/mm ²)	Mean of a group of test results		Any Consecutive 4 (N/mm ²)
			First 2 (N/mm ²)	First 3 (N/mm ²)	
15/20	15	13	15	16	17
20/20	20	17	21	22	23
25/20	25	22	26	27	28
30/20	30	27	31	32	33
35/20	35	32	36	37	38
40/20	40	37	41	42	43
45/20	45	42	46	47	48
50/20	50	47	51	52	53

Note : The strength requirements given above shall apply irrespective of the maximum size of aggregates used.

Table 2.09 (A1) (DEMOULDING PRECAST CONCRETE UNITS)

CONCRETE GRADES AND STRENGTHS

GRADE OF CONCRETE	CHARACTERISTIC COMPRESSIVE STRENGTH AT 3 DAYS (N/mm ²)	COMPRESSIVE STRENGTH COMPLIANCE REQUIREMENTS			
		Any individual test result (N/mm ²)	Mean of a group of test results		Any Consecutive 4 (N/mm ²)
			First 2 (N/mm ²)	First 3 (N/mm ²)	
30/15 & 30/12	10	9	10.5	11.0	11.5
30/20	10	9	10.5	11.0	11.5
35/15 & 30/12	12	11	12	12.5	13.0
35/20	12	11	12	12.5	13.0

Note : The strength requirements given above shall apply irrespective of the maximum size of aggregates used.

Table 2.09 (A2) (HANDLING PRECAST CONCRETE UNITS)

CONCRETE GRADES AND STRENGTHS

GRADE OF CONCRETE	CHARACTERISTIC COMPRESSIVE STRENGTH AT 7 DAYS (N/mm ²)	COMPRESSIVE STRENGTH COMPLIANCE REQUIREMENTS			
		Any individual test result (N/mm ²)	Mean of a group of test results		Any Consecutive 4 (N/mm ²)
			First 2 (N/mm ²)	First 3 (N/mm ²)	
30/15 or 30/12	20	18	21	21.5	22.0
30/20	20	18	21	21.5	22.0
35/15 or 35/12	24	21.5	24	25	25.5
35/20	24	21.5	24	25	25.5

Note : The strength requirements given above shall apply irrespective of the maximum size of aggregates used.

Table 2.09 (B)

MINIMUM CEMENT CONTENT AND MAXIMUM WATER/CEMENT RATIO

GRADE OF CONCRETE	MINIMUM CEMENT CONTENT (kg/m ³)	MAXIMUM WATER/CEMENT RATIO	
		A	B
15/20	200	0.70	x
20/20	250	0.65	x
25/20	300	0.60	x
30/20	325	0.60	0.55
35/20	350	0.58	0.53
40/20	400	0.55	0.48
45/20	425	0.50	0.45
50/20	450	0.47	0.45

Notes :

- (a) The minimum cement contents given above are per cubic metre of compacted concrete made with 20 mm nominal maximum size of aggregates. For maximum aggregate size of 12 mm or 15mm, the minimum cement content should be increased by 30 kg/m³.

For maximum aggregate size of 40 mm, the minimum cement content may be reduced by 30 kg/m³.

- b) Under the heading "Maximum water/cement ratio", column A applies to sheltered and average conditions and column B applies to severe conditions and water retaining structures. Also the columns A and B apply respectively to members mentioned in Columns A and B of Table 2.08 of Article 2.08.
- (c) Use of "An Approved Concrete Admixture" to BS 5075 or ASTM C494 to achieve the strength with the maximum water/cement ratio as tabulated above is allowed.
- (d) Use of more than 30 kg over and above the minimum cement content specified and tabulated above is not allowed.

2.10 Requirements for Designed Mixes

(1) Evidence of Suitability of Proposed Mix Proportions

Evidence should be submitted to the Engineer to obtain his written approval for each grade of concrete showing that at the intended workability, the proposed mix proportions and manufacturing method will produce concrete of the required quality.

The following information should be provided before any designed mix proposals are submitted for Engineer's approval.

- (a) Nature and source of each material including grading requirements of Aggregates mentioned in Article 2.03
- (b) Quantity of each constituent in kg per cubic metre of fully compacted concrete. These constituents shall be measured by weight and not by volume.
- (c) Either
 - (i) data from previous production of concrete using the materials and plant which will be used to produce the concrete, confirming that the proposed mix proportions satisfy the criteria given in 2.10 (2); or
 - (ii) where no satisfactory data exist under item C (i), data from trial mixes confirming that the proposed mix proportions satisfy the requirements of 2.10 (3).

Sampling and testing shall be carried out by the methods described in the relevant Parts of BS 1881.

Subsequently the Contractor should declare any change in sources of materials where Aggregates not complying to Article 2.03 and any change in cement content which results in addition greater than 20 kg/m³ from the cement content last declared:

(2) Proposals based on previous production data

When based on previous production data, the mean 28 days compressive strength calculated from n cube results, from separate batches of concrete shall exceed the specified characteristic strength by:

$$k s [0.86 + \sqrt{(2/n)}]$$

where

k is a statistical constant, not less than 1.64;

s is the standard deviation estimated from n results, but not less than 3.0 N/mm²;

n is the number of consecutive test results, not less than 10 and not greater than 100. A test result may be a single result or the mean of two or four results from cubes of the same sample provided the difference between the strengths of two cubes divided by their mean is less than 30%.

When n exceeds 100, the mean strength shall exceed the specified characteristic strength by k_s , in which k shall not be less than 1.64 and s shall not be less than 3.0 N/mm^2 .

Previous production data for use in calculating these criteria shall be 28 day compressive strength results from separate batches of concrete sampled at random over an immediately prior period exceeding 1 month and not exceeding 1 year, using the materials and plant which are proposed for the work.

(3) Proposals based on Trial Mixes

Where trial mixes are required three separate batches of concrete should be made using materials likely to be typical of the proposed supply and preferably under full scale production conditions. If circumstances make this inconvenient, with a written permission of the Engineer the batches may be mixed in a laboratory. The workability of each of the trial batches shall be the same as the proposed supply. Three cubes shall be made from each batch for test at 28 days. The average compressive strength of the three cubes tested at 28 days shall exceed the specified characteristic strength by at least 10 N/mm^2 .

(4) Additional Trial Mixes

During production before any change is made to an approved design mix, the Contractor shall seek an approval from the Engineer giving reasons for the change and substantiating the proposal. This approval may only be obtained if the proposal is submitted with test results of the proposed design mix.

2.11 Requirements of Nominal Volumetric Mix

If the Contractor fails to achieve the requirements of Article 2.10 and/or prefers nominal volumetric mix as per Table 2.11 given below he may use them with a written approval from the Engineer.

TABLE 2.11

NOMINAL VOLUMETRIC MIX

Description	Mix 30/20 1 : 1.8 : 2.8		Mix 25/20 1 : 2.4 : 3.8		Mix 20/20 1 : 2.7 : 4.2		Mix 15/20 1 : 4 : 6	
Cement	1 bag of 50 kg		1 bag of 50 kg		1 bag of 50 kg		1 bag of 50 kg	
Crushed rock sand	1¼ cu ft	.0355 m³	1¾ cu ft	.0497 m³	1⅞ cu ft	.0532 m³	2½ cu ft	.071 m³
Coral sand/ <i>Sugar size rock sand</i>	1 cu ft	.0284m³	1¼ cu ft	.0355 m³	1½ cu ft	.0426 m³	2½ cu ft	.071 m³
10mm to 5mm graded aggregate	1 cu ft	.0284 m³	1¼ cu ft	.0355 m³	1¼ cu ft	.0355 m³	2½ cu ft	.071 m³
20mm to 10mm graded aggregate	2½ cu ft	.0710 m³	3½ cu ft	.1094 m³	4 cu ft	.1136 m³	5 cu ft	.1419 m³
Maximum water/ Cement ratio	0.55	0.55	0.60	0.60	0.65	0.65	0.70	0.70
Maximum slump	2"	50 mm	2"	50 mm	2"	50 mm	2 3/8"	60 mm

Note: 1 bag of cement i.e. 50 kg = 1 ¼ cu.ft = 0.0355 m³

2.12 Ready Mixed Concrete

Ready mixed concrete may be used subject to the approval of the Engineer.

When it is used the Contractor shall ensure that all the requirements of these specifications are complied with.

Further to above requirements, the Contractor shall ensure that transport and delivery of ready mixed concrete comply with the recommendations of Clause 4.10.4 of BS 5328 : Part 3 : 1990.

The concrete shall be transported to the site in truck mixers from the mixing plant premises and shall be continuously agitated until it is delivered on site. The Contractor shall ensure that no further water is added after water added in preparation at the mixing plant.

For plant mixed concrete the Contractor shall check that the delivery note for each truck shows:

- (1) volume of concrete in m³
- (2) cement in kg per m³ of mixed concrete;
- (3) grade of the concrete;
- (4) initial setting time with or without retarder;
- (5) type and quantity of admixture added per m³ of mixed concrete;
- (6) the time when water is first added to the concrete materials, and
- (7) the maximum allowable time interval between the completion of discharge and the mixing of water at the mixing plant.

This time interval should be 30 minutes less than the initial setting time of the cement. Any concrete which is not placed in its final position within this time interval should not be used.

The concrete delivery note showing all the above information should be signed by approved qualified/experienced technical supervisors, one at the plant before departure of truck and another one on site before the truck is discharged.

Sample of workcube shall be taken by the Main Contractor at the place where concrete is finally placed in the structural members at the rate specified in Article 2.14.

2.13 Waterproof Concrete

Where "waterproof concrete" is specified, "sealocrete", "Hydro fuge sika", liquid or other approved waterproofing material and plasticising agent complying to concrete admixtures to British Standard 5075 and ASTM C494 shall be added to the mixing water in the proportion recommended by the manufacturers and strictly in accordance with their written instructions. Waterproof concrete shall be grade as specified but not lower than 30/20 and shall meet all the strength requirements of the specified grade, except that the fine aggregate shall consist solely of rock sand.

2.14 Quality Control of Concrete Production

(1) Sampling

For each grade of concrete in production at each plant for use in the permanent works, samples of concrete shall be taken at the point of deposition in the presence of a representative of the Engineer, all in accordance with the sampling procedures described in BS 1881 and with further requirements set out below.

Six 150 mm cubes shall be made from each sample and shall be cured, and tested all in accordance with BS 1881 two at 7 days and two others at 28 days. Remainder two to be kept until instructed by the Engineer to be tested/or to be deposed.

Each sample shall be taken from one batch selected at random and at intervals such that the rate of sampling is not less than the minimum rates of sampling given in Table 2.14. At least one sample should be taken of each grade of concrete on each day that concrete is placed. The actual rate of sampling shall be increased for critical elements if instructed by the Engineer.

Table 2.14 (I)

Minimum Rate of Sampling	
Average Rate Of Sampling One Sample Per Batch of	Example Where Applicable
10 m ³ or a full truck mixer which ever is less	Columns, Cantilever member piles
20 m ³ or anyone of the two full truck mixers, whichever is less	Beams, slabs
40 m ³ or anyone of the four full truck mixers whichever is less	Solid rafts, breakwaters

(2) Testing

- (a) The consistency of all concrete shall be determined by means of the slump test in accordance with British Standard Specification No. 1881 "Methods of Testing Concrete". The Contractor shall provide the necessary number of slump cones and rods as required by the Engineer. The slump cones shall be designed to lift off in a truly vertical plane, this being controlled by guides set on a steel base, the guides being also used to determine the exact amount of slump.

Slump tests shall be made at frequent intervals at the point of deposition, when concreting is in progress and as ordered by the Engineer. It shall, nonetheless be taken two nos. for each batch from which samples are taken for cube tests. The first consistency tests shall be made immediately concreting is commenced on any section. For the purposes of any test two slump tests shall be taken at a time and the average adopted for compliance to this specifications.

The slump required shall be determined by the Engineer and shall be varied to suit the purpose for which the concrete is required. The slump of the concrete in any batch shall, however, not differ from the value established by trial mixes by more than 25 mm or one third of the value, whichever is the greater. No concrete shall be used with a slump exceeding 75 mm without the approval of the Engineer.

The cost of providing slump apparatus and labour and materials required for taking slump tests shall be included in the rates for concrete in the Bill of Quantities.

- (b) The water cement ratio as estimated from the results of (a) above, or when required by the Engineer, determined by samples from any batch shall not vary by more than 5% from the specified maximum value or the value established during the trial mixes, whichever is the lower.
- (c) The compressive strength of the concrete at 28 days shall be such that any individual test result as well as the means of the first 2, first 3 or any consecutive 4 test results comply with the strength requirements given under the appropriate headings in Table 2.09 (A). In this context, a result is defined as the average strength of the two cubes taken from one batch and tested at 28 days.
- (d) When the difference between the strengths of the two cubes divided by their mean exceeds 30%, the test result shall be deemed invalid and Article 2.15 (2) shall apply.

2.15 Failure to comply with requirements

(1) Quantity of Concrete Represented by Strength Test Results

The quantity of concrete represented by a group of four consecutive test results shall include the batches from which the first and last samples were taken together with all intervening batches. Similarly, the first two or three results shall be taken as representing all the intervening batches. For the individual test result requirements given in Table 2.09 (A), only the particular batch from which the sample was taken shall be at risk.

- (2) The Contractor shall take any action instructed by the Engineer to remedy concrete which does not comply with the specification. The results of such actions do not nullify the previous establishment of non-compliance with the specification based on requirements for cube test results. The Contractor shall be responsible for all costs and delays for such actions. Such action may include but is not necessarily confined to the following:

- (i) Increasing the frequency of sampling until control is again established.
- (ii) Cutting test cores from the concrete and testing in accordance with BS 1881.
- (iii) Carrying out strengthening or other remedial work to the concrete where possible or appropriate.
- (iv) Carrying out non-destructive testing such as load tests on beams
- (v) Removing the failed concrete.

2.16 Mixing Concrete

Before any plant for batching, mixing, transporting, placing, compacting and finishing concrete is ordered or delivered to site, the Contractor shall submit to the Engineer for approval full details of all the plant which he proposes to use and the arrangements he proposes to make, including qualified/ experienced technical personnel separately for supervision of these activities.

Concrete for the permanent works shall be batched and mixed in one or more central plants unless the Engineer agrees to some other arrangement.

Mixer shall be of a capacity sufficient to take two whole bags of cement per mix. Smaller size mixer shall not be used. Weigh batching machines with water measuring device shall be of an approved type and shall be properly maintained and checked weekly for its accuracy. All materials shall be thoroughly mixed dry before the water is added and the mixing of each batch shall continue for a period of not less than two minutes after the water has been added and until there is a uniform distribution of the materials and the mass is uniform in color.

The entire contents of the mixer drum shall be discharged before recharging. The volume of mixed materials shall not exceed the rated capacity of the mixer. Whenever the mixer is started, 10% extra cement shall be added to the first batch and no extra payment will be made on this account.

2.17 Conveying

- (1) The concrete shall be mixed as near to the place where it is required as is practicable to avoid rehandling and only as much as is required for a specified section of the work at one time, such section being commenced and finished in one operation without delay. All concrete must be efficiently handled and used in the works within thirty (30) minutes before the initial setting time of cement. It shall be discharged from the mixer direct either into receptacles or barrows and shall be distributed by approved means which do not cause segregation or loss of ingredients or otherwise impair the quality of the concrete. Approved mechanical means of handling will be encouraged, but the use of chutes for placing concrete is permitted provided they are not longer than 6 m and their slope do not exceed 1 vertical to 2 horizontal and is not less than 1 vertical to 3 horizontal. Conveying of concreting by hand-buckets or similar shall not be allowed. Similarly conveying of concrete by belt conveyor shall not be allowed.
- (2) Pumped Concrete – Coarse aggregate size shall be limited to 20 mm for pumped concrete mixes. The slump of concrete discharged into the pump may exceed the specified slump by the amount of slump loss in the pumping system up to a maximum of 25 mm. The slump loss shall be the difference between slump tests made at both ends of the pumping system. If tests indicate a loss greater than 25 mm, the Contractor shall modify the pumping system as required to reduce the slump loss to 25 mm or less.

A superplasticiser should preferably be used in pumped concrete. The slump of the concrete mix shall not exceed 75 mm before addition of superplasticiser.

2.18 Depositing

Placing of concrete in supported elements, e.g. slab, beam shall not be started until the concrete previously placed in top parts not exceeding 300 mm depth below the bottom of the beam/slab of columns is no longer plastic and has been in place at least for two hours.

Concrete shall be placed from height not exceeding 1.5 m directly into its permanent position and shall not be worked along the shutters to that position. Unless otherwise approved, concrete shall be placed in a single operation to the full thickness of slabs with beams and similar members. The Engineer shall allow concrete to be placed for walls exceeding 150 mm thickness from a height up to 3 m and in layers not exceeding 750 mm if ACROW or other approved system of formwork is used.

In addition, Contractor will ensure that the concrete shall be deposited continuously such that no concrete shall be deposited on concrete which has hardened sufficiently to cause the formation of seams or places of weakness within the section. Placing shall be carried out at such a rate that the concrete which is being integrated with fresh concrete is still plastic.

Concrete in columns may be placed to a height of 3 m with careful placing and vibration to achieve satisfactory results. Where the height of the column exceeds 3 m suitable openings to engineer's approval must be left in the shutters so that this maximum lift is not exceeded.

Concrete shall be placed continuously until completion of the part of the work between construction joints as specified hereinafter in article 2.25 or of a part of approved extent. At the completion of a specified or approved part construction joint of the form and in the positions hereinafter specified shall be made. For approval of construction joints and records thereof article 2.25 refers.

2.19 Placing Concrete Under Water

Concrete shall be deposited under water by an approved method e.g. tremie concreting in such a way that the fresh concrete enters the mass of previously placed concrete from within, causing water to be displaced with minimum disturbance at the surface of the concrete.

2.20 Precautions of Mixing and Placing

Any accumulation of set concrete on the reinforcement shall be removed by wire brushing and the area is cleaned thoroughly before further concrete is placed. The Contractor shall provide runways well supported on metal stands for concreting to the satisfaction of the Engineer. Under no circumstances will runways supports be allowed to rest on the reinforcement. Overnight before concreting the formwork and reinforcement shall be thoroughly wetted with clean water and it is again lightly wetted just before concrete is deposited.

Care shall be taken that the concrete is not disturbed or subjected to vibrations and shocks during the setting period.

Mixing machines, platforms and barrows shall be cleaned before commencing mixing and be cleaned on every cessation of work.

Where concrete is laid on hardcore, concrete blocks or other absorbent materials of the base shall be suitably and sufficiently wetted before the concrete is deposited.

2.21 Compaction of Concrete

(1) Compaction

At all times during which concrete is being placed, the Contractor shall provide adequate trained and experienced labour to ensure that the concrete is compacted in the forms to the satisfaction of the Engineer.

Concrete shall be placed neither at a rate greater than will permit satisfactory compaction nor to a depth greater than 750 mm before it is compacted.

2.22 Vibration of Concrete

(1) General

During and immediately after placing, the concrete shall be thoroughly compacted by means of continuous tamping, spading, slicing, rodding, forking and vibration. Vibration is required for all concrete of grades with 28 days strength greater than 15 N/mm².

Care shall be taken to fill every part of the forms, to work the concrete under and around the reinforcement without displacing it and to avoid disturbing recently placed concrete which has begun to set. Any water accumulating on the surface of newly placed concrete shall be removed and no further concrete shall be placed thereon until such water is removed.

(2) Internal Vibrators

Internal vibrators shall have a frequency of not less than 7,000 cycles per minute. Such vibrators shall visibly affect the concrete within a radius of 225 mm from the vibrator.

Vibrator shall not be used to move concrete from place to place in the formwork.

At least one internal vibrator shall be operated for every two cubic metres of concrete placed per hour and at least one spare vibrator shall be maintained on site in case of break-down during concreting operations.

(3) External Vibrators

External formwork vibrators shall be of the high frequency low amplitude type applied with the principal direction of vibration in the horizontal plane. They shall be attached directly to the forms at no more than 1.2 m centers.

In addition to internal and external vibration the upper surface of suspended floor slabs shall be levelled with manual tamping or vibrating elements prior to finishing. Vibrating elements shall be of the low frequency high amplitude type operating at a speed of not less than 3,000 r.p.m.

2.23 Curing and Protection

Care must be taken that no concrete becomes prematurely dry and fresh concrete must be carefully protected within two hours of placing from rain, sun and wind by means of hessian sacking, polythene sheeting or other approved means. This protective layer and the concrete itself must be kept continuously wet for at least three days for members less than 300 mm thickness and 6 days for members greater than 300 mm thickness after the concrete has been placed. The Contractor must allow for the complete covering of all fresh concrete for a period of three days.

