



**THE MUNICIPAL CITY COUNCIL
OF PORT LOUIS**

BIDDING DOCUMENTS

Issued on: 18th August 2017

for

Procurement of

**Construction of Drains and Related
works within The Municipal City
Council Area of Port Louis**

Procurement Reference No: ONB/CCPL/005/17

Open National Bidding

Public Body (Employer):

THE MUNICIPAL CITY COUNCIL OF PORT LOUIS

CITY HALL, PORT LOUIS

Tel: 4056600 Fax: 2124258

Standard Bidding Document

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PART 1 – Bidding Procedures

Section 1 - Instructions to Bidders

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Section I - Instructions to Bidders

General

1. **Scope of Bid**
 - 1.1 The Public Body as defined¹ in Section II “Bidding Data Sheet” (**BDS**) also referred to herein as Employer invites bids for the construction of Works, as **described in the BDS** and Section VII, “Particular Conditions of Contract” (**PCC**).

The name and identification number of the Contract are **provided in the BDS and the PCC**.
 - 1.2 The successful Bidder shall be expected to complete the Works by the Intended Completion Period **specified in the BDS**.
 - 1.3 Throughout these bidding documents, the terms:
 - (a) “writing” means any typewritten or printed communication, including e-mail and facsimile transmission,
 - (b) “day” means calendar day, and
 - (c) Singular also means plural.
2. **Source of Fund**
 - 2.1 The Works shall be financed by the Public Body’s own budgetary allocation, **unless otherwise stated in the BDS**.
3. **Challenge and Appeal**
 - 3.1 Unsatisfied bidders shall follow procedures prescribed in Regulations 48, 49 and 50 of the Public Procurement Regulations 2008 to challenge procurement proceedings and award of procurement contracts or to file application for review at the Independent Review Panel.
 - 3.2 Addresses to forward Challenges or Application for Review are **specified in the BDS**.
4. **Fraud and Corruption**
 - 4.1 The Government of the Republic of Mauritius requires that bidders/suppliers/contractors, participating in procurement in Mauritius, observe the highest standard of ethics during the procurement process and execution of contracts.
 - 4.2 Bidders, suppliers and public officials shall be aware of the provisions stated in sections 51 and 52 of the Public Procurement Act which can be consulted on the website of the Procurement Policy Office (PPO): ppo.govmu.org

¹ See Section IV, “General Conditions of Contract,” Clause 1. Definitions.

- 4.3 The Employer will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for the contract in question;

For the purposes of this Sub-Clause:

- (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;
 - (v) “obstructive practice” is 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
- 4.4 The Employer commits itself to take all measures necessary to prevent fraud and corruption and ensures that none of its staff, personally or through his/her close relatives or through a third party, will in connection with the bid for, or the execution of a contract, demand, take a promise for or accept, for him/herself or third person, any material or immaterial benefit which he/she is not legally entitled to. If the Employer obtains information on the conduct of any of its employees which is a criminal offence under the relevant Anti-Corruption Laws of Mauritius or if there be a substantive suspicion in this regard, he will inform the relevant authority (ies) and in addition can initiate disciplinary actions. Furthermore, such bid shall be rejected.

5. Eligible Bidders

5.1 (a) In accordance with CIDB Act 2008, Contractors currently operating in the construction industry have the statutory obligation to be registered with the Construction Industry Development Board (CIDB) accordingly.

(b) Subject to paragraph (e), Foreign contractors as defined in the CIDB Act will have to apply for and obtain a Provisional Registration prior to bidding for this project. If the contract is awarded to the foreign contractor the latter shall have to apply for and obtain a Temporary Registration before starting the project.

(c) Contractors whether local or foreign under an existing or intended joint venture will be eligible as a joint venture if, in addition to their respective individual registration, they obtain a Provisional Registration for the joint venture prior to bidding for this project. If an existing or intended joint venture is awarded the contract it shall have to apply for a Temporary Registration prior to starting the project.

(d) Sub-contractors undertaking works for value Rs 500 000 or above are subject to registration as applicable to Contractors.

(e) Paragraph (b) shall not apply to Foreign contractors who have been carrying construction works in the construction industry during the 20 years preceding 01 March