Hessian or polythene sheeting shall be in the maximum widths obtainable and shall be secured against wind. The Contractor will not be permitted to use old cement bags, hessian or other material in small pieces. When temperature exceeds 30° C the new concrete shall be covered with a layer of drip dry hessian.

Traffic or loading shall not be allowed on the concrete except with the written permission of the Engineer.

Contractor should allow in his price the adequate supply and storage of water, if not available from the water main, for curing of the concrete as specified above.

If the Contractor intends to use curing compound or membrane, he should submit full details of the same with manufacturer's literature and test certificate from independent testing laboratory and seek the Engineer's approval before use. The curing compound should have an efficiency index of not less than 90% when tested in accordance with BS 7542. Sika Top 71 or approved equivalent, without diluting, curing compound shall be applied strictly in accordance with the manufacturer's recommendations. The floor slab shall not be cured by curing compound but by ponding of water for at least three days or 6 days as specified above.

The method of monitoring the application rate and the area to which curing compound has been applied shall be submitted by the Contractor for Engineer's approval and the approved method shall be strictly followed by the Contractor. The Engineer shall, at his discretion, require the Contractor without claiming extra cost to adopt an effective alternative means of curing any area of the structure where curing compound or membrane curing is unsatisfactory in the opinion of the Engineer.

2.24 Faulty Concrete

Any concrete which fails to comply with these preambles, or which shows signs of setting before it is placed shall be taken out and removed from the site. Where concrete is found to be defective by the Engineer after it has set, the concrete shall be cut out and replaced in accordance with the Engineer's instructions. On no account shall any faulty, honeycombed, or cracked or otherwise defective concrete be repaired or patched until the Engineer has made an inspection and issued instructions for the repair. The whole of the cost whatsoever, which may be occasioned by the need to remove faulty concrete shall be borne by the Contractor.

2.25 Construction Joints

(1) Position of Construction Joints

Construction joints shall be permitted only at the locations shown on the drawings or as instructed/agreed on the site by the Engineer. In general they shall be perpendicular to the lines of principal stress and shall be located at points of minimum shear, viz. vertically at, or near, mid-spans of slabs ribs and beams.

Where construction joints are not shown on the drawings, the Contractor shall submit the plan of floor layout, column and wall elevations showing the construction joints to comply with all requirements of this Article and seek the Engineer's written approval immediately on or before fixing reinforcement. The Contractor shall keep record of position and details of all construction joints and submit to the Engineer within a week of completion the drawing showing them.

(2) Maximum Distance between Construction Joint

Suspended slabs are generally to be cast using alternative bays not exceeding 12 m in length. At least 48 hours shall elapse between the casting of adjacent bays. Joints between bays shall be in positions to be agreed with Engineer. Beams shall be cast with the slab.

Mass concrete shall be cast in alternate bays in lengths not exceeding 7.5 m and in depths not exceeding 1.5 m. Adjacent sections shall not be cast within 48 hours of each other. Ground floor slab on hardcore shall be cast in alternate bays not exceeding 4.0 m in length and/or width, unless otherwise shown on the drawings. At least 48 hours shall elapse between the casting of adjacent bays.

Under no circumstances shall concrete be allowed to tail off, but shall be deposited against stopping-boards.

(3) Preparation of Construction Joints

Before placing new concrete against concrete already set, the face of the old concrete shall be thoroughly hacked and roughened to expose the coarse aggregates without damaging/breaking the edges of the concrete. Edges of concrete if damaged shall be repaired with 'Epoxy Mortar' of approved quality. The surface shall be cleaned, laitance and loose material removed therefrom. Immediately before placing the new concrete the surface shall be saturated with water. All construction joints of roof, external walls and columns; and external beams shall be treated with epoxy resin in accordance with the manufacturer's instruction by an experienced skilled worker. Main Contractor shall ensure that full watertightness of external construction joints is achieved.

Before the final set of the concrete, the construction joint at its top shall be made good with surface trowelling.

(4) Reinforcement across Construction Joints

At construction joints in slabs, minimum reinforcement of 0.15% of the cross section of the slab should be provided on each face of the slab unless otherwise as detailed shown by the Engineer.

Prices for concrete shall include for construction joints as required by Articles 2.25 (1) to 2.25 (4) above.

2.26 Expansion/Contraction Joint

Joint fillers shall be flexcell except where high density styropor is shown on the drawing. Sealants shall be Elastomeric of an approved type unless otherwise shown on the drawings. Reinforcement or other embedded items bonded to the concrete shall not extend through any expansion/contraction joint.

External peripheral strip of the joint fillers shall be sawn and fixed so that it can be removed easily to form correct and true depth and width of the sealants. Unless otherwise shown on the drawing the depth of the sealants shall be equal to the width of the expansion joint.

The gap for sealants shall be cleared of any mortar and foreign material. The edges of concrete on the sides of the expansion joint shall be protected from breaking. Broken edges shall be repaired with "Epoxy Mortar" of approved quality such that the width and the line of the expansion joint is perfectly maintained.

The elastomeric sealants shall be applied after the application of approved separating membrane and the primer all as per manufacturer's specifications.

2.27 Waterbars

(1) Type

Waterbars shall be PVC waterbars to British Standard 2782 Part 3 and of an approved type, shape and size (min 240 mm wide where not shown) shall be provided in the positions indicated on the drawings. At places galvanised m.s strip of minimum thickness of 1.0 mm in corrugated shape and of 300 mm minimum width in the following properties i.e. can be used as waterbar, pvc waterbars where shown as such, i.e.

- (i) Tensile strength min 12.5 N/mm²
- (ii) Elongation at break 300%
- (iii) Hardness

and resistant to aggressive water, diluted acids, moderate alkalis and salt etc.

(2) Joints

Joints shall be continuously heat welded in accordance with the manufacturer's instructions. Where the waterbar is to be fixed vertically, metal clips as manufactured by the supplier of the water bar or of other approved design shall be provided to suspend the waterbar from the reinforcement.

(3) Additional Waterbar

The Contractor shall adhere strictly to the position and type of construction joints as specified or detailed on the drawings. Any deviation from this procedure or the provision of additional construction joints will require the prior approval of the Engineer and any additional waterbars which may be required will be at the Contractor's expense.

(4) Formwork to Waterbar

Formwork shall be designed with sufficient timber formers and blocking pieces to support the waterbar and to ensure that it is not displaced during concreting. In vertical walling and similar members the formwork shall be so constructed as to permit the kicker or upstand of concrete surrounding the lower half of the waterbar to be poured in the same operation as the slab or other member from which it springs.

Formwork to walls or similar members where a waterbar is positioned at the base of the lift shall have sufficient openings not less than 300 mm square at approximately 225 mm above the level of the waterbar to permit checking that the waterbar is correctly positioned and not displaced during concreting.

No concreting to a member will be approved where kicker or upstand forms its integral part, until the formwork to the upstand is fixed and the waterbar position is secured.

2.28 Embedded Items in Concrete

(1) General

All sleeves, inserts, anchors and embedded items required for adjoining structural work or for its support shall be approved by the Engineer and shall be placed prior to concreting and shall be used after an interval of time approved by the Engineer.

All sub-contractors whose work for various services is related to the concrete and/or must be supported by it shall be given ample notice and opportunity to furnish and/or fix embedded items. Main Contractor shall obtain a written approval of service consultants before formwork and reinforcement to engineer's design/drawings is inspected by the Engineer. Approval of concreting by the Engineer does not relieve the Main Contractor of his responsibility to correct sizes and position of the embedded items in the concrete for services etc.

Expansion joint material, waterstops, and other embedded items shall be positioned accurately and rigidly, voids in sleeves, etc. shall be filled temporarily with readily removable materials to prevent concrete entering into them.

(2) Electrical Conduits

Conduits shall be of size not exceeding 20 mm overall diameter. They shall be placed at least 75 mm apart in the central thickness of the slab and beam. The group (consisting of maximum 3 @ 75 mm each apart) of conduits to be spaced at not less than 2000 mm apart. At crossing the conduits should not be more than 2 nos. vertically. Where diameter of conduits exceeds 20 mm, a written approval of such drawing showing their exact position and numbers should be obtained from the Engineer. The same applies to insert for electrical sockets, similar fittings into the concrete members.

2.29 Formwork

(1) Materials and Design

Formwork shall be constructed of timber or steel or precast concrete or other approved material with sufficient strength to withstand pressure resulting from placing and vibration of the concrete and with rigidity to achieve the specified tolerances.

The design and engineering of the formwork as well as its construction shall be the responsibility of the Contractor.

The formwork shall be designed for the loads, lateral pressure, pressure due to cyclonic winds and other loads likely to be encountered on site.

Shop drawings for formwork including the location of shoring and reshoring shall be submitted for approval by the Engineer before erection. As and when requested by the Engineer, the calculations for the design of formwork will be submitted for approval by the Engineer before erection.

(2) Construction

All formwork shall have joints close enough to prevent leakage of liquid from the concrete and formwork shall be jacked or wedged and clamped or bolted to permit adjustments before concreting and to permit easing and removal without jarring the concrete. Lost tie system must be used in reinforced concrete wall designed as water retaining structures and for perimeter walls in basement construction. Formwork shall be securely braced and struttred against lateral deflections and vertical movements. Where formwork is supported on previously constructed portions of the reinforced concrete structural frame, the Contractor shall by consultation with the Engineer ensure that the supporting concrete structure is capable of carrying the load and/or is sufficiently propped from lower floors or portions of the frame to permit the load to be temporarily carried during construction.

Formwork shall be cambered by the Contractor to the amount approved by the Engineer to compensate for anticipated deflections prior to hardening of the concrete. Unless where shown/directed otherwise the amount of camber to be 1/500 of the span; e.g. for 10 m span camber to be provided is 20 mm.

(3) Preparation for Concreting

The Contractor's attention is drawn to the various surfaces textures and applied finishes required and the faces of the formwork next to the concrete must be of such material and construction and be sufficiently true to provide a concrete surface which will in each particular case permit the specified surface treatment or applied finish.

At construction joints contact surface of the form for surfaces shall overlap minimum 300 mm and shall be held tight against the hardened concrete to prevent offsets or loss of mortar.

Methods of fixing and positioning of the formwork which results in holes through the concrete and/or left in metal ties or similar in the concrete shall require the Engineer's approval.

All surfaces which will be in contact with concrete shall be oiled or greased to prevent adhesion of mortar. Oil or grease shall be of a non-staining mineral type as approved by the Architect/Engineer and shall be applied as a thin film before the reinforcement is placed.

Surplus moisture shall be removed from the forms prior to placing of the concrete. For surfaces to receive waterproofing membrane, an approved water based mould oil compatible with the specified waterproofing materials shall be used. For fair-face concrete to receive paint, an approved mould oil compatible with paint shall be used.

Temporary openings shall be provided at the base of columns, wall and beam forms and at any other points where necessary to facilitate cleaning and inspection immediately before the pouring of concrete.

Before the concrete is placed the shuttering shall be trued-up, and the interior of the form shall be completely cleared of all extraneous materials including accumulated water.

The reinforcement shall then be inspected for accuracy of fixing. Immediately before placing the concrete the formwork shall be well wetted and inspection openings shall be closed.

(4) Defective Formwork

Defective formwork shall be removed or strengthened and improved by the Contractor according to the instructions by the Engineer at no extra cost to the Employer.

(5) Formwork to Construction Joints, etc.

Formwork forming the construction joints and expansion joint shall be rigid, tight to avoid loss of mortar and true in square.

Formwork shall be inspected and approved by the Engineer before placing reinforcement unless previously agreed with the engineer, then it will be inspected along with the inspection of reinforcement prior to concreting.

2.30 Stripping Formwork

Formwork shall be removed without undue vibration or shock and without damage to the concrete.

Contractor should submit concrete cube test results at 3 days/7 days and seek the Engineer's approval before removal of formwork. No formwork shall be removed without the prior consent of the Engineer and the minimum periods that shall elapse between the placing of the concrete and the striking of the formwork will be as follows:

- | | | |
|-----|---|----------|
| (a) | Beam sides, walls and columns (unloaded) | 24 hours |
| (b) | Slab soffits except of flat slab, shell roof, folded plate construction (with props designed to left under) | 84 hours |
| (c) | Soffits of ribbed slab and hollow block composite floor slab except solid strips (with props designed to left under) | 5 days |
| (d) | Flat slab, shell roof and folded plate construction slab soffits and sides (with props designed to left under) | 10 days |
| (e) | Beam soffits including those of solid strips of hollow block composite floor slabs, waffle slab (with props designed to left under) | 10 days |

If the formwork is not designed for removal of soffits with props left in place, the soffits and props should be left in position until the appropriate period for removal of props given below. (Subject to works cubes achieving at 7 days strength equal to 2/3 of specified 28 days strengths and the loads due to constructions on them being lighter than the designed superimposed loads,

- | | | |
|-----|---|---------|
| (f) | Slab soffits except of flat slab, shell roof, folded plate construction | 10 days |
| (h) | Flat slab, shell roof folded plate construction slab | |

soffits and sides

14 days

- (i) Beam soffits including those of solid strips of hollow block composite floor slabs, waffle slab 14 days

If the Contractor wishes to take advantage of the shorter stripping times as permitted above for beam and slab soffits when props are left in place, he must so design his formwork that sufficient props as agreed with the Engineer can remain in their original position without being moved in any way until expiry of the minimum time for removal of props. Stripping and re-propping will not be permitted.

For system of construction of r.c walls by slip forms or similar; the full details of the system of formwork, its rate of travel, method of making good and curing of concrete, method with detailed drawings for reinforcement starters for structural r.c members to be supported on the r.c walls and other relevant details to be submitted for the approval by the engineer before commencement of works.

For systems of construction such as prestressing or post-tensioning, stripping of formwork should be carried out after the concrete attains the requisite strength and after tensioning of tendons, but in no case shall it be less than 72 hours.

Contractor shall be responsible for consequent damage arising from early stripping of formwork.

2.31 Making Good

After removal of formwork, all projections, fins, etc., on the concrete surface shall be chipped off, and made good to the requirements of the Engineer. Any voids or honeycombing shall be treated as described in Clause 2.24 "Faulty Concrete".

2.32 Surface Finishes from Formwork or Moulds

(1) Type A finish

This finish is obtained by the use of properly designed formwork or moulds of closely-jointed sawn boards. The surfaces will be imprinted with the grain of the sawn boards and their joints. Alternatively, steel or other suitable material may be used for the forms. Small blemishes caused by entrapped air or water may be expected, but the surface should be free from voids, honeycombing, or other large blemishes. Permissible tolerances are to be as per Clause 2.34 (1) to (7) of this specification.

Unless and otherwise shown, this is the finish required for all rendered surfaces after hacking as specified for rendering to architect's specifications.

(2) Type B finish

The finish is obtained by the use of properly designed forms of closely-jointed wrought boards. The surfaces will be imprinted with the slight grain of the wrought boards and their joints. Alternatively, steel or other suitable material may be used for the forms. Small blemishes caused by entrapped air or water may be expected, but the surface should be free from voids, honeycombing, or other large blemishes. Permissible tolerances are to be same as (1) above. Unless and otherwise shown, this is the finish required for surfaces covered by false ceiling and by metal framework to fix wall cladding etc.

(3) Type C finish

This finish can only be achieved by the use of good quality concrete and by using properly designed forms having a hard, smooth surface. The concrete surfaces should be smooth with true, clean arrisses. Only very minor surface blemishes should occur and there should be no staining or discolouration from the release agent.

Permissible tolerances are to be half of those mentioned in Clause 2.34 of this specification.

Unless and otherwise shown, this is the finish required for "Fairface" concrete or precast concrete.

(4) Type D finish

This finish is obtained by first producing a Type B finish on thoroughly compacted high quality concrete, cast in properly designed forms. The surface is then improved by carefully removing all fins and other projections, thoroughly washing down and then filling the most noticeable surface blemishes with a cement and fine aggregate paste. Every effort should be made to match the colour of concrete. Care should be taken, in the choice of any release agent used, to ensure that the finished concrete surface is not permanently stained or discoloured.

Unless and otherwise shown, this is the finish required for "off shutter" concrete where shown without rendering and to remain exposed after painting to architect's specifications.

(5) Type E finish

This finish is obtained by first producing a Type C finish and then, while the concrete is still green, filling all surface blemishes with a fresh, specially manufactured and marketed approved cementitious paste/slurry coloured or plain to architect's approval as a base coat and thereafter applying on the same day a finished coat, total thickness to be specified by the architect, finished even and smooth with steel trowel without any marks. Every effort should be made to match the colour of the concrete. Thereafter the unit is properly cured, the faces rubbed down where necessary, to produce a smooth and even surface. This finish is used only where so specified by the architect for special surfaces.

A sample for each of the above surface finishes will be made for at least of 10 m² area for approval by the architect and the engineer. The sample will be used for comparison for acceptance of similar specified finished surfaces.

2.33 Grades of Finish on Free Surfaces

Horizontal or nearly horizontal surfaces which are not cast against formwork shall be finished to the grade shown and/or specified by the Architect. They are defined hereunder.

(1) Grade U1

This is a hard smooth steel trowelled surface for use where appearance is important, for laying of finished product with minimum thickness of adhesive and for laying epoxy thereon.

To start with, the surface shall be floated as for a U2 finish. When the moisture film has disappeared and the concrete has hardened sufficiently to prevent laitance from being worked to the surface, it shall be steel-trowelled under firm pressure to produce a dense, smooth uniform surface free from trowel marks.

The tolerances to be achieved for the finished surface when measured should not be more than a half of what is specified in Clause 2.34 (3) (5) and (6).

(2) Grade U2

This is a floated finish for roof or floor slabs and other surfaces where a hard steel trowelled surface is not required e.g. for laying waterproofing membrane, pvc tiled floor on adequate thickness of filler/adhesive all to architect's specifications.

The surface shall first be treated as a Class U3 finish and after the concrete has hardened sufficiently, it shall be floated by hand or power floated sufficient only to produce a uniform surface free from marks and thereafter wood floated.

The tolerances to be achieved for the finished surface when measured should not be more than of what is specified in Clause 3.24 (3), (5), and (6).

(3) Grade U3

All surfaces on which no higher class of finish is called for on the drawings or instructed by the Engineer shall be given a U3 finish.

The concrete shall be levelled; all voids filled with concrete, (and screeded where so stated/specified, screed to be monolithic with concrete,) to produce a uniform plain or ridged surface without any voids or projecting coarse aggregates, surplus material being struck off by a straight edge immediately after compaction.

A sample for each of the above grades of finish on Free Surface will be made at least of 10.0 m² area for approval by the architect and the engineer. The samples will be used for comparison for acceptance of similar specified finish for the free surface

Where floor hardener is required by the architect for any of the above surfaces, it shall comply to Clause 2.05 (b) of this specification

2.34 Tolerances

- (1) On all setting out dimensions of 10.0 m and over a maximum non-cumulative tolerance of plus or minus 10 mm will be allowed, and for those under 10 m the allowable maximum non-cumulative tolerance will be plus or minus 5 mm.
- (2) On the cross sectional dimensions of structural members, unless otherwise required by the drawings, a maximum tolerance of plus or minus 5 mm will be permitted.

- (3) The top and soffit surface of slabs shall be within 5 mm for area less than 40 m² and within 10 mm for area 40 m² and above of the normal levels shown on the drawings. The top of upstand beam and soffit of downstand beams shall be truly level and line and non-cumulative tolerance of 5 mm for length up to 10.0 m and not more than 10 mm for full length of the beam exceeding 10.0 m length.
- (4) Walls and columns shall be truly plumb and non-cumulative tolerance of 10 mm in each storey and not more than 20 mm out in their full height will be permitted.
- (5) Surface tolerance for slab on grade of industrial buildings, warehouses, etc. shall be based on a 3 m long straight edge which rests in contact with the floor surface. The maximum gap under the straight edge should not exceed 5 mm.
- (6) Where drawings call for tolerance other than those given in the above paragraphs the drawings shall prevail.
- (7) The Contractor shall be responsible for the cost of all corrective measures required by the Engineer to rectify work which is not constructed within the tolerance set out above.

2.35 Precast Concrete

(1) General Requirements

Unless otherwise approved by the Engineer, all precast concrete construction shall be carried out on the site and shall conform to requirements given elsewhere in these preambles.

The maximum size of coarse aggregate in precast concrete shall not exceed 20 mm except for members of thickness less than 75 mm where it shall not exceed 12 mm. Minimum cement/m³ of concrete will be increased as per guidance given in Table 2.09 (B).

The compacting of precast concrete shall conform with requirements given elsewhere in these preambles except for thin slabs where use of immersion type vibrators is not practicable, the concrete in these slabs may be consolidated on a vibrating table or by any other methods approved by the Engineer.

(2) Curing

The precast work shall be made under cover and shall remain under the same for three days. During this period and for a further four days the concrete shall be shielded by hessian sacking or other approved material which including concrete must be kept continuously wet. It shall then be stacked in the open for at least a further seven days to season before being set in position. Where steam curing is used these times may be reduced subject to the approval of the Engineer.

Steam curing of precast concrete will be permitted. The procedure for steam curing shall be subject to the approval of the Engineer.

(3) Method of Handling

Precast concrete units shall be constructed in individual forms. The method of handling the precast concrete units after casting, during curing and during transport and erection shall be subject to the approval of the Engineer, providing that such approval shall not relieve the Contractor of responsibility for damage to precast concrete units resulting from careless handling.

(4) Repairs

Repair of damage to the precast units, except for minor abrasions of the edges which will not impair the installation and/or appearance of the units will not be permitted and the damaged units shall be replaced by the Contractor at his own expense.

(5) Moulds

Except where precast work is described as "fair-face" or as having an "exposed aggregate" or terrazzo finish the moulds shall be made of suitable strong sawn timber true in form to the shape required. Unless otherwise described faces are to be left rough from the sawn moulds.

Where precast work is described as "fair-face" the moulds are to be made of metal or are to have metal or plywood linings or are to be other approved moulds which will produce a smooth dense fair face to the finished concrete suitable to receive a painted finish direct and free from all shutter marks, holes, pitting, etc. In his prices for such precast work the Contractor shall include for all rubbing down to produce the finish required, to the satisfaction and approval of the Engineer/ Architect.

Where precast work is to have an "exposed aggregate" or terrazzo finish the moulds shall be constructed to the requirements given for moulds for "fair-face" work. The method of achieving the exposed aggregate finish shall be the "aggregate transfer" or other approved methods. A sample showing the required finish and shape shall be approved by the Architect/Engineer before commencement of the works.

The precast units shall be installed to the lines, grades and dimensions shown on the drawings or as directed by the Engineer.

2.36 Predalle

General requirements as per Article 2.35 (1) apply. Articles 2.35 (1) to (5) shall apply except where they differ as stated below.

Moulds shall be made of metal or concrete and shall be rigid enough to achieve the required dimensions and thickness. The mould shall be approved by the Engineer before commencing. Mould oil shall be compatible with the specified paint to the soffit of predalle.

The reinforcement in fabric mesh or as detailed shall be placed in exact position. The lifting hooks and/or reinforcement shall be adequately lapped and tied with 18 S.W.G. wires or welded if approved to the reinforcement.

The concrete shall be as specified except that the maximum size of aggregate shall be 14 mm to BS 882 instead of 20 mm. The concrete shall be placed in one operation in moulds laid horizontally and shall be vibrated by means of maximum 25 mm diameter poker type vibration or a vibrating table or an external vibrator. The top surface of the concrete shall be finished rough. Removal of laitance by water at approved pressure in hose pipe shall be allowed 12 hours after concreting.

Any unit found of thickness less than shown or not being cured properly or with reinforcement incorrectly placed in position or cracked/damaged; shall be rejected by the Engineer.

2.37 Composite Floor Slabs

(1) Size, type & concrete mix for floor block

Concrete hollow blocks for use in the composite floor slabs are to be size and shape as shown on the drawings with 30 mm wall thickness and are to be of adequate strength to support the concrete during placing and consolidation by vibration. Blocks are to be manufactured in accordance with the procedure specified in BS 6073 or MS 42.

No coral sand shall be used in making of concrete blocks. The compressive strength of concrete block on gross area to be not less than 3.5 N/mm² at 28 days.

Concrete blocks are to remain under cover and to be cured as per articles 2.35 (2) precast units and stored for at least 14 days before use on the site.

Concrete blocks are to be well wetted before 12 hours and immediately before concreting.

(2) Composite floor construction

The hollow block floor construction is generally to be as shown on the Engineer's drawings.

Care shall be taken in placing blocks to ensure that they are set out in accordance with the details shown on the drawings and that they run truly in line without encroaching on the width of the insitu ribs and solid strips.

Concrete block where shown on the drawings for less than full width e.g. ½ and 1/3 width shall be cut by grinder or manufactured as such. The length of the concrete block where it encroaches the solid strip shall be cut by grinder. Contractor to include cost of the cutting in his prices.

The open ends of hollow blocks adjacent to the concrete to be placed insitu are to be plugged or stopped previously with concrete 25/20 grade 40 mm thick to prevent the concrete from flowing into the void and the Contractor is to include for this in his prices.

The Contractor should note that slip tiles are not to be used to the soffit of ribs. The formwork shall be for whole area covering the blocks and ribs and he is to take this into consideration in pricing the items of formwork to the soffit of hollow block floor construction.

Before concreting is carried out the blocks are to be thoroughly wetted. Care should be taken during concreting that the width of ribs between the rows of blocks and of the solid insitu concrete shown on the drawings adjacent to supporting beams is not encroached upon by the blocks.

The purpose made spacer blocks of approved size is made in mortar of not less than a half strength as of specified strength of concrete with grooves and tying wires shall be used to maintain the width of the ribs and positioning of reinforcement. Contractor to include for this in his pricing.

It is required that the concrete for topping is placed along with concrete to the ribs between hollow blocks.

(3) Fixing of rib reinforcement

Reinforcement shall be positioned accurately with required cover in accordance with the drawings and using the particular spacing blocks with wire ties as previously described. Spacer blocks shall be provided in ribs at no more than 1.2 m centres. Care must be taken during concreting that the reinforcement is not displaced.

(4) Holes for services, etc.

Where holes for services, etc. occur, the necessary holes or openings shall be accommodated by the replacing of a hollow block by insitu concrete or the widening of a rib including extra reinforcement all in accordance with the Engineer's instructions. Prices for holes/opening etc. through hollow block construction are to include the re-arrangement or substitution of the hollow block with solid concrete and reinforcement in addition to the actual formation of the hole.

(5) Embedded Items in concrete

Clause 2.28 (1) General and 2.28 (2) electrical conduits of this specification for concrete for embedded items and electrical conduits shall apply except (i) no electrical conduits will be placed in the topping less than 70 mm thick and (ii) where conduits are required to be placed in topping, they shall be placed in size not exceeding 20 mm before placing reinforcement to topping i.e. below the reinforcement on top of the concrete blocks.

2.38 Waffle Slab Construction

(1) Size, type and materials of waffle moulds

The size and shape of the mould to be used in the construction is required to achieve the profile as shown on the drawings by the Architect and/or the Engineer.

The moulds are made of glass fibre. The moulds shall have dimensional accuracy and constant profile. The moulds shall not stain the concrete. When it is normally exposed in weather under all conditions and under working loads on site, its shape shall not get deformed.

Repetitive use of placing and removal of the mould if found damaging its profile, shall be replaced by a new one at no extra cost to the Employer.

Sample of concrete of the waffle slab using at least 4 moulds shall be prepared to enable the Architect and/or Engineer to approve the sample of mould used before the same is used for the formwork to slab.

(2) The floor construction

Waffle slab construction is generally to be as shown on the Engineer's drawings. Care shall be taken in placing the waffles to ensure that they are set out in accordance with details shown on the drawings and that they run truly in line without encroaching on the width of the in-situ ribs.

Contractor should note that slip tiles shall not be used to soffit of the ribs. Waffle shall be placed on fully decked out formwork for whole area covering the waffles and in between ribs and Contractor should take this into consideration when pricing the items of formwork to the soffit of the slab. Price of formwork to waffle slab shall deem to include for both moulds and decked out formwork.

Appropriate approved wax based mould release agent compatible with the specified part shall be used for releasing waffle moulds. Before concreting is carried out the surface is wetted thoroughly with water.

Care should be taken during concreting that the width, of ribs between moulds of solid in-situ concrete shown on the drawings adjacent to supporting beams and of solid strip is not encroached by the moulds. The purpose made spacer blocks of approved size is made in mortar of not less than half strength as of specified concrete with grooves and 18 swg tying wires shall be used to maintain the width of the ribs and positioning of reinforcement. Contractor to include for this in his pricing. It is required that the concrete for topping is placed along with concrete to the ribs between the moulds.

(3) Fixing of rib reinforcement

Reinforcement shall be positioned accurately with required cover in accordance with the drawings, using particular spacing of blocks with wire ties as previously described. Spacer blocks shall be provided in ribs at not more than 1.2 m centres. Care must be taken during concreting that reinforcement is not displaced.

(4) Holes for Services

Where holes for services, etc. occur, the necessary holes or openings shall be accommodated replacing a waffle by in-situ concrete or the widening of solid strips including extra reinforcement all in accordance with the Engineer's instructions. Price for forming opening/ hole, etc. through waffle shall be deemed to include the rearrangement and/or substitution of the waffle with solid concrete and reinforcement.

(5) Embedded Items in Concrete

Clause 2.28 (1) General and 2.28 (2) electrical conduits of this specification for concrete for embedded items and electrical conduits shall apply except (i) no electrical conduits will be placed in the topping less than 80 mm thick and (ii) where conduits are placed in topping, they shall be placed in size not exceeding 20 mm before placing reinforcement to topping i.e. below the reinforcement with min 10 mm concrete cover under the conduit.

(6) Finished surfaces

Bottom and side surfaces of concrete after removal of mould shall be fairface as specified in Article 2.32 Type C Finish. Touching up or cement wash to surfaces shall not be accepted. Surfaces should be plane at shown levels and shape with smooth or uniform texture and appearance free from all surface defects. Construction joints shall be made such that no grout leaks/overflows under soffit/sides of waffle moulds and the concrete ribs/solid strip/beams etc. The joint shall be in a straight line showing solid non honeycombed uniform smooth and perfectly level concrete. Touching up, if any required, shall be carried out after instructions from the Engineer and shall be to the satisfaction of Architect and Engineer.

2.39 Post Tensioning with Bonded Tendons

(1) Tendons

Tendons shall be of low relaxation 7 wire strands complying with the requirements of BS 5896 : 1980 (seven wire super strands) or Grade 270 of ASTM 416.

Contractor shall submit test certificates from results of manufacturer's production testing for each batch of material for all tests generally carried out by the mill. Tests on samples selected from site shall be carried out as required by the Engineer.

Tendons should be free from kinks and permanent bends. Tendons shall be clean, and free from rust, scale, pitting, corrosion and any lubricant or oil that would affect their bond with the cement grout.

Pre-made tendons shall be identified and labelled with all relevant data.

It should be ensured that all tendons are adequately protected against corrosion throughout construction. Any tendons with signs of corrosion will be rejected.

Tendons remaining unstressed in ducts for more than four weeks shall either be removed or inspected before stressing, or shall be specially protected from corrosion in an approved manner.

(2) Ducts and vents

Ducts shall conform to Clause 9.2 of BS 8110.

Ducts shall be mortar-tight and strong enough to resist damage and deformation during construction. Ducting material left in place shall not cause electrolytic action or deteriorate. Ducting should be approved by the Engineer and if it is found unsatisfactory, it should be replaced by the Contractor with a stronger duct.

Joints in ducts should be sealed so that they are waterproof under the normal pressures to which they will be subjected during concreting.

Grout holes or vents should be provided at anchorages and at crests in the profile and at major changes in the section of the duct. Vents should be provided at intervals not greater than 15 m. Vents and injection connections to the duct should be secured and tight. They should be able to withstand disturbance and pressures generated in concreting and grouting.

The vents to be used as entry points for grout should have appropriate type of connector for the grout pump.

For members where the grouting operation is delayed for more than 2 weeks after stressing, including stage stressed members, drainage lines should be provided to the low point(s) of the profile unless other approved means of corrosion protection are being employed.

(3) Anchorage

Anchorage shall conform to the requirements of BS 8110 and BS 4447.

All anchorage devices fixed at stressing ends of tendons shall be capable of being fully released if required after the tendon has been anchored.

Contractor shall submit full details of all prestressing anchorages proposed including relevant test certificates. The normal "draw-in" of the tendons when anchoring the tendon in the anchorage device shall be stated.

(4) Storage and protection of tendons and anchorages

All tendons and anchorages components shall be stored under cover and protected from corrosion. All threaded components shall be protected by greased wrapping or plugs until used. Anchorage devices shall at all times be kept free from dirt, mortar, rust, paint, or any deleterious matter.

Anchorage cast into the work shall be protected from corrosion during the period prior to receiving the permanent protection.

Any anchorage or anchorage component which has been damaged in any way shall not be used.

(5) Grout

Grouting is a vital step in the protection of the highly stressed tendons against long term corrosion. All ducts containing post-tensioned tendons shall be completely filled with grout.

Ducts shall be grouted as soon as possible after stressing the tendons but not later than four weeks. Grout shall comply with the requirements of BS 8110. Conformance should be demonstrated by test prior to commencement on site.

Sampling of grout for compressive strength test shall be at the rate of one sample per 1 cubic metre of grout placed with a minimum of one sample per day of grouting. Each sample shall consist of six cubes of 100 mm sides.

(6) Fixing ducts and anchorages

Ducts should be secured in position to ensure no movement during concreting. The profiles should follow smoothly between support points and be free from kinks and sudden bends. Site-made tendons shall be inserted in such a way as to avoid any damage or contamination to either the tendon or the duct. Any clashes with untensioned steel or cast-in obstructions should be reported to the Engineer for resolution.

Anchorage shall be fixed securely in position and square to the line of the tendon or to the tangent to the curve at the end of the tendon. Grout-tight joints should be ensured between the anchorage and the formwork and between the anchorage and the duct surrounding the tendon.

(7) Tolerances

Ducts shall be placed so that tendons when stressed shall not deviate from their correct profile at any point by more than 5 mm unless noted otherwise on the drawings, except that the required concrete cover shall not be reduced.

(8) Tensioning

Tensioning shall comply with the requirements of BS 8110.

No tendon shall be tensioned until the concrete has attained the required transfer stress. For ensuring this, the concrete test cubes should be cured in the same way as the concrete in the structure and cube test results are to be submitted to the Engineer while seeking approval for stressing.

The stressing operation shall be performed only by personnel trained and experienced in this type of work. Special care shall be taken to apply the tensioning force smoothly and evenly. The stressing operation shall be performed in accordance with the best practice applicable to the particular system adopted. The tendons shall be stressed to the initial forces specified in the drawings.

The sequence of stressing shall be as shown on the drawings. To minimise uneven distribution of forces and to avoid tensile cracking, the stressing sequence used shall ensure that the forces applied are kept as symmetrical as possible about the centroid of the tendons within the structural element.

No member shall be left partly stressed except as specified on the drawings for staged stressings.

The jacks shall be set accurately in the line of the tendons. The force which is applied initially to take up the slack of the tendon shall be sufficient to set the jack firmly but shall not exceed the amount normally associated with the particular method of prestressing.

Allowance should be made during stressing for the friction in the jack and in the anchorage.

In the case of a tendon breaking or slipping, the tendon shall be released, replaced if necessary and re-stressed. Any other corrective/remedial actions as required shall be carried out to the Engineer's approval.

A record sheet shall be made for the stressing operations and the following data shall be recorded:

- (i) Identification number of each piece of equipment used (e.g. pressure gauge, pump, and jack, etc.)
- (ii) Date and time of stressing
- (iii) Identification particulars of tendons
- (iv) Initial forces (or pressures) when tendons are marked for measurement of elongation
- (v) Final forces/pressures obtained on completion of tensioning
- (vi) Theoretical elongations
- (vii) Final elongations remaining after release of jacks
- (viii) Remarks

The records shall be signed by the Supervisor and submitted for scrutiny and approval by the Engineer before any tendon is grouted.

(9) Elongation of tendons

The elongation of tendons shall be measured to the nearest millimetre and the tendon force evaluated by applying the load-elongation curve to it. This should be compared with the tendon force obtained by measuring the jacking force or pressure and deducting the appropriate transfer losses from it. Where discrepancies between the two methods of determining tendon force exceed 10%, the Contractor shall ascertain the cause and submit proof that any proposed remedial works will correct the situation to the satisfaction of the Engineer before proceeding. Similarly, the Contractor shall ascertain the cause and submit details of any remedial works when discrepancies between measurements for strands of the same length and profile exceed 5%.

(10) Grouting

Grout shall be batched and mixed and the grouting carried out in accordance with BS 8110. The grout shall be kept agitated during the whole grouting operation, which shall be a continuous process. All equipment, especially piping, shall be thoroughly washed out after each series of operations, or at a maximum of 3 hour intervals. Grout shall not be used later than 30 minutes after the addition of the cement to the mix, unless it incorporates a retarder.

Prior to grouting, ducts shall be cleaned out with oil-free compressed air. The grout shall then be injected into each duct from the lowest grout tube in one continuous operation. A continuous, steady flow of grout shall be maintained until the duct is completely filled and all entrapped air has been expelled. Grouting should continue until the fluidity or density of the grout flowing from the free ends and the vent openings is the same as that of the injected grout. The vents shall be progressively closed as required to ensure the complete filling of the duct. All vents and ends shall be kept closed until final setting of grout has taken place. After closing the last vent, the pressure should be held at 0.5 N/mm² for 5 minutes. Where necessary duct openings shall be inspected two or three days after grouting.

If serious leaks occur, or the grouting needs to be stopped for any reason, the duct shall be immediately flushed clean with water.

Vents and all other openings should be sealed after grouting to prevent the ingress of water or other corrosive agents.

(11) Anchorage protection

On satisfactory completion of stressing and grouting operations, all protruding tendons shall be cut off using an abrasive cutting disc. The tendons should not be cut too close to the anchoring device and a minimum protrusion of 20 mm should be allowed.

The anchorage pockets shall be thoroughly cleaned and the exposed anchorages and tendon ends shall be coated with an approved epoxy and grouted with an approved non-shrink mortar mix. The cover to the ends shall not be less than 30 mm.

The mix must not contain any substances that will affect the tendons. The Contractor shall produce prototypes of such works, including the standard of colour and surface matching achievable, for approval prior to commencement of the works.

(12) Safety

Adequate precautions shall be taken during tensioning operations to ensure the safety of all personnel engaged on the work and of other persons in the vicinity of the work. As a minimum, this will require areas behind anchorages to be screened off with safety barriers and clearly displayed warning signs. No person shall be permitted to stand behind the jacks or close to the line of tendons while tensioning is in progress. Jacks shall be secured in such a manner that they will be restrained should they lose their grip on the tendons. The operation of the jacks, the measurement of elongation and associated operations, should be carried out in such a manner and from such positions that the safety of all is ensured.

Personnel engaged on grouting operations and other persons in the vicinity of the work should be made aware of the possible hazards associated with the production of pressurised grout and the use of compressed air. All involved should wear eye protectors at all times.

(13) General requirements

(a) *Supervision*

The Contractor shall provide a Supervisor experienced in prestressed construction using the post-tensioning system and equipment being adopted for this work.

(b) *Shop Drawings*

Prior to construction, the Contractor shall prepare prestressing shop drawings necessary for the proper fabrication and placement of the tendons and anchorages. The Contractor will be fully responsible for dimensional accuracy of shop drawings. Two copies of shop drawings shall be submitted for review and acceptance by the Engineer.

(c) *Concreting*

Vibrators shall not come into direct contact with the duct or tendon. If duct or tendon is damaged or displaced during concreting, the whole or a portion of the concrete may be rejected. Particular attention shall be taken to ensure no honeycombing or porosity occurs in the concrete in the vicinity of the anchorages. Temporary openings should be provided in formwork where necessary.

(d) *Formwork*

Formwork shall not restrain shortening or deflections resulting from application of the prestressing force, and shall be designed for any loading effects imposed by the prestressing.

(e) *Scaffolding*

Where necessary, provide working platforms, etc., as a means of access for the stressing and grouting operations. This access shall remain available on site until the final grouting of the anchorage pockets.

(f) *Tendons and Anchorages*

Tendons or anchorages shall not be subjected to excessive temperatures, welding sparks or ground currents. Burning and welding operations should not be carried out in the vicinity of tendons.

(14) Stressing equipment calibration

Stressing equipment shall be calibrated to an accuracy of 2%. Current calibration curves for the equipment to be used shall be made available prior to stressing, and be available for inspection on site during the works. All stressing equipment shall be re-calibrated at intervals not exceeding 6 months, except that it shall be recalibrated immediately should it be suspected that the equipment has been damaged or become inaccurate.

2.40 Post Tensioning with unbonded tendons

(1) Prestressing tendons

The tendons shall be low relaxation 7 wire stands, coated with special grease and covered by a polyethylene sheath extruded over the strand. The strands shall conform to ASTM -A416 (Grade 270) or to BS 5896 (seven wire super strands).

Contractor shall submit test certificates from manufacturer's production testing and from tests on selected samples to the Engineer.

The coating of grease should be continuous over the entire tendon length and should completely fill the sheathing without air pockets. The grease shall be such as that it neither hardens and cracks nor become fluid over the normal range of temperatures during fabrication, transportation, storage, installation, tensioning and while in service. It should not contain any harmful compounds such as chlorides, sulphides or nitrates except in traces harmless to tendon materials.

The sheathing should be of either high-density polyethylene or polypropylene. The material should be of a type which will not react with cement, grease coating or steel. It should be durable and resistant to damage and abrasion with reasonable handling and should remain stable and flexible during handling, storing, installation and service. It should be resistant to ageing by exposure to ultraviolet light.

The sheathing should be able to bridge any fine cracks that may occur in the concrete. The thickness of the sheathing should not be less than 1.0 mm.

(2) Anchorage

The requirements of Article 2.39 (3) shall be applicable.

(3) Storage and protection of tendons and anchorages

The requirements of Article 2.39 (4) shall be applicable. In addition, adequate precautions should be taken during handling and storage in order to avoid damage to sheathing of tendons. Any localised damages to sheaths should be promptly remedied. If sheaths are damaged over a considerable length, such parts of the tendon shall not be used on the work.

(4) Installation

Tendons should be installed to the specified alignment and profile and securely held in position at intervals such that they will not be displaced during concreting. The tendons should be installed to a smooth alignment and profile without kinks. Tendons shall not deviate from their correct profile by more than 5 mm at any point. Proper care should be taken to avoid any damage to the sheathing. Minor damages to sheathing should be remedied by suitable adhesive tape. In case of major damage, the tendon should be removed and replaced.

Anchorage should be set square to the tendon axis and securely held in position to prevent movement during concreting.

(5) Tensioning

The requirements of Article 2.39(8) and 2.39 (9) shall be applicable.

Completed record sheets should be submitted to the Engineer while seeking approval for stripping of formwork and cutting off protruding tendons.

(6) Protection of anchorages

The requirements of Article 2.39(11) shall be applicable for the protection of anchorages.

(7) Safety

Adequate safety precautions should be taken during tensioning operations as per Article 2.39(12).

(8) General requirements and stressing calibration equipment

The requirements of Articles 2.39(13) and 2.39(14) shall be applicable.

2.41 Notes Concerning Measurements and Pricing Concrete Work

The Contractor must allow for costs incurred during the progress of the Contract for complying with the provisions concerning the preparation and use of specified grades of concrete mixes.

Prices for concrete shall include for mixing and depositing as described or indicated and for hoisting and depositing at the various levels required throughout the building, and shall also include for forming or hacking a satisfactory key for construction joints and for all faces receiving asphalt and plaster work.

Prices for slabs shall also include for levelling off the surface as described under "Compaction", and all temporary formwork to form construction joints at bay edges.

Prices for reinforced concrete shall, in addition, include for filling into, between or on formwork and thoroughly compacting between and around rods or fabric reinforcement and for forming all additional construction joints between varying mixes. Where described as vibrated, prices must include for fully vibrating as described.

Formwork (use and waste only) is measured net to the actual face of the concrete to be supported and the prices for formwork shall include for extra material at joints, extra labour and waste for narrow widths, small quantities, overlaps, passings at angles, straight cutting and waste, splayed edges, notchings, etc., and for fixing at the various levels including battens, struts, and supports and for bolting, jacking, wedging, casing, striking and removal. Prices for linear items such as boxings shall include for angles and ends. Strutting has been measured at varying levels to slab soffits only and prices for other items include for strutting at any level.

Prices for steel rod reinforcement shall include for all wastes in cutting to lengths and all labour in bending and cranking, forming hooked ends, handling, hoisting and fixing in position and for providing all necessary tying wire and supports, e.g. steel chairs. Prices for fabric reinforcement shall include for all straight cutting and waste, handling, hoisting and fixing in position, providing all necessary tying wire, and supports, e.g. steel chairs and all extra material in laps. Prices for steel rod reinforcement shall include for lengths up to and including 12 metres. Prices shall

include preparation of bending schedules and calculation of weights from reinforcement drawings, submission of the same for the Engineer's approval before commencement of their placing into works.

The prices for post tensioning work shall include tendons, ducts and vents, anchorages, their assembly/installation, stressing operations, grouting of ducts, protection of anchorages and all associated works required by the specifications/drawings/contract documents and as necessary to complete the post-tensioning work. (In the case of post tensioning with unbonded tendons, provision of ducts and vents and their grouting are not required). Prices shall include for all wastes in cutting to required lengths and for handling, hoisting and fixing in position including all necessary tying wire, spacers, chairs and the like.

For calculation of increased costs due to change in prices of reinforcement bars, the wastage to be allowed for calculation will not be greater than 4 % for bars up to size of 12 mm and 6% for bars of sizes above 12 mm, both of the weights measured from the schedule of reinforcement.

SPECIFICATION FOR PAINTING

SPECIFICATION FOR PAINTING

TABLE OF CONTENTS

	Page No.
1.1 General.....	1
1.2 Painting to Timber Works.....	2
1.2.1 Painting to New Timber Works.....	2
1.3 Painting to Metal Work.....	2
1.3.1 Paints.....	2
1.3.2 Preparation for Painting.....	2
1.3.3 Painting to Ungalvanised Surfaces.....	3
1.3.4 Painting to Galvanised Surface.....	3
1.4 Painting to Masonry Work.....	4
1.4.1 Painting New Plastered/Masonry Surfaces.....	4
1.4.2 Internal Surfaces.....	4
1.4.3 External Surfaces.....	4
1.5 Treatment to Fair Surfaces.....	4
1.6 Varnishing to Timberwork.....	4
1.7 Lime Wash.....	5
1.8 Completion of Painting Work.....	5

SPECIFICATION FOR PAINTING

1.1 General

All paints to be used shall be those supplied by the manufacturers approved by the Engineer. The brand name of the paint to be used shall be as stated by the Contractor at the time of tendering and agreed upon by the Engineer. The quality of paints shall comply with British Standard in respect of oil/enamel paint (glass paint) and MS 3 in respect of solvent based emulsion paint.

Paints shall be delivered to the site in the manufacturer's original sealed containers unopened and shall be used strictly in accordance with the manufacturer's instructions.

Paints shall not be adulterated and any paint that has deteriorated shall not be used and shall be removed from site forthwith.

The colours and tints of paints shall be selected by the Engineer and the priming, undercoats and finishing coats shall be of differing tints as approved and shall be obtained from the same manufacturer.

Painting work shall be done by skilled workmen and appropriate equipment or tools shall be used.

No painting shall be done under conditions, which may jeopardize the quality of finished paintwork.

During painting, care shall be taken to prevent stain or damage to other works.

Surfaces to be painted shall be dry, free from dirt, oil, grease, old loose paint and other deleterious matter. All cracks shall be raked out and stopped and holes and dents shall be filled.

Unless otherwise specified in the manufacturer's instructions, each coat of paint applied on timber or metal surfaces shall be allowed to dry and subsequently rubbed down lightly with sand paper before next coat is applied. Any dirt or dust shall be removed from preceding coat immediately before proceeding with application of the next coat.

All priming to shop fabricated components shall be done at the shop.

Finished surfaces shall be uniform in finish and colour and be free from brush marks or other defects.

Sample areas showing all tints of paints to be used shall be prepared by the Contractor as and when required by the Engineer.

1.2 Painting to Timber Works

1.2.1 Painting to New Timber Works

Before painting to new timberwork all knots shall be covered with knotting and all nail holes, cracks, etc., shall be stopped with white lead and putty (1:3) and shall be primed with aluminium wood primer well brushed in. The prepared surface shall be painted with one undercoat and unless otherwise specified shall be finished with two coats of gloss enamel paint. Each preceding coat shall be allowed to dry thoroughly and rubbed down lightly with fine sand paper and thoroughly cleaned before applying the next coat.

All timber surfaces abutting concrete or brickwork shall be primed before fixing or assembling.

All ironmongery except hinges shall be removed before painting begins and shall be carefully refixed.

Unless otherwise specified all exposed wood surfaces of timber shall be painted as specified herein before.

1.3 Painting to Metal Work

1.3.1 Paints

All paints are to be supplied to meet the requirements of the appropriate British or other specified Standard by a supplier approved in writing by the Engineer.

Paints are to be delivered to the site or the Structural Contractor's works in the original containers as supplied by the manufacturer with seals unbroken and are to be used in strict accordance with the manufacturer's instructions. Manufacturer's representatives are to be free to visit the site and inspect materials and workmanship, and if necessary take samples of materials for laboratory analysis.

Paints are not to be thinned unless instructed by the Engineer.

No external painting is to be carried out during rain or when rain is likely to occur before the paint has had time to dry.

All surfaces are to be dry and free from moisture at the time of painting.

1.3.2 Preparation for Painting

All structural steel shall be thoroughly scraped and wire brushed to remove mill scale and rust. Dirt and grease or oil shall be washed off with white spirit and the steel allowed to dry.

1.3.3 Painting to Ungalvanised Surfaces

A first coat of Red Lead type C Primer shall be applied in the works immediately the steel preparation has been completed, in accordance with the requirements specified in MS 13. A minimum of 24 hours shall elapse before the steel is moved from its position whilst painting.

After delivery to site, the steel shall be carefully examined and all areas where the priming coat has been damaged and/or where rust has developed shall be washed with white spirit and wire brushed as necessary and a further priming coat as for the first coat applied to completely cover the damaged areas.

A minimum of 48 hours after any patching work has been completed, the whole of the steel shall be cleaned off with white spirit and 2nd coat of Red Lead Type C Primer of a different approved colour or shade from the first coat shall be applied and the painted steelwork left undisturbed for a further 48 hours.

During erection, surface of steel which are to be in contact shall be painted with 1 further coat of primer as previously described and the surfaces brought together whilst the paint is still wet.

After erection a third and finishing high gloss alkyd enamel (white) or other approved shade of colour to BS 4800 "Schedule of Paint Colours for Building Purposes", meeting the requirements of British Standard "Decorative high gloss enamel paint for interior and exterior use" or a coat of Micaceous Iron Oxide is applied if noted on the drawing.

Bolts, nuts and washers, etc., shall, after erection is completed to approval, be carefully degreased with white spirit and painted as for steelwork.

Steel purlins and sheeting rails shall generally be painted as for steelwork except for purlins and rails supporting aluminium sheeting, when the following specification shall be used:

- | | |
|----------|----------------------------------|
| 1st coat | - Red Oxide Zinc Chromate Primer |
| 2nd coat | - Red Oxide Zinc Chromate Primer |
| 3rd coat | - Approved Aluminium Paint |

The interior of mild steel gutters shall be prepared as previously described and painted with 2 coats of Epilac coal Tar Epoxy Paint.

1.3.4 Painting to Galvanised Surface

Surface Treatment

- (a) Surfaces shall be thoroughly cleaned wire brushed to remove scales. Dirt and grease or oil shall be washed with hot water.
- (b) Apply 1 coat of etching primer (with min. 15% phosphoric acid) to enable sufficient adhesion of the subsequent paint.
- (c) Apply 1 coat of calcium plumbate primer in accordance with British Standard.
- (d) Apply 2 coats of white high gloss enamel in accordance with British Standard "Decorative High Gloss Enamel Paint for Interior and Exterior Use" of an approved shade of colour to BS 4800.

Allow 24 hours intervals between each coat.

1.4 Painting to Masonry Work

1.4.1 Painting New Plastered/Masonry Surfaces

The new plastered or masonry surface shall be allowed to dry completely and shall be cleaned down to remove dust, dirt, plaster, splashes and the like. In case of old unpainted walls, all fungus, mess, lichens and vegetative growth shall also be removed. The cleaned surfaces shall then be applied.

1.4.2 Internal Surfaces

Internally with one coat of undercoat and two finishing coats of water based emulsion paint to MS 3. Each preceding coat shall be allowed to dry thoroughly and defects in surface made good with approved fillers before application of subsequent coats. In case the surface fails to achieve clean even painting to Engineer's satisfaction, the Contractor at his own cost shall apply an extra coat of paint. All off shuttered concrete surfaces shall be made good as per specification. They shall be painted as internal surfaces as mentioned above. Where for 2000 mm ht Acrylic paint is specified, it shall be solvent based emulsion paint to MS 3 (one undercoat + two finishing coats).

1.4.3 External Surfaces

The above specification for internal surfaces will be applicable, however, additionally one coat of approved seal coat (Mauviseal/Mauvilith or equivalent) shall be applied before application of an undercoat and two coats of the primer shall be antifungus to MS 3.

1.5 Treatment to Fair Surfaces

Surfaces that are to be left bare such as for fair face concrete or stones and the like shall be thoroughly clean, dry, free from grease, dust and loose or flaking materials. The surface shall then be treated with an approved colourless silicon-based water repellent liquid to BS 3826 applied in accordance with the manufacturer's instructions. The solution shall be applied in two coats over the entire area and crevices by brushing.

1.6 Varnishing to Timberwork

The surfaces to be varnished shall be smoothened with fine sand paper and all crevices, holes and the like if any, shall be filled with approved whiting. It shall be clean, dry, free from dust, dirt and wax before the application of varnish. Unless otherwise approved, the surface shall be applied with two coats of approved varnishing mixture used strictly in accordance with the manufacturer's instructions. Where non-patented products are allowed to be used, the varnishing mixture shall consist of methylated spirit, shellac and approved stain forming the first coat followed by one coat of an approved mixture consisting of thinner and lacquer. The mixtures shall be of uniform consistency throughout. Unless otherwise specified the finished shall be gloss.

1.7 Lime Wash

White-wash or colour-wash that will not easily rub off may be prepared as described below.

About 1 cwt. (= 112 lbs.) of burnt shell lime is slaked thoroughly with hot water in a covered vessel. With this mixture are added about 14 1/2 lbs. salt dissolved in hot water, about 8 1/2 lbs. pounded rice mixed in hot water and about 2 lbs. glue dissolved in hot water. The whole mixture is then stirred well and thinned by adding hot water to a consistency of cream, and put over a fire for a few hours.

Finally, the hot liquid mixture is strained through a clean cloth and applied hot (in the usual manner). For colour-wash the desired pigment in suitable quantity is added to the liquid mixture prepared for white-washing.

Whiting is made by reducing pure white chalk to a fine powder. It is mixed with water and rice size and used for whitening ceilings and inside walls. It will not stand the weather well.

Application of white-wash or colour-wash:

Before white-wash or colour-wash is applied to the surfaces of new walls, the surfaces should be well cleaned and brushed. The surfaces should also be in dry condition. If the surfaces are extra smooth, white-wash or colour-wash will not stick well to them, and hence, in that case, they should be carefully rubbed with sand paper. For rewhite-washing or re-colour washing, the surfaces should be cleaned of all loose old wash, and sand papered, all nails removed and holes filled with lime putty in which a small quantity of fine silver sand and some gur (jaggery) are mixed. All greasy spots should be given a coat of rice water and fine sand in order to give an adequate key to the wash. If the surfaces are discoloured by smoke, they should be given a wash made of fine wood ashes and water before the application of the wash. Cement plastered walls should be washed with a weak solution of soap, and should be given one coat of sodium silicate and water 1:5. There will be no scaling or flaking off after this treatment. After the preparation of the surfaces, the white-wash or colour-wash should be applied with a brush.

Three coats of wash are generally required for new work and for work on scraped surfaces. The coats are given alternately, vertically and horizontally. One stroke is given from the top downwards and the other from the bottom upwards over the first stroke and similarly, one stroke from the right and another from the left over the first brush before it dries. Each coat should be allowed to dry before applying the next coat. Annual white-wash or colour-wash may consist of one coat only, applied first in vertical strokes, of the brush, followed immediately by horizontal strokes.

1.8 Completion of Painting Work

On completion of paintwork all paint marks inadvertently left on glass, floors, tiles and other surfaces shall be removed. Any stain or marking on finished paintwork shall be removed and touched up to the approval of the Engineer.

SECTION V
CONDITIONS OF CONTRACT

GENERAL CONDITIONS OF CONTRACT



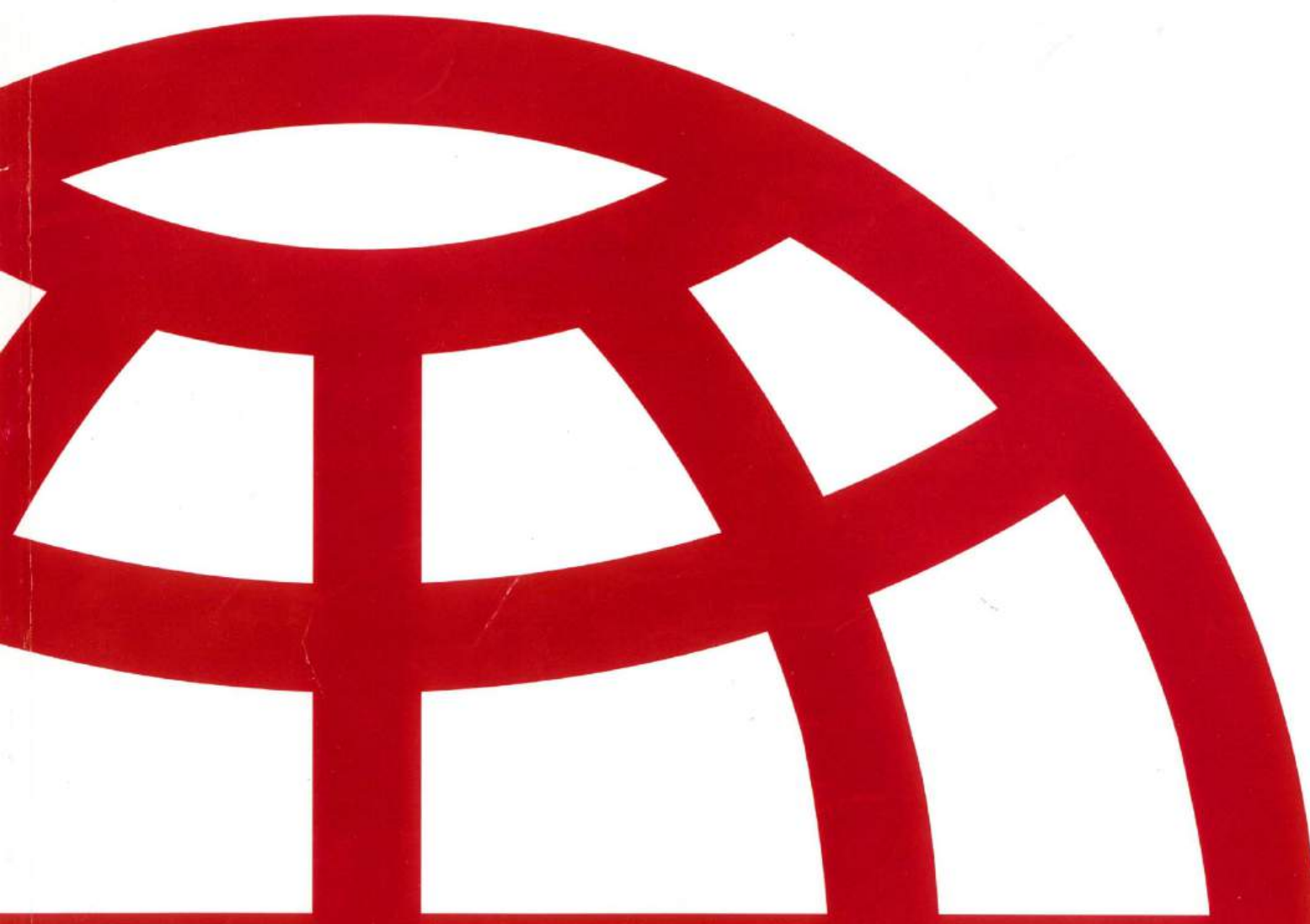
Fédération Internationale des Ingénieurs-Conseils
International Federation of Consulting Engineers
Internationale Vereinigung Beratender Ingenieure
Federación Internacional de Ingenieros Consultores

Conditions of Contract for **Construction**

FOR BUILDING AND ENGINEERING WORKS DESIGNED BY THE EMPLOYER

GENERAL CONDITIONS

GUIDANCE FOR THE PREPARATION OF PARTICULAR CONDITIONS
FORMS OF LETTER OF TENDER, CONTRACT AGREEMENT AND
DISPUTE ADJUDICATION AGREEMENT



APPENDIX TO CONDITIONS OF CONTRACT

ITEM	CLAUSE	DATA
Employer's name and address	1.1.2.2 & 1.3	SBM Bank (Mauritius) Ltd 1, Queen Elizabeth II Avenue, Port Louis
Contractor's name and address	1.1.2.3 & 1.3	Name Address (To be decided)
Engineer's name and address	1.1.2.4 & 1.3	<u>Servansingh Jaday and Partners Consulting Engineers Ltd of</u> 7,Remy Ollier Street, Beau Bassin as ' Project Coordinator and Civil and Structural Engineers '
Employer's Personnel – (Sub-Consultants appointed by the Engineer)	1.1.2.6	Sub-Consultants appointed by the Engineer: <u>1. Chuttur & Partners Ltd of</u> Level 4, Editions Le Printemps Bldg., Club Road, Vacoas as ' Quantity Surveyors ' <u>2. Profive Ltd of</u> Level 5, Hyvec Business Park, Lot 15A3, Wall St, Cybercity, Ebene as ' MEP Engineers '
Employer's Personnel – (Consultants appointed by the Employer)	1.1.2.6	N/A
Time for Completion of the works	1.1.3.3	154 Calendar Days
Defects Notification Period	1.1.3.7	365 days
Electronic transmission systems	1.3	Electronic mails and facsimiles
Governing Law	1.4	Republic of Mauritius
Ruling Language	1.4	English
Language for communications	1.4	English
Time for the Parties entering into a Contract Agreement	1.6	Twenty-Eight (28) days from date of receipt of Contract Agreement
Time for access to the site	2.1	Within Fourteen (14) days from date of Letter of Acceptance.
Engineer's Duties and Authority	3.1	All variations with cost implication greater than MUR 25,000 shall require approval of the Employer.
Amount of Performance Security	4.2	The performance security will be in the form of a performance bond in the amount of Fifteen per cent (15%) of the Accepted Contract Amount including VAT in Mauritian Rupees.

ITEM	CLAUSE	DATA
Normal working hours	6.5	In compliance with the Workers' Rights Act 2019 and with any latest Regulations and subject to Client's approval.
Commencement of works	8.1	Within 14 days after the Contractor receives the Letter of Acceptance or within 7 days from handing over of site whichever is later
Programme	8.3	Within 7 days after the commencement of works.
Delay damages for the works	8.7 & 14.15 (b)	MUR 25,000 per calendar day
Maximum amount of delay damages	8.7	Limited to 10% of accepted Contract Amount
Clause 8.9 Consequences of suspension – Sub clause (b) Payment of any such cost, which shall be included in the contract price	8.9	Delete Sub-Clause 8.9 (b) in its entirety
Completion of Outstanding work and Remedying Defects (Time to Complete Outstanding work)	11.1 (a)	35 days
Completion of Outstanding work and Remedying Defects (Penalty for failure Time to Complete any Outstanding work/Defects)	11.1 (a)	MUR 5,000 per day
Completion of Outstanding work and Remedying Defects (Time to remedy defects or damage)	11.1 (b)	35 days
Completion of Outstanding work and Remedying Defects (Penalty for failure to remedy any Defects or damage)	11.1 (b)	MUR 5,000 per day
Adjustment for changes in cost	13.8	No escalation on Contract Amount shall be permitted.
Advance payment	14.2	Fifteen per cent (15%) of the Accepted Contract Amount, excluding Provisional and Contingency Sum, in Mauritian Rupees against Bank Guarantee.

ITEM	CLAUSE	DATA
Start repayment of advance payment, Repayment amortization of advance payment	14.2 (a) 14.2 (b)	(i) The Advance shall be released only after obtaining an unconditional bank Guarantee from an approved local commercial bank for the amount of advance to be released and valid for the contract period. (ii) It shall be ensured that at any point of time, Bank Guarantee is available for the amount of outstanding advance. (iii) The recovery shall commence after value of works, including value of materials on/off site and variations, has reached Ten per cent (10%) of the accepted Contract Amount, excluding Provisional and Contingency Sums but including Variations. The recovery of the advance payment shall be based on the percentage of work completed to total value of works. The entire amount together shall be recovered by the time Eighty per cent (80%) of the work is completed.
Percentage of retention	14.3	Ten per cent (10%) of the Accepted Contract Amount including value of Materials on/off site and Variations.
Limit of Retention Money	14.3	Ten per cent (10%) of the Accepted Contract Amount and Variations.
Plant and Materials for payment when shipped en route for site	14.5 (b)	Not applicable
Plant and Materials for payment	14.5 (c)	Eighty per cent (80%) of Cost of Resilient flooring (multi-use sport flooring) as approved by the Engineer, upon submission of Cession of Rights, identification labels, insurance cover for storage areas and subject to Conditions stated. Retention will be held on value of Resilient Flooring certified.
Minimum amount of Interim Payment Certificates	14.6	Ten per cent (10%) of the Accepted Contract Amount
Delayed Payment	14.8	Simple interest as specified by Central Bank plus 3%
Currency/Currencies of payment	14.15	MUR (Mauritian Rupees)
Periods for submission of insurance: Evidence of insurance and Relevant policies	18.1	Fourteen (14) days from date of issue of letter of acceptance.
Insurance of works and Contractor equipment	18.2	Contract Price + 15% for Consultant fees, including VAT.
Minimum amount of deductible for insurance of the employer's risks	18.2 (d)	All liability under this contract is in the scope of Contractor
Insurance against value of existing premises Insurance against Injury to Persons and Damage to Property	18.3	(i) Minimum amount of Value of Existing Building for Insurance Purpose - MUR 50.00 Million (ii) Minimum amount of third party insurance - MUR 20.00 Million amount of each occurrence. Number of occurrences – unlimited.

ITEM	CLAUSE	DATA
Insurance for Contractor Personnel and Employer's Representative and Consultants	18.4	Loss and damage of Construction plant & Equipment - MUR 200,000.00
		Contractor's workforce - MUR 5.00 Million
		Contractor's site personnel - MUR 5.00 Million
		Employer's Representatives and dedicated personnel - MUR 5.00 Million
		Consultants – Engineer and other Subconsultants - MUR 5.00 Million
Appointment of the Dispute Adjudication Board	20.2	Delete the Sub clause 20.2 in its entirety
Failure to agree Dispute Adjudication Board	20.3	Delete the Sub clause 20.3 in its entirety
Arbitration	20.6	Arbitration Law – Law of Republic of Mauritius.

PARTICULAR CONDITIONS OF CONTRACT

PARTICULAR CONDITIONS OF CONTRACT

- | | |
|-------------------|---|
| NOTE (1) : | The clause numbers hereinafter referred are equivalent to the Clauses in the General Conditions. These amendments to the General Conditions set out hereafter shall be deemed to be incorporated in them. The Particular Conditions shall prevail over those of the General Conditions. |
| NOTE (2) : | The words ' Bid ', ' Bidding ' and ' Bidder ' in the bidding document shall be synonymous to ' Tender ', ' Tendering ' and ' Tenderer '. |
| NOTE (3) : | Wherever in the General Conditions, it is specified provisions including the expression " Cost plus reasonable profit " and " Cost plus profit " is to be deleted and is to be replaced by " Cost only ". |

CLAUSE 1 **GENERAL PROVISIONS**

Sub-Clause 1.1.1.1 **The Contract**

Delete **Sub-Clause 1.1.1.1** and replace with

"Contract' means 'the Contract Agreement (if completed), the Letter of Acceptance, The Conditions of Contract and The Particular Conditions, Addendum to Bid Documents (if any), the Letter of Bid, the Specifications, the Drawings, the completed Schedules, the Performance Security and Guarantees, the Insurance Policies, the Annexes to the Bid Documents and such further documents as may be expressly incorporated in the Letter of Acceptance or Contract Agreement (if completed)'.

Sub-Clause 1.1.2.4 **Engineer**

The term '**Engineer**' throughout all the 'General Conditions' or 'Particular Conditions' shall also mean '**Project Coordinator**'.

Sub-Clause 1.1.2.6 **Employer's Personnel**

Amend **Sub-para 1.1.2.6** by adding "*The Engineer shall appoint the Sub Consultants as named in the Appendix to Tender, to assist the Engineer in carrying out of his duties under **Sub-Clause 3.2** of the General Conditions.*"

Sub-Clause 1.1.2.9 **DAB**

Delete whole of **Sub-Clause 1.1.2.9**, in its entirety.

Sub-Clause 1.1.3 **Datas, Test, Periods and Completion**

Amend **Sub-Para. 1.1.3.6** by replacing “*provisions of the Particular Conditions*” with “*Specifications*”

Sub-Clause **Provisional Sum**
1.1.4.10

Add the words ‘*and Prime Cost Sum*’ after ‘*Provisional Sum*’ in the heading and lines 1, 2 and 3.

Sub-Clause 1.3 **Communications**

Delete the following in line 1 and 2:

“wherever these Conditions provide for the giving or issuing of approvals, certificates, consents, determinations, notices and requests”
and replace by “*All communications and*”

Sub-Clause 1.5 **Priority of Documents**

Delete **Sub-Clause 1.5** and replace with the following:

“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**

Delete ‘*Particular Conditions*’ in line 3 and replace with ‘*Bidding Documents*’.

Sub-Clause 1.8 **Care and Supply of Documents**

Delete ‘*two copies of the Contract and of each subsequent Drawing*’ in lines 2 and 3 of first paragraph and replace with ‘*one copy of the Contract and two copies of each subsequent Drawing*’.

Sub-Clause 1.9 **Delayed Drawings and Instructions**

Delete the words ‘*plus reasonable profit*’ in item (b) of the second paragraph and the word ‘*profit*’ in the last paragraph.

Delete ‘*such extension of time, cost or profit*’ in lines 3 and 4 of final paragraph and replace with ‘*such extension of time or cost*’.

Sub-Clause 1.10 **Employer's Use of Contractor's Documents**

Delete the words '*on site or other places as envisaged by the Contract*' in **Sub-Clause 1.10(c)**.

At the end of **Sub-Clause 1.10**, add the following paragraph:

"The Contractor shall allow the Employer and his personnel to use and copy the Contractor's Documents and and communicate with statutory authorities as may be required for obtention of permits and approvals to comply with statutory obligations'.

Sub-Clause 1.12 **Confidential Details**

Delete this **Sub-Clause 1.12** in its entirety and replace as follows:

"The Contractor's and the Employer's Personnel shall disclose all such confidential and other information as may be reasonably required in order to verify the Contractor's compliance with the Contract and allow its proper implementation.

Each of the Parties shall treat the details of the Contract as private and confidential, except to the extent necessary to carry out their respective obligations under the Contract or to comply with application Laws. Each of them shall not publish or disclose any particulars of the Works prepared by the other Party without the previous agreement of the other Party. If any dispute arises as to the necessity of any publication or disclosure of the details of the Contract, the same shall be referred to the Employer whose determination shall be final. The Contractor shall ensure that the requirements imposed on the Contractor by this Sub-Clause apply equally to each Subcontractor."

Sub-Clause 1.13 **Compliance with Laws**

Add the following at the end of **Sub-Clause 1.13 (b)**:

"unless the Contractor is impeded to accomplish these actions and shows evidence of its diligence."

Add the following additional para as **Sub-Clause 1.13 (c)**:

"The Contractor shall acquaint himself and comply with all regulations in respect of import of plant and equipment, materials, fiscal taxes, custom duties, registration duties, local taxes, transfer of capital etc., including all regulations in respect of employment of labour force and other personnel, and the provisions of the Environment Act of 1991, all Regulations and Acts in respect to Covid-19 and any new regulations which will come into force."

No Claim whatsoever from the Contractor for additional payment will be entertained by the Employer on grounds of any misunderstanding or misinterpretation in respect of any above matter or otherwise."

CLAUSE 2 **THE EMPLOYER**

Sub-Clause 2.1 **Right of Access to the Site**

Delete the words '*the right and possession may not be exclusive to the Contractor*' in line 2 and 3 of the first paragraph and add the following to **Sub-Clause 2.1**.

'The Contractor shall allow access to the Employer's Personnel and other Contractors appointed by the Employer to execute special works or other works and shall allow the said Personnel and other Contractors access to any part of the Works either completed in whole or in part to enable them to proceed with their works'.

Delete the words '*such extension of time, cost and profit*' in lines 3 and 4 of the final paragraph and replace by '*such extension of time or cost*'.

Sub-Clause 2.2 **Permits, Licences or Approvals**

Delete the whole of **Sub-Clause 2.2** and replace with the following:

'the Employer shall (where he is in a position to do so) provide reasonable assistance to the Contractor, at the request of the Contractor, for the Contractor's applications for any permits, licences or approvals required by the Laws of the Country.

- a) which the Contractor is required to obtain under **Sub-Clause 1.13***
- and*
- b) for custom clearance of materials and goods'..*

Sub-Clause 2.4 **Employer's Financial Arrangements**

Delete whole of **Sub-Clause 2.4**, in its entirety.

CLAUSE 3 **THE ENGINEER**

Sub-Clause 3.1 **Engineer's Duties and Authority**

Amend **Sub-Clause 3.1** by replacing the word "may" in the first sentence of the third paragraph with the word "shall".

Amend Subpara. (b) of **Sub-Clause 3.1** by deleting the word "and" at the end.

Amend Subpara. (c) of **Sub-Clause 3.1** by inserting "and" at the end.

Add new para as **Sub-Clause 3.1 (d)**:

"(d) any act by the Engineer in response to a Contractor's request except otherwise expressly specified shall be notified in writing to the Contractor within 28 days of receipt.

The following provisions also shall apply:

The Engineer shall obtain the specific approval of the Employer before taking action under the following Sub-Clauses of these Conditions:

*(i) **Sub-Clause 4.12** [Unforeseeable Physical Conditions]: Agreeing to or determining an extension of time and/or additional cost.*

*(ii) **Sub-Clause 13.1** [Right to Vary]: Instructing a Variation, except if such a Variation would increase the Accepted Contract Amount by an amount as approved by the Employer which would be formalised after award of the Contract.*

Sub-Clause 3.1
(continued)

(iii) **Sub-Clause 13.3** [Variation Procedure]: Approving a proposal for Variation submitted by the Contractor in accordance with **Sub-Clause 13.1** [Right to Vary] or **13.2** [Value Engineering], except if such a Variation would increase the Accepted Contract Amount by an amount as approved by the Employer which would be formalised after award of the Contract.

Notwithstanding the obligation, as set out above, to obtain approval, if, in the opinion of the Engineer, an emergency occurs affecting the safety of life or of the Works or of adjoining property, he may, without relieving the Contractor of any of his duties and responsibility under the Contract, instruct the Contractor to execute all such work or to do all such things as may, in the opinion of the Engineer, be necessary to abate or reduce the risk. The Contractor shall forthwith comply, despite the absence of approval of the Employer, with any such instruction of the Engineer. Within 7 days of having issued such emergency instructions, the Engineer shall submit written documentation of such instructions to the Employer. The Engineer shall determine an addition to the Contract Price, in respect of such instruction, in accordance with Clause 13 [Variations and Adjustments] and shall notify the Contractor accordingly, with a copy to the Employer."

Sub-Clause 3.2 **Delegation by the Engineer**

The Engineer has appointed the following Sub-Consultants to assist the Engineer in carrying out their duties as per **Clause 3.0** of the Conditions of Contract.

1. Chuttur & Partners Ltd of
Level 4, Editions Le Printemps Bldg,
Club Road, Vacoas as '**Quantity Surveyors**'

2. Profive Ltd of
Level 5, Hyvec Business Park, Lot 15A3, Wall St,
Cybercity, Ebene as '**MEP Engineers**'

The appointed Sub-Consultants shall be delegated with duties relevant to their respective fields in their specified professions as per the Contract and such other cognate duties to assist the Engineer in the Performance of the Engineer assignment.

Sub-Clause 3.3 **Instructions of the Engineer**

Delete '*within two working days*' and replace with '*within seven working days*' in line 2 of **Sub-Clause 3.3(b)**.

Delete '*within two working days*' and replace with '*within seven working days*' in line 1 of **Sub-Clause 3.3(c)**.

At the end of **Sub-Clause 3.3**, add the following paragraph:

'If the Contractor fails or refuses to comply with any instruction issued by the Engineer, the Employer may after Seven (7) days' notice from the Engineer to the Contractor requiring such compliance, carry out or employ other Contractors to do so. All costs incurred shall be recoverable by the Employer against the Contractor'.

Before the start of the Works the Contractor must check all the documents including, construction drawings, submitted and notify the Engineer of any errors, omissions or contradictions or discrepancy for the Engineer's final decision. No claim shall be entertained if the Contractor have carried out the work without checking the documents including construction drawings which have resulted in abortive works.

If in the opinion of the Contractor an instruction goes beyond his contractual obligations and which may give rise to claims, he shall give notice to the Engineer within a period of seven days, following the date of issue of the instruction. Beyond that period of seven days, no claim shall be accepted. Such claim shall not suspend the execution of the written instruction unless the Engineer instruct otherwise.

CLAUSE 4 **THE CONTRACTOR**

Sub-Clause 4.2 **Performance Security**

Delete the following in lines 2 to 5 of the second paragraph:

"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"

and replace by

"The Performance Security shall be in the form of a Bank Guarantee issued from a registered local commercial bank which shall be approved by the Employer and shall be in the form as annexed in the Bidding Documents".

Sub-Clause 4.3 **Contractor's Representative**

Add the following paragraph as last para:

"The Contractor's Representative shall be qualified and experienced, with at leastt a BSc in Engineering, with proven experience in concrete works."

The miminum number of years of Post Qualification experience of the Contract Manager shall be as stated in the Bidding Documents.

Sub-Clause 4.4 **Sub-Contractors**

Add the following at the end of Sub-Clause 4.4:-

The Contractor, when making application for subcontracting any parts of the works, for which the Subcontractor is not named in the Contract, or for replacing a named Subcontractor, shall submit a list of Subcontractors for approval by the Engineer, at least Twenty One (21) days before the Subcontractors are due to start works. The Engineer shall either consent or disagree with the list within Seven (7) days of receipt of the list. Rejection of such application shall not entitle the Contractor to any claim whatsoever.

Sub-Clause 4.8 **Safety Procedures**

Amend **Sub-Clause 4.8** by adding the following at the end:

"The Contractor shall notify the Engineer and the Employer within 48 hours or as soon as reasonably possible after the occurrence of any accident which has resulted in damage or loss of property, disability or loss of human life, or which has or which could reasonably be foreseen to have a material impact on the environment and shall submit to the Engineer and the Employer not later than 14 days after the occurrence of such an event a summary report thereof.

The Contractor shall also comply with the Occupational Safety and Health (Safety of Scaffolds) Regulations 2013."

Sub-Clause 4.10 **Site Data**

Delete **Sub-Clause 4.10** and replace with the following:

"The Contractor shall be deemed to have visited the site, the existing facilities where Works are to be carried out prior to the Submission of the Tender, and to ascertain the nature of the site and have full knowledge of the state of existing premises and its surrounding and out buildings. Under no circumstances will extension of time and any cost for whatsoever reason shall be entertained. Bidders have to allow in the tender all cost for working in such nature of the premises and constraints.

Sub-Clause 4.18 **Protection of the Environment**

Add the following paragraphs at the end of this Sub Clause:

"The Contractor shall comply with all conditions imposed by the Statutory Authorities and shall allow for the implementation of all measures and conditions prescribed.

The Contractor shall also comply with the Occupational, Health and Safety Act 2005 and such latest version of the Standing Regulations in respect of safety, security and protection of the environment as well as control of pollution, nuisance which include among others dust, mud, noise and the like, both on and off site.

The Contractor shall implement health and safety requirements in compliance with regulations and also the directives issued as a result of periodic inspections to be undertaken as part of the supervisory role required of the Engineer, to ensure compliance with the requirements of the aforesaid Act.

The Contractor shall be responsible for ensuring that all Subcontractor's and Contractor's Personnel understand and operate in accordance with the principles and requirements of the environmental and social impacts provisions of this Sub-Clause and that similar standards apply to the Subcontractor's environmental and social impacts management systems and social impacts performance.

The Contractor's program shall demonstrate clearly the procedures and methods of working that the Contractor and its Subcontractors will adopt to comply with the environmental and social impacts requirements of this Sub-Clause.

The Contractor shall ensure the adequate disposal of construction debris and like.

The Contractor shall restore the Site to original conditions or to a state as set out in the Specifications after the completion of the Works."

Sub-Clause 4.21 **Progress Reports**

Replace the words “monthly” by the word “fortnightly” and the word “month” by “fortnight” in the Sub-Clause.

CLAUSE 6 **STAFF AND LABOUR**

Sub-Clause 6.1 **Engagement of Staff and Labour**

Add ‘or the Schedules’ after ‘Specifications’ in line 1 of **Sub-Clause 6.1**.

Add the following paragraph to **Sub-Clause 6.1**:

‘The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labour within Mauritius’.

Sub-Clause 6.2 **Rate of Wage and Conditions of Labour**

Add the following to Sub-Clause 6.2.

The Contractor shall comply with the Workers' Rights Act 2019 and such other latest version of the Act.

Sub-Clause 6.5 **Working Hours**

Add the following to Sub-Clause 6.5

The Contractor shall comply with the Workers' Rights Act 2019 and such other latest version of the Act.

Sub-Clause 6.6 **Facilities for Staff and labour**

Insert ‘or in the Schedules’ after ‘Specification’ in line 1 and line 4 of first paragraph.

Sub-Clauses 6.12 Add the following as **Sub-Clauses 6.12 to 6.23** after **Sub-Clause 6.11 to 6.21**

Sub-Clause 6.12 Foreign Personnel

"The Contractor may bring in to the Country any foreign personnel who are necessary for the execution of the Works to the extent allowed by the applicable Laws. The Contractor shall ensure that these personnel are provided with the required residence visas and work permits".

"The Contractor shall be responsible for the return of these personnel to the place where they were recruited or to their domicile. 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".

Sub-Clause 6.13 Prohibition of Harmful Child Labour

"The Contractor shall not employ any child to perform any work that is economically exploitative, or is likely to be hazardous to, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development".

Sub-Clause 6.14 Employment Records of Workers

"The Contractor shall keep complete and accurate records of the employment of labour at the Site. The records shall include the names, ages, genders, hours worked and wages paid to all workers. These records shall be summarized on a fortnightly basis and submitted to the Engineer, and these records shall be available for inspection by auditors during normal working hours. These records shall be included in the details to be submitted by the Contractor under Sub-Clause 6.10 [Records of Contractor's Personnel and Equipment]."

Sub-Clause 6.15 Facilities for Staff and Labour

"The Contractor shall provide and maintain such accommodation and amenities as he may consider necessary for all his staff and labour, employed for the purposes of or in connection with the Contract, including all fencing, water supply (both for drinking and other purposes), electricity supply, sanitation, cookhouses, fire prevention and fire-fighting equipment, air-conditioning, cookers, refrigerators, furniture and other requirements in connection with such accommodation or amenities. The Site of Works and the neighbourhoods of the site shall not be permitted to be used as temporary camps/housing by the Contractor."

Sub-Clause 6.16 **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, rats or other pests nuisance, and to reduce the dangers 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."

Sub-Clause 6.17 **Epidemics**

"In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the Government, or the local medical or sanitary authorities, for the purpose of dealing with and overcoming the same".

Sub-Clause 6.18 **Burial of the Dead**

"The Contractor shall make all necessary arrangements for the transport, to any place as required for burial, of any of his expatriate employees or members of their families who may pass away in Mauritius. The Contractor shall also be responsible, to the extent required by the local regulations, for making any arrangements with regard to burial of any of his local employees who may pass away while engaged upon the Works."

Sub-Clause 6.19 **Supply of Foodstuffs**

"The Contractor shall arrange for the provision of a sufficient supply of suitable food at reasonable prices for all Contractor's Personnel for the purposes of or in connection with the Contract."

Sub-Clause 6.20 **Supply of Water**

"The Contractor shall, so far as is reasonably practicable, having regard to local conditions, provide on the Site an adequate supply of drinking and other water for the use of Contractor's Personnel."

Sub-Clause 6.21 **Alcoholic Liquor or Drugs**

"The Contractor shall not, otherwise than in accordance with the Statutes, Ordinances and Government Regulations or Orders for the time being in force in 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."

Sub-Clause 6.22 **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."

Sub-Clause 6.23 **Festivals and Religious Customs**

"The Contractor shall in all dealings with his staff and labour have due regard to all recognised festivals, days of rest and religious or other customs."

CLAUSE 7 **PLANT, MATERIALS AND WORKMANSHIP**

Sub-Clause 7.2 **Samples**

Delete the **Sub-para 7.2(b)** in its entirety and add the following;

"The Contractor shall submit samples of Materials and relevant information for the Engineer's consent as and when required, prior to using the Materials for the Works. The samples must be submitted within a reasonable time for the Engineer's review prior to fabrication and in the case of imported or manufactured items, prior to placing orders.

Samples shall be submitted with descriptive labels shall be duly referred to the item of Work described in Bills of Quantities and in schedule of specifications and with installation instructions to identify the manufacturer, source of origin, catalogues or manufacturer's references, as associated shop drawings in conformity with specifications, construction drawings and on items of works as described in the Scheduled bills of quantities. Where variations in texture, colour, grain or other characteristics are expected from the manufacture in the samples submitted, the Contractor shall indicate the extent of characteristics differentiations expected.

The Contractor shall execute samples of workmanship of intended various types of finishes of the items of the Work as and when instructed by the Engineer. The Contractor shall obtain the Engineer's approval of the respective samples of workmanship of the intended finishes of the items of work, components, elements, fittings, fixtures, accessories and the like before execution with the actual finished works.

The finished work shall correspond to the approved samples of materials and workmanship approved. These shall be maintained in good condition and suitably marked for identification. Such samples are to be provided at the expense of the Contractor and kept on site for verification by the Engineer."

Sub-Clause 7.3 **Inspection**

Add the following at the end of **Sub-Clause 7.3**:-

"If any inspection falls within the jurisprudence of statutory provisions of an Authority other than that of the Engineer, the Contractor must notify this Authority, with copy to the Engineer, of the date when the inspection is to be done."

Sub-Clause 7.6 **Remedial Work**

Add the following paragraph at the end of **Sub-Clause 7.6**:

"Notwithstanding the above, the Engineer shall not be bound to accept any defective Plant, Materials or work unremedied. In the event that the Contractor cannot remedy the defects therein, the Contract Price shall be reduced for the loss of value of the Works to the Employer or any savings in cost for the Contractor by not having to rectify the defective Plant, Materials or work whichever is greater."

Sub-Clause 7.7 **Ownership of Plant and Materials**

Amend **Sub-Clause 7.7** by replacing Subparas. (a) and (b) with the following:

'(a) when it is incorporated in the Works;'

*'(b) when the Contractor is paid the corresponding value of the Plant and Materials under **Sub-Clause 8.10***

Sub-Clause 7.9 **Quality of Materials, Plant, Supplies and Workmanship**

Add the following Sub-Clause 7.9:-

The Contractor is to be solely responsible for the supply of the materials required for the execution of the works. He shall ascertain himself of the availability of such materials.

The Contractor shall guarantee that the strength and quality of all materials supplied by him and all workmanship and he shall not be relieved of any of his obligations with respect to the sufficiency of the materials and works by reason of no objection having been taken by the Engineer although the same may have been inspected by him in regular course.

Sub-Clause 7.9
(continued)

The contractor shall furnish all information as to the quality, weight, constituent substances, dimension, levels, strength and description of the materials and works and give the Engineer such particulars as may be required.

All materials and things of any kind obtained from demolition found on or under the site or on or under any additional site which the Contractor may be allowed to occupy, shall remain the property of the Employer and shall not be used in the Works or sold or otherwise disposed of without the written authority of the Engineer.

Sub-Clause 7.10 **Site Installations**

Add the following Sub-Clause 7.10:-

(a) The Contractor shall provide, maintain and remove on completion of the Works all temporary facilities, mechanisms and the like to minimize pollution due to the Contractor's operations;

(b) The Contractor shall provide, maintain and remove on completion of the Works, hoarding, protection facilities, temporary works, the site installations including offices and provide appropriate security measures on access roads thereto, but without prejudice to his obligations including maintenance of free access for the Employer, the Engineer, other Contractors and any other persons entitled to such access

Sub-Clause 7.11 **Plant and Materials intended for the Works**

Add the following Sub-Clause 7.11:-

The Contractor shall, at his own risk, take the necessary precautions against his supplies, constructional plant and installations on the site from being swept away or damaged by cyclone, or any other atmospheric phenomena. It shall not be compensated for any difficulties arising during these events nor for loss, deterioration or damage due to negligence, lack of foresight or means, or to mishandling.

CLAUSE 8 **COMMENCEMENT, DELAYS AND SUSPENSION**

Sub-Clause 8.1 **Commencement of Works**

Delete 'within 42 days' in line 3 of the First Paragraph and replace by:

'within the number of days stated in the Appendix to Tender'

Sub-Clause 8.3 **Programme**

Delete 'within 28 days' in line 1 of the First Paragraph and replace by:

'within the number of days stated in the Appendix to Tender'

Sub-Clause 8.4 **Extension of Time for Completion**

Insert after **8.4 (c)** at the end of *climatic conditions*,

- " (1) Wind due to cyclone carrying a warning of class 3 or above;
(2) rainfall exceeding 50mm intensity during last 24 hours and continuous rainfall for 4 hours in the working area ; and
(3) flood as declared by the Meteorological Authority shall be considered as "exceptionally adverse climatic conditions."
(4) prevailing high winds as declared by the Meteorological Authority

The Contractor shall not be entitled to any claim whatsoever for additional payment for any extension of the time granted for exceptionally adverse climatic conditions as specified of the above events. No extension of the time for completion shall also be granted on the grounds of non-availability of labour or locally manufactured materials.

No extension of the time for completion shall be granted on the grounds of non-availability of labour or materials."

Sub-Clause 8.7 **Delay Damages**

Delete "subject to **Sub-Clause 2.5** (Employer's Claims)" in line 2

Add the following at the end:

(a) The delay damages shall be construed as liquidated damages for such default and not as a penalty.

(b) If the Contractor fails to complete the whole of the Works and or a section (if any) within the time for completion for the works or section, as stated in the Appendix to these Conditions or within any extended time fixed as per Sub Clause 8.4 of these Conditions, the Employer or the Engineer certifies in writing that in his opinion the same ought reasonably so to have been completed then the Contractor shall pay damages to the Employer the relevant sum stated in the Appendix to Bid as liquidated and Ascertained damages for such default and not as penalty. The Employer may without prejudice to any other method of recovery deduct the amount of such damages from any monies due or to become due to the Contractor.

Sub-Clause 8.9 **Consequences of suspension**

Delete **Sub-Clause 8.9 (b)** in its entirety.

Sub-Clause 8.12 **Resumption of Work**

Amend **Sub-Clause 8.12** by inserting the following at the end:

“after receiving from the Engineer an instruction to this effect under Clause 13 [Variations and Adjustments].”

CLAUSE 9 **TESTS ON COMPLETION**

Sub-Clause 9.5 **Pre-Completion Inspection**

Add new **Sub-Clause 9.5**:

‘Prior to any application for the Taking-Over Certificate, the Contractor shall issue a written request to the Engineer or the Employer’s Personnel to carry out a joint inspection of the Works completed with the Contractor. The said request shall be issued at least seven (7) days prior to the commencement of the said joint inspection.

If during the course of the said joint inspection, the Engineer or the Employer’s Personnel are of the opinion that there is any item of work, Plant and/or Materials which does not comply with the Contract in any respect and that the same should be re-done, remedied before the application of the Taking-Over Certificate, the Engineer shall instruct the Contractor to remedy or reconstruct the same to the satisfaction of the Engineer. The Contractor’s compliance therewith shall immediately be a condition precedent to the issue of the Taking-Over Certificate under Sub-Clause 10.1 unless the Engineer expressly consent with the approval of the Employer to accept any of the items of defective work, without their being remedied by the Contractor. In such event the Contract Price shall be reduced for any loss of value or otherwise suffered by the Employer, or by any saving in cost to the Contractor in carrying out the remedial work, whichever is the greater.

CLAUSE 11 **DEFECTS LIABILITY**

Sub-Clause 11.1 **Completion of Outstanding Work and Remedying Defects**

Add in **Subclause 11.1(a)**, in 2nd line, after the Engineer:

“All outstanding works shall be completed within 28 days after Engineer’s Instruction”.

Sub-Clause 11.3 **Extension of Defects Notification Period**

Add the words '*attributable to the Contractor*' at the end of the first sentence of the first paragraph.

Add the words '*for a cause for which the Contractor was not responsible*' after words '**Sub-Clause 8.8** (suspension of work)' in the second paragraph of **Sub-Clause 11.3**.

CLAUSE 12 **MEASUREMENT AND EVALUATION**

Sub-Clause 12.1 **Works to be measured**

Add the following at the end of first paragraph in **Sub-Clause 12.1:-**

"All quantities in the Contract bills are accurate and firm quantities, measured in accordance with the Principles of Measurement, as specified herein after. Quantities which are specified to be provisional quantities shall be measured and valued as per the provisions specified in this Sub-Clause. Any error in description or in quantity or omission of items of work from the Contract Bills shall not vitiate the Contract but shall be corrected and deemed to be a variation required by the Engineer."

Add at the end of second paragraph of Sub-Clause:-

"The Contractor shall maintain records of any works which will be hidden and shall obtain approval from the respective Consultants prior that such works are covered up for establishment of joint records, as agreed with Engineer."

Sub-Clause 12.2 **Method of Measurement**

Delete **Sub-Clause 12.2** and add the following:

The works shall be deemed to have been measured in accordance with the Principles of Measurement (International) for works of construction; July 1979 Edition, issued by the Royal Institution of Chartered Surveyors, as may be amended by the special requirements of the Bills of Quantities and/or specifications.

Sub-Clause 12.3 **Evaluation**

Amend the following in Sub-Clause 12.3:

- (a) (i) Read **25%** in lieu of **10%***
- (a) (ii) Read **0.20%** in lieu of **0.01%**.*
- (a) (iii) Read more than **10%** in lieu of **1%**.*

CLAUSE 13 **VARIATIONS AND ADJUSTMENTS**

Sub-Clause 13.1 **Right to Vary**

Amend **Sub-Clause 13.1** by inserting the following at the end of the first sentence of the second paragraph:

"or (ii) such Variation triggers a substantial change in the sequence or progress of the Works."

Sub-Clause 13.7 **Adjustments for changes in Legislation**

Amend **Sub-Clause 13.7** by adding the following to the end of the first paragraph:

"provided, that no such adjustment will be made on account of any change in the Laws of the Country related to Taxes other than Value Added Tax."

Sub-Clause 13.8 **Adjustments for changes in Cost**

Delete **Sub Clause 13.8** and replace as follows:

"The Contract Price and all tenders rates and prices shall remain firm and fixed for the whole duration of the contract and no escalation or adjustment for whatsoever reason will be allowed."

CLAUSE 14 **CONTRACT PRICE AND PAYMENT**

Sub-Clause 14.1 **The Contract Price**

Delete **Sub-Clause 14.1(a)** in its entirety.

Delete at lines 3 and 4 of paragraph **14.1(b)** the following:

*"except as stated in **Sub Clause 13.7** (Adjustments for changes in Legislation)"*

Delete **Subpara 14.1 (c)** in its entirety and replace instead as follows:

*"Any quantities which may be set out in the Bills of Quantities or other schedules shall be deemed to be firmed and fixed quantities and shall reflect the scope of work to be executed, except for provisional quantities, as specified shall be subject to remeasurement, unless otherwise agreed and shall be used for the purpose of **Clause 12**, provided no gross error is noted in the quantities."*

Sub-Clause 14.2 **Advance Payment**

Delete **Sub-Clause 14.2** in its entirety and add the following:

(i) The total Advance payment shall be as stated in the Appendix to the Conditions of Contract and shall be released only after obtaining an unconditional Bank Guarantee from an approved local commercial 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 reimbursement and shall be at the expense of the Contractor.

(ii) It shall be ensured that at any point of time, Bank Guarantee is available for the amount of outstanding advance.

(iii) The recovery shall commence after value of works, including value of materials on/off site and variations, has reached Ten per cent (10%) of the accepted Contract Amount, excluding Prime Cost, Provisional and Contingency Sums but including Variations. The entire amount together with interest shall be recovered by the time Eighty per cent (80%) of the work is completed.

Sub-Clause 14.3 **Application for Interim Payment Certificates**

Delete sub-paragraph (b) in its entirety.

Sub-Clause 14.4 **Schedule of Payments**

Delete **Sub-Clause 14.4** in its entirety and replace with the following:

*"Interim payments shall be by periodic monthly valuation of the amounts referred to in **Sub-Clause 14.3**."*

Sub-Clause 14.5 **Plant and Materials intended for the Works**

Delete **Sub-Clause 14.5** in its entirety and replace by:

Upon delivery of unfixed materials on site or offsite (offsite shall not mean outside Mauritius) for the Permanent Work, payments may be made to the extent of the percentage as stated in the Appendix to Tender of the cost of the materials calculated on the basis of certified invoices.

Advances on materials shall continue throughout the period of execution of the works except that no advance shall be made on any material which in the opinion of the Engineer has been brought on to the site prematurely or is not properly stored or is in excess of the quantities required to complete the works as detailed in the approved programme of work or is not in accordance with the requirements of the Contract or not protected against loss, damage or deterioration.

The Payment of any sum by way of advance on any material shall not prejudice the right of the Engineer to reject such material.

The Contractor shall furnish to the Engineer such records, invoices, insurance cover, proof of identification, vouchers, cession of rights or other documents as the Engineer may require for determining the quantities of materials and the values thereof for the purposes of making the said advances.

Sub-Clause 14.8 **Delayed Payment**

Amend this Sub Clause as follows:

"If the Contractor does not receive payment in accordance with Sub Clause 14.7 (Payment), the Contractor shall be entitled to receive the financing charges as simple interest on the amount unpaid at the Interest Rate established by the Central Bank plus 3% for the period from the final date for payment until payment is made".

Sub-Clause 14.9 **Payment of Retention Money**

Delete 'latest of the expiry dates of the Defects Notification Periods' in line 1 of second paragraph and replace by 'issuance of the Performance Certificate under Sub-Clause 11.9.'

At the end of **Sub-Clause 14.9**, add the following paragraphs:

"Notwithstanding the above,

(i) the Engineer shall not be bound to certify the payment of the first half or first proportion unless he receives the conforming documents from the Contractor. Such confirming documents shall include insurance policies and performance security valid to the end of the Defects Notification Period, test certificates, indemnities and warranties, guarantees, as-built drawings, operating and maintenance manuals and any other documents as called for in the Contract which are to be submitted by the Contractor following completion of the Works.

(ii) the Contractor shall make an application for release of any money due."

Sub-Clause 14.11 **Application of Final Payment Certificate**

Amend **Sub-Clause 14.11** by inserting the following in the first sentence of the second paragraph after 'may reasonably require':

"within 28 days from receipt of the said draft"....

Sub-Clause 14.16 **Employer's Final Statement**

Add the following **Sub-Clause 14.16**:

"The Engineer may (but shall not be bound to) proceed to prepare the Final Statement and issue the Final Payment Certificate if the Contractor fails to submit a draft final statement under Sub-Clause 14.11 after 28 days from the date of his receipt of the Engineer's notice requiring him to submit the same. The final statement prepared by the Engineer under this Sub-Clause shall in the absence of any written dispute by the Contractor with 28 days from the date of its receipt by the Contractor be deemed to be final and conclusive."

CLAUSE 16 **SUSPENSION AND TERMINATION BY CONTRACTOR**

Sub-Clause 16.1 **Contractor's Entitlement to Suspend Work**

Delete 'Sub-Clause 2.4 (Employer's Financial Arrangements) or' in lines 2 & 3 of first paragraph.

Sub-Clause 16.2 **Termination by Contractor**

Delete **Sub-Clause 16.2 (a)** in its entirety.

Delete **Sub-Clause 16.2 (c)** in its entirety.

Amend **Sub-Clause 16.2 (d)** by adding the following at the end:

"in such manner as to materially and adversely affect the economic balance of the Contract and/or the ability of the Contractor to perform the Contract,"

Delete **Sub-Clause 16.2 (e)** in its entirety.

Sub-Clause 16.4 **Payment on Termination**

Delete sub-paragraph (c) and replace with the following:

'(c) pay to the Contractor the amount of any direct loss and/or damage sustained by the Contractor as a result of this termination'.

CLAUSE 17 **RISK AND RESPONSIBILITY**

Sub-Clause 17.1 **Indemnities**

Amend **Sub-Clause 17.1 (b)** by replacing part the first line *"damage to or loss of property"* with *"damage to or loss of property including any property outside the site"*.

Sub-Clause 17.3 **Employer's Risks**

Amend **Sub-Clause 17.3** by replacing the first line with the following:-

"The Employer's risks, in so far as they directly affect the execution of the Works are:"

Delete **Sub-para 17.3 (c)** in its entirety.

Add the following at the end of **Sub -para to 17.3 (h)**

Cyclones shall be considered as a cause arising and shall not be regarded as an "Employer's Risks".

Sub-Clause 17.6 **Limitation of Liability**

Amend **Sub-Clause 17.6** by replacing the first paragraph with the following:

*“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 as specifically provided in **Sub-Clause 8.7** [Delay Damages]; **Sub-Clause 11.2** [Cost of Remedying Defects]; **Sub-Clause 15.4** [Payment after Termination]; **Sub-Clause 16.4** [Payment on Termination]; **Sub-Clause 17.1** [Indemnities]; **Sub-Clause 17.4 (b)** [Consequences of Employer’s Risks] and **Sub-Clause 17.5** [Intellectual and Industrial Property Rights].”*

CLAUSE 18 **INSURANCE**

Sub-Clause 18.1 **General Requirements for Insurances**

Amend **Sub-Clause 18.1** by adding the following at the end:

“The insuring Party shall be entitled to place all insurance relating to the Contract including, but not limited to the insurance referred to Clause 18 [Insurance] with Insurers company licensed in the Republic of Mauritius.

Add the following at the end of **Sub-Clause 18.1**:

“The insurance shall be taken in the joint names of the Contractor and the Employer.”

Sub-Clause 18.3 **Insurance against Injury to Persons and Damage to Property**

Delete **Sub-para 18.3 (d) (ii)** in its entirety and add the following after the last paragraph:

“The Contractor shall also insure against damages caused to Existing Building for a minimum value as stated in the Appendix to Tender”

“The Contractor shall also insure against Employer's Representative for the amount stated in the Appendix to Tender”

Sub-Clause 18.4 **Insurance for Contractor’s Personnel**

Add the following at the end of **Sub-Clause 18.4**:

The insurance policy must include a clause forbidding their cancellation without the Insurer giving prior notice to the Employer.

CLAUSE 19 **FORCE MAJEURE**

Sub-Clause 19.1 **Definition of Force Majeure**

Add the following at the end of **Sub-Clause 19.1**:

"Provided always that Cyclones Warning Class 3 and above and including Torrential rains causing Flash Floods as declared by Meteorological Authority and as experienced in Mauritius shall not be considered as Force Majeure."

Sub-Clause 19.4 **Consequences of Force Majeure**

Amend **Sub-Clause 19.4** by inserting the following at the end of Subpara. (b):

", including the costs of rectifying or replacing the Works and/or Goods damaged or destroyed by Force Majeure, to the extent they are not indemnified through the insurance policy referred to in Sub-Clause 18.2 [Insurance for Works and Contractor's Equipment]."

CLAUSE 20 **CLAIM, DISPUTES AND ARBITRATION**

Sub-Clause 20.1 **Contractor's Claims**

Delete Para 6 from **Sub-Clause 20.1**, and replace as follows: -

*"The Engineer shall respond with approval or with disapproval any detailed comments on the claim received. The Engineer may also request any further particulars but shall give his principles on the claim and making any determination, subject to **Sub-Clause 3.5** of the Conditions, but not later than the date for the issue of the Performance Certificate under **Sub-Clause 11.9** of the Conditions."*

Sub-Clause 20.2 **Appointment of the Dispute Adjudication Board**

Delete Sub-Clause in its entirety.

Sub-Clause 20.3 **Failure to Agree Dispute Adjudication Board**

Delete Sub-Clause in its entirety.

Sub-Clause 20.4 **Obtaining Dispute Adjudication Board's Decision**

Delete Sub-Clause in its entirety and replace with:

*'All references in the Conditions of Contract to **Sub-Clauses 20.2, 20.3 and 20.4** shall throughout these conditions be deemed to read as **Sub-Clause 20.4**'.*

'If a dispute of any kind whatsoever arises between the Employer and the Contractor in connection with, or arising out of, the Contract or the execution of the Works, whether during the execution of the Works or after their completion and whether before or after repudiation or other termination of the Contract, including any dispute as to any opinion, instruction, determination, certificate or valuation of the Engineer, the matter in dispute shall, in the first place, be referred in writing to the Engineer, with a copy to the other party. Such reference shall state that it is made pursuant to this Clause. No later than the eighty-fourth (84th) day after the day on which he received such reference, the Engineer shall give notice of his decision to the Employer and the Contractor. Such decision shall state that it made pursuant to this Clause.

Unless the Contract has already been repudiated or terminated, the Contractor shall, in every case, continue to proceed with the Works with all due diligence and the Contractor and the Employer shall give effect forthwith to every such decision of the Engineer unless and until the same shall be revised, as hereinafter provided, in an amicable settlement or an arbitral award.

If either the Employer or the Contractor be dissatisfied with any decision of the Engineer, or if the Engineer fails to give notice of his decision on or before the eight-fourth (84th) day after the day on which he received the reference, then either the Employer or the Contractor may, on or before the seventieth (70th) day after the day on which the said period of 84 days expired, as the case may be, give notice to the other party, with a copy for information to the Engineer, of his intention to commence arbitration, as hereinafter provided, as to the matter in dispute.

*Such notice shall establish the entitlement of the party giving the same to commence arbitration, as hereinafter provided, as to such dispute and, subject to **Sub-Clause 20.7** of Particular Conditions no arbitration in respect thereof may be commenced unless such notice is given.*

Sub-Clause 20.4
(continued)

If the Engineer has given notice of his decision as to a matter in dispute to the Employer and the Contractor and no notice of intention to commence arbitration as to such dispute has been given by either the Employer or the Contractor on or before the seventieth (70th) day after the day on which the parties received notice as to such decision from the Engineer, the said decision shall become final and binding upon the Employer and the Contractor'.

Sub-Clause 20.5 **Amicable Settlement**

Replace 'on or after the fifty sixth day' in line 4 with 'after eighty fourth (84th) day'.

Sub-Clause 20.6 **Arbitration**

Delete the Sub-Clause in its entirety and replace with:

"Unless settled amicably, any dispute in respect of which:

- (a) the decision, if any, of the Engineer has not become final and binding pursuant to **Sub-Clause 20.4**, and*
- (b) amicable settlement has not been reached within the period stated in **Sub-Clause 20.5**, shall be settled by an Arbitrator to be agreed by both parties and failing agreement, an Arbitrator nominated by a Judge sitting in Chambers in Mauritius.*

The said arbitrator(s) shall have full power to open up, review and revise any decision, opinion, instruction, determination, certificate or valuation of the Engineer related to the dispute.

*Neither party shall be limited in the proceedings before such arbitrator(s) to the evidence or arguments put before the Engineer for the purpose of obtaining his said decision pursuant to **Sub-Clause 20.4**. No such decision 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. Arbitration may commence prior to or after completion of the Works, provided that the obligations of the Employer, the Engineer and the Contractor shall not be altered by reason of the arbitration being conducted during the progress of the Works.*

The cost of the Arbitration shall be borne by the LOSING PARTY."

Sub-Clause 20.7 **Failure to comply with Dispute Adjudication Board's Decision**

Delete the Sub-Clause in its entirety and replace with:

Failure to comply with Engineer's Decision

*'Where neither the Employer nor the Contractor has given notice of intention to commence arbitration of a dispute within the period stated in **Sub-Clause 20.4** and the related decision has become final and binding, either party may, if the other party fails to comply with such decision, and without prejudice to any other rights it may have, refer the failure to arbitration in accordance with **Sub-Clause 20.6**. The provisions of **Sub-Clauses 20.4 and 20.5** shall not apply to any such reference'.*

Sub-Clause 20.8 **Expiry of Dispute Adjudication Board's Appointment**

Delete this **Sub-Clause 20.8** in its entirety.

Sub-Clause 20.9 **Place of Arbitration**

Add the following New **Sub-Clause 20.9**:

The place of arbitration shall be in Mauritius. Arbitration shall be conducted according to the Laws of Mauritius and in English Language.

ADD NEW CLAUSE – 21 TAXES

Sub-Clause 21.1 **Foreign Taxation**

The prices bid by the Contractor shall include all taxes, duties and other charges imposed outside Mauritius on the production, manufacture, sale and transport of the Contractor's equipment, plant, materials and supplies to be used on or furnished under the Contract, and on the services performed under the Contract.

Sub-Clause 21.2 **Local Taxation**

The prices bid by the Contractor, with the exception of Value Added Tax, shall include all customs duties, import duties, business taxes and income and other taxes that may be levied in accordance to the laws and regulations of the Republic of Mauritius on the Contractor's Equipment, Plant, materials and supplies acquired for the purpose of the Contract and on the services performed under the Contract. Nothing in the Contract shall relieve the Contractor from his responsibility to pay any tax that may be levied in the Republic of Mauritius in respect of the Contract.

Sub-Clause 21.3 **Income Tax on Staff**

The Contractor's staff, personnel and labour will be liable to pay personal income taxes in Mauritius in respect of such of their salaries and wages as are chargeable under the laws and regulations for the time being in force, and the Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such laws and regulations.

ADD NEW CLAUSE – 22 FRAUD AND CORRUPTION

Sub-Clause 22.1 Add new **Sub-Clause 22.1**

If the Employer determines that the Contractor has engaged in corrupt, fraudulent, collusive, coercive or obstructive practices, in competing for or in executing the Contract, then the Employer may, after giving 14 days notice to the Contractor, terminate the Contractor's employment under the Contract and expel him from the Site.

Sub-Clause 22.2 Add new **Sub-Clause 22.2**

Should any employee of the Contractor be determined to have engaged in corrupt, fraudulent, collusive, coercive, or obstructive practice during the execution of the Works, then that employee shall be removed in accordance with Sub Clause 6.9.

Sub-Clause 22.3 Add new **Sub-Clause 22.3**

- (i) “corrupt practice” is the offering, giving, receiving or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;
- (ii) “fraudulent practice” is any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;
- (iii) “collusive practice” is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;
- (iv) “coercive practice” is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

Sub-Clause 22.3
(continued)

- (v) “obstructive practice” is
 - (a) deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede an investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or
 - (b) acts intended to materially impede the exercise of an inspection and audit rights provided for under **Sub-Clause 22.4**.

Sub-Clause 22.4 Add new **Sub-Clause 22.4**

The Contractor shall permit persons appointed by the Employer to inspect the Site and/or the accounts and records of the Contractor and its sub-contractors relating to the performance of the Contract, and to have such accounts and records audited by auditors appointed by the Employer if required by the Employer. The Contractor’s attention is drawn to **Sub-Clause 24** which provides, inter alia, that acts intended to materially impede the exercise of the inspection and audit rights provided for under **Sub-Clause 22.4** constitute a prohibited practice subject to contract termination.

SECTION VI
CONTRACT FORMS

Section VIII. - Contract Forms

Table of Forms

Notification of Award..... 2

Contract Agreement 3

Performance Security..... 4

Advance Payment Security 5-6

**NOTIFICATION OF AWARD/
LETTER OF ACCEPTANCE**

Notification of Award

LETTER OF ACCEPTANCE

[letterhead paper of the Employer]

[date]

To: *[name and address of the Contractor]*

This is to notify you that your Bid dated *[date]* for execution of the *[name of the Contract and identification number, as given in the Contract Data]* for the Accepted Contract Amount of the equivalent of *[amount in numbers and words] [name of currency]*, as corrected and modified in accordance with the Instructions to Bidders, is hereby accepted by our Agency.

You are requested to furnish the Performance Security within 28 days in accordance with the Conditions of Contract, using for that purpose one of the Performance Security Forms included in Section VIII, Annex to the Particular Conditions - Contract Forms, of the Bidding Document

Authorized Signature: _____

Name and Title of Signatory: _____

Name of Agency: _____

Attachment: Contract Agreement

CONTRACT AGREEMENT

Contract Agreement

THIS AGREEMENT made the _____ day of _____, _____, between _____ of _____ (hereinafter “the Employer”), of the one part, and _____ of _____ (hereinafter “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 Bid 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 Contract documents referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement. This Agreement shall prevail over all other Contract documents.

- (i) the Letter of Acceptance
- (ii) the Bid Submission Form and Appendices
- (iii) the addenda Nos _____ (if any)
- (iv) the Particular Conditions
- (v) the General Conditions;
- (vi) the Specification, Appendices
- (vii) the Drawings; and
- (viii) the Priced Bills of Quantities,

3. In consideration of the payments to be made by the Employer to the Contractor as indicated in this Agreement, the Contractor hereby covenants with the Employer to execute the Works and to remedy defects therein in conformity in all respects 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 or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of _____ on the day, month and year indicated above.

Signed by _____ (for the Employer)

Signed by _____ (for the Contractor)

PERFORMANCE SECURITY

Performance Security

(Demand Guarantee)

.....*Bank's Name and Address of Issuing Branch or Office*.....

Beneficiary:*Name and Address of the Employer*.....

Date...

PERFORMANCE GUARANTEE No.:.....

We have been informed that*name of the Contractor*..... (hereinafter called "the Contractor") has entered into Contract No.....*reference number of the Contract*..... dated..... with you, for the execution of *name of Contract and brief description of Works*(hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance security is required.

At the request of the Beneficiary, we *name of Bank*hereby irrevocably undertake to pay you within Five working days any sum or sums not exceeding in total an amount of *amount in figures (amount in words)*..... such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation(s) under the Contract, without your needing to prove or to show grounds for your demand or the sum specified therein.

This guarantee shall expire not later than twenty-eight days from the date of issuance of the Certificate of Completion/Acceptance Certificate, calculated based on a copy of such Certificate which shall be provided to us, or on the.....day of,, whichever occurs first. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 758. (Applicable to overseas contractor only).

.....*Seal of bank and*

Signature(s).....

ADVANCE PAYMENT SECURITY

Advance Payment Security

Demand Guarantee

_____ *[Bank's Name, and Address of Issuing Branch or Office]*

Beneficiary: _____ *[Name and Address of Employer]*

Date: _____

ADVANCE PAYMENT GUARANTEE No.: _____

We have been informed that _____ *[name of Contractor]* (hereinafter called "the Contractor") has entered into Contract No. _____ *[reference number of the contract]* dated _____ with you, for the execution of _____ *[name of contract and brief description of Works]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, an advance payment in the sum _____ *[amount in figures]* (_____) *[amount in words]* is to be made against an advance payment guarantee.

At the request of the Beneficiary, we _____ *[name of Bank]* hereby irrevocably undertake to pay you within Five working days any sum or sums not exceeding in total an amount of _____ *[amount in figures]* (_____) *[amount in words]*¹ upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation under the Contract because the Contractor used the advance payment for purposes other than the costs of mobilization in respect of the Works.

It is a condition for any claim and payment under this guarantee to be made that the advance payment referred to above must have been received by the Contractor on its account number _____ at _____ *[name and address of Bank]*.

¹ The Guarantor shall insert an amount representing the amount of the advance payment and denominated either in the currency(ies) of the advance payment as specified in the Contract, or in a freely convertible currency acceptable to the Employer.

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Contractor as indicated in copies of interim statements or payment certificates which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of a copy of the interim payment certificate indicating that eighty (80) percent of the Contract Price has been certified for payment, or on the ___ day of ___, 2___,² whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 758.

[signature(s)]

Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.

² Insert the expected expiration date of the Time for Completion. The Employer should note that in the event of an extension of the time for completion of the Contract, the Employer would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Employer might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [six months][one year], in response to the Employer's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."

ANNEX 1
TENDER DRAWINGS

**UPGRADING WORKS IN GYMNASIUM AND SWIMMING
POOL AT SBM PARK LA VIGIE**
List of TENDER Drawings

Drawing No	Rev	Drawing Title
24-108-L0	T0	GENERAL NOTES
24-108-L1	T0	EXISTING GROUND FLOOR PLAN - GYMNASIUM
24-108-L2	T0	REMEDIAL WORKS TO GYMNASIUM FLOOR AND DRAIN DETAILS
24-108-L3	T0	SWIMMING POOL REMEDIAL WORKS
24-108-L4	T0	DRAIN DETAILS ON PERIMETER OF GYMNASIUM

1. GENERAL

- G1. The Engineer's drawings are to be read in conjunction with ARCHITECTS and OTHER CONSULTANTS' drawings, specifications and with such other written instruction as may be issued during the course of the contract. All discrepancies shall be referred to the Engineer for decision before proceeding with the works and/or ordering materials.
- G2. All dimensions relevant to setting out and off site work shall be verified by the Contractor and the Contractor shall seek approval from the ARCHITECT before construction and fabrication is commenced.
- G3. During construction, the Contractor shall be responsible for maintaining the structure in a stable condition and ensuring no part shall be overstressed under construction activities.
- G4. A written approval for the substitution of any material, along with any cost implications, shall be sought by the Contractor from the Engineer before proceeding with work and/or ordering materials.
- G5. All dimensions are in millimetres unless stated otherwise (i.e 10x550 means 10 metres and 550 millimetres). All levels are expressed in metres unless stated otherwise (i.e 10.500 means 10½ metres). The drawings shall not be scaled.
- G6. These notes are to be read in conjunction with the Engineer's Specifications.

2. STRUCTURAL CONCRETE

- C1. All workmanship and materials shall be in accordance with BS 8110 "Structural use of concrete" and the Engineer's "Specification for Concrete". The Engineer's Specification shall take precedence on any requirement of BS 8110 in case of inconsistency.
- C2. Construction of water retaining structures shall be in accordance with BS 8007 "Design of concrete structures for retaining aqueous liquids, and the Engineer's "Specification for Concrete". The Engineer's Specification shall take precedence on any requirement of BS 8007 in case of inconsistency.
- C3. Minimum cover (mm) to all reinforcement unless otherwise shown shall be as follows:-

Substructure Element	Cover (mm)
(a) Foundation against earth face	75
(b) Foundation against blinding	50
(c) Wall below ground or against water face	40
(d) Column with least dimension > 200 mm	35
(e) Ground beams	30
(f) Slab on fill	≤ 200 mm
(g)	35
	35

Superstructure Element

(g)	Column with least dimension > 200 mm ≤ 200 mm	35 30
(h)	Beams and wall	35
(i)	Suspended slabs internally	25
(j)	Suspended slabs externally	30

- C4. Sizes of concrete elements and levels do not include thickness of applied finishes.
- C5. Beam depths are written first and include slab thickness.
- C6. No holes, chases or embedment of pipes other than those shown on the Engineer's drawings shall be made in concrete members without prior written approval of the Engineer.
- C7. Shop drawings for formwork including the location of shoring, restoring and also calculation for its design when specially asked: shall be submitted for a written approval by the Engineer before proceeding with fabrication.
- C8. For construction joints and expansion/contraction joints in floor slab, refer to clauses 2.25 and 2.26 respectively of the Engineer's "Specification for Concrete".
- C9. For design mix of concrete refer to clauses 2.09 and 2.10 of the Engineer's "Specification for Concrete".
- C10. For extra reinforcement detail at construction joints in suspended slab, refer to detail given on drawing L00.
- C11. Reinforcement is represented diagrammatically and not necessarily shown in true projection.
- C12. Splices in reinforcement shall be made only in the positions shown or as otherwise approved by the Engineer in writing.
- C13. Welding of reinforcement and/or use of mechanical couplers shall not be permitted without the approval of the Engineer.
- C14. All reinforcement bars shall be securely supported in its correct position during concreting by approved bar chairs, spacers or support bars.
- C15. Reinforcement shall be checked by the Engineer and a written approval of the Engineer should be obtained before concreting.
- C16. Removal of formwork - Written request with cube test results and the drawings showing the area of formwork to be stripped, along with adjacent areas of formwork to be left, with dates concreted shall be submitted to the Engineer for approval. Refer to clause 2.30 of the Engineer's "Specification for Concrete".

- C17. Reinforcement symbols
All reinforcement shall comply with MS 10 Mauritian standard for steel bars for the reinforcement of concrete
T - Hot rolled deformed bar - grade 460 (i.e minimum yield strength 460 N/mm²)
R - Structural grade mild steel plain round bar - grade 250 (i.e minimum yield strength 250 N/mm²)
The number following the bar symbol is the nominal bar diameter in millimetres.
- C18. Concrete grades shall be as specified and as follows unless shown otherwise on drawings:-

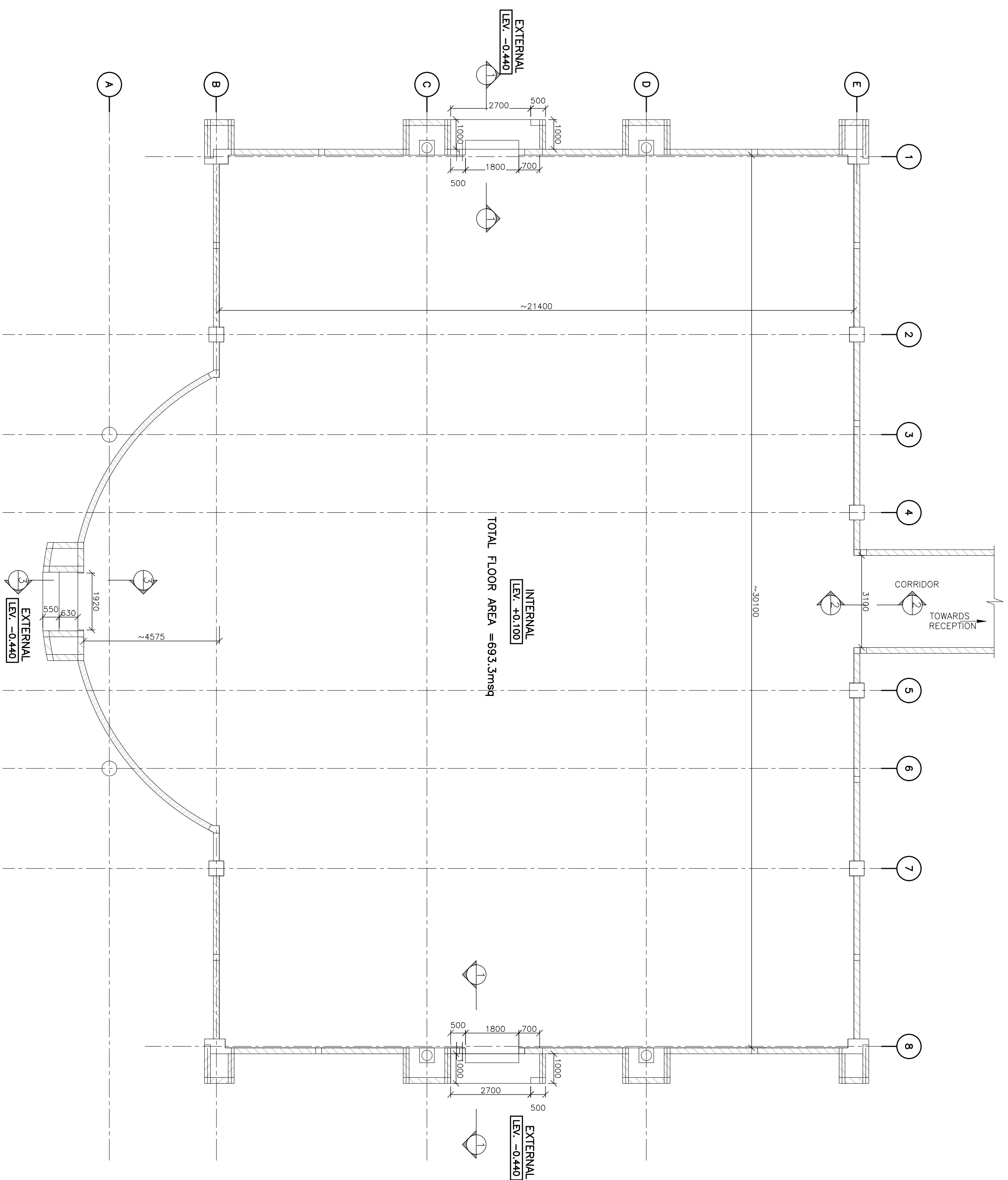
Element	Grade of Concrete	f_{cu} (Mpa)
All structural concrete unless otherwise shown	30/20	30
Water retaining structures	35/20	35
Binding and mass concrete	15/20	15
Infill concrete to blockwall	20/20	20

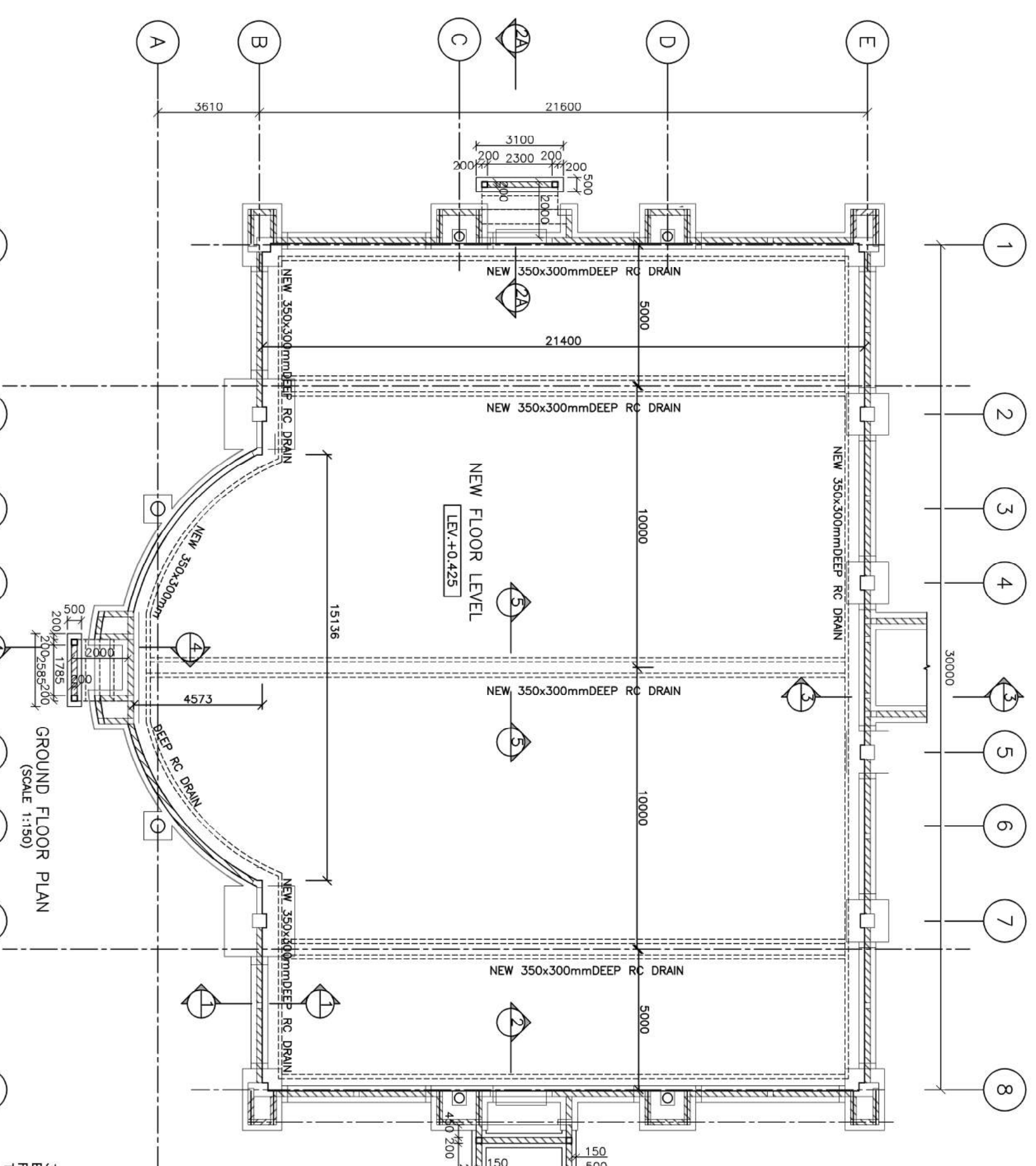
- C19. Curing of concrete shall be carried out as per clause 2.23 of the Engineer's "Specification for Concrete".
- C20. Contractor shall submit compliance certificate for all structural concrete and concrete material.
- C21. Tests shall be carried out by the MSB or other approved authority as specified and/or where so required by the Engineer.

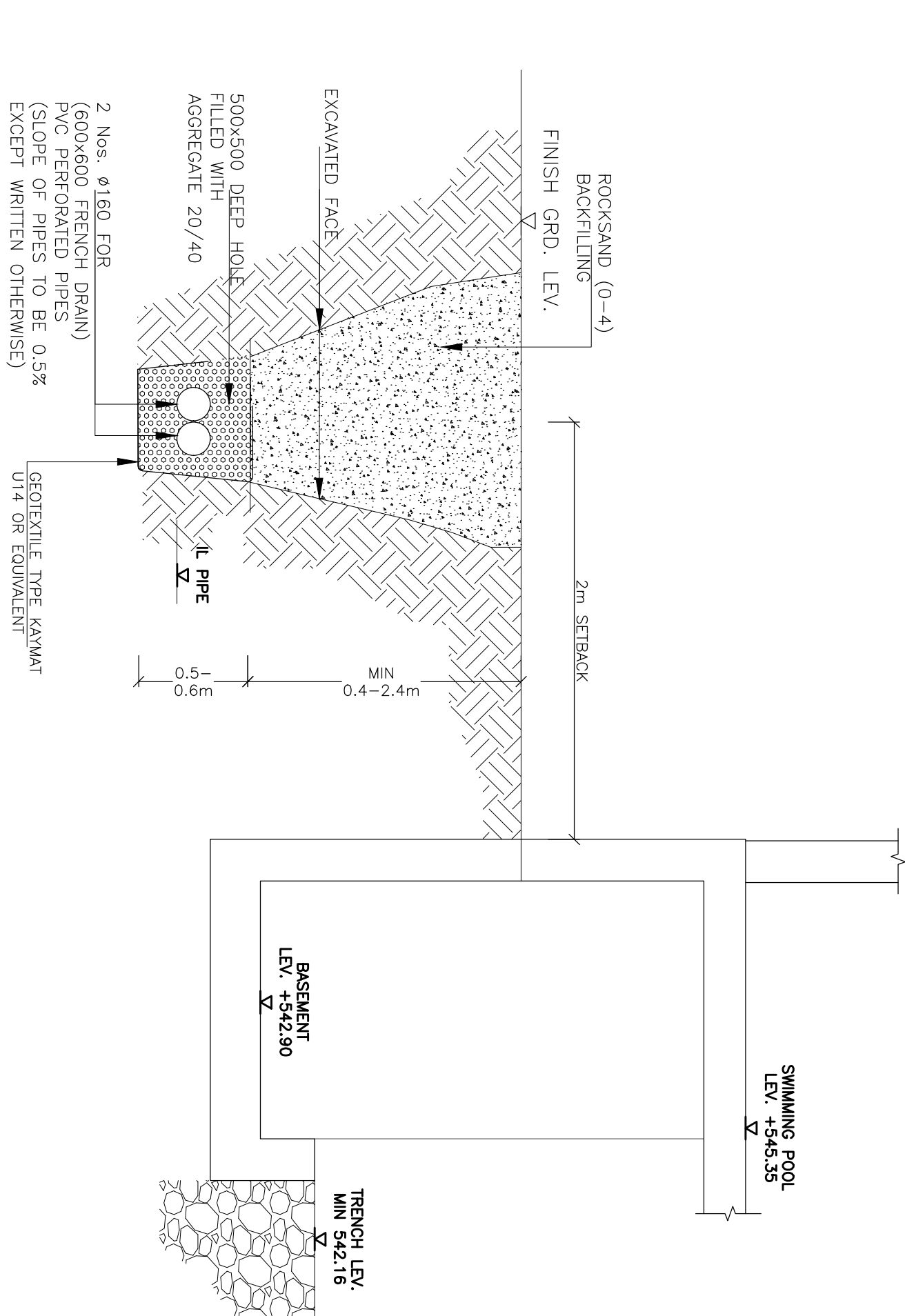
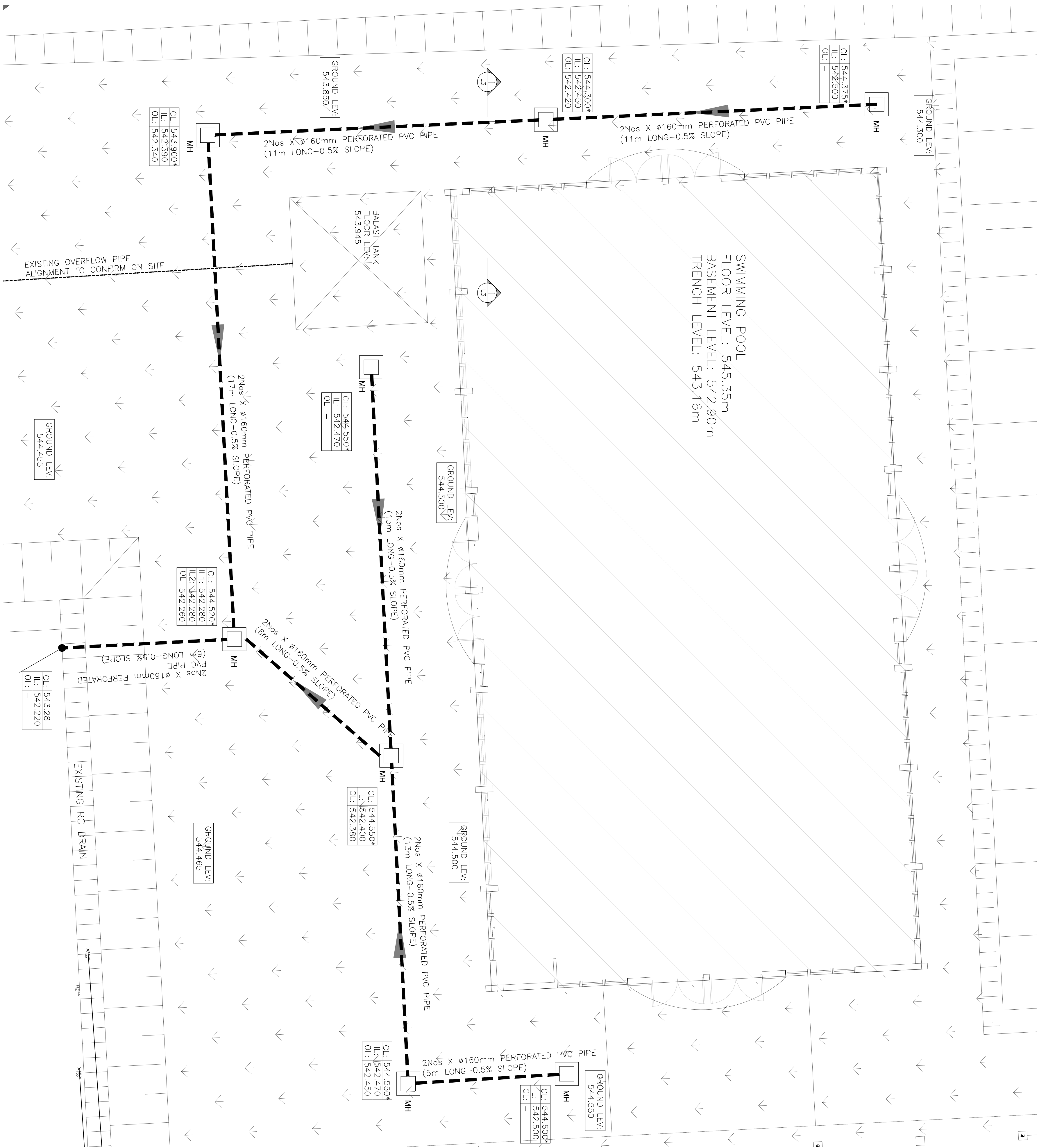
3. FOUNDATION

- F1. All materials and workmanship shall be in accordance with BS 8004 "Code of practice for foundations" and the Engineer's "Specification for Excavation, Underfloor / Hardcore Filling". The Engineer's Specification shall take precedence on any requirement of BS 8004 in case of inconsistency.
- F2. Pad and strip footing shall be founded at depth below ground level shown on the drawings or as instructed on site by the Engineer. The Engineer's written approval is required before blinding of any foundation.
- F3. Backfilling / Filling shall be carried out in sequence shown on the drawings.
- F4. Temporary supporting works for excavation and dewatering shall be Contractor's responsibility. Details and calculations for these to be submitted for Engineer's written approval before commencement of works.

[illegible]



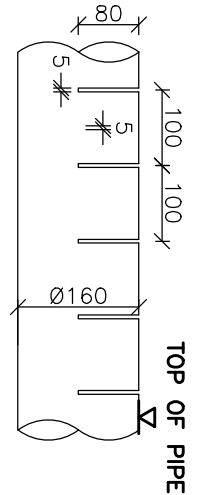




TYPICAL DETAILS OF 500x500mm FRENCH DRAIN
SCALE 1:25

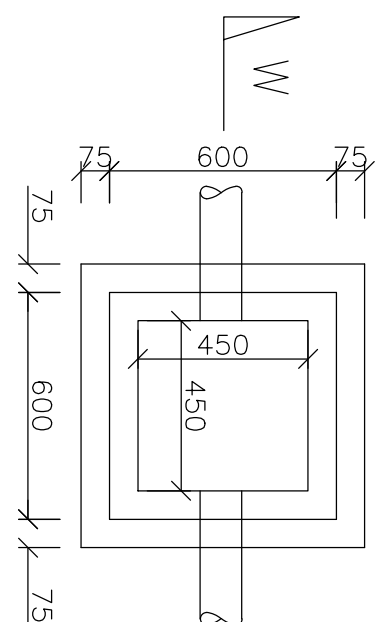
LEGEND

CL – COVER LEVEL
IL – INLET INVERT LEVEL
OL – OUTLET INVERT LEVEL
FRENCH DRAIN WITH ø160mm PERFORATED PVC PIPE
NOTE: PERFORATION ON TOP
MH – MANHOLE

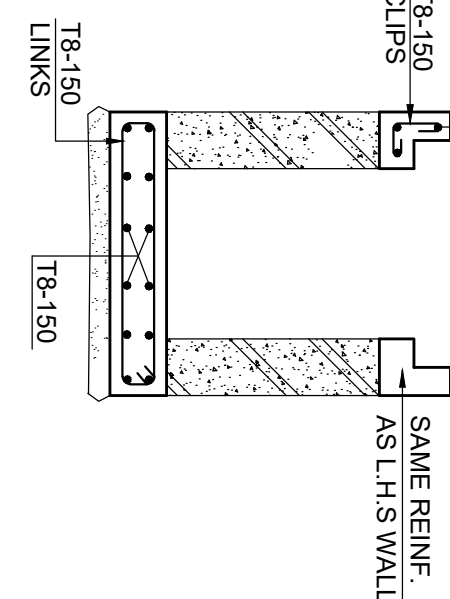


DETAIL OF ø160 PVC PERFORATED PIPE
SCALE 1:10

REINFORCEMENT DETAIL



SECTION W-W



REV	Date	Issues	REV	By	Date	Description
TO	06.10.25	FOR TENDER				

NOTES :

- CONTRACTOR TO DO SETTING OUT AND PROVIDE IBM OF MANHOLES AND CALL FOR INSPECTION.
- CONTRACTOR TO PROVIDE APPROPRIATE SHORING AND STRUCTURING TO REMAIN SIDE OF EXCAVATED TRENCH.
- ALL DIMENSION MARKED WITH • TO BE CONFIRMED ON SITE.

SJP **SERVANSINGH JADAV & PARTNERS**
CONSULTING ENGINEERS LIMITED

7, Penny Oliver Street Beau-Bassin, Mauritius.
Tel: (230)466-2777 – Fax: (230)467-7984.
E-mail: administration@spsc.com
Web Site: www.spsc.com
BRR: C06019291

CLIENT	SBM BANK (MAURITIUS) LTD.
DRAWING TITLE	NEW FRENCH DRAIN AT SWIMMING POOL

PROJECT DESCRIPTION	UPGRADING WORKS IN GYMNASIUM AND SWIMMING POOL AT SBM PARK LA VIGIE
---------------------	---

Drawn	RS		
Checked	RG		
Date	OCTOBER 2025		
Format A1	Format A2	Format A3	
Scale 1:100, ISO 1:25			
Drawing Number	24-108-L3		Rev.
			T0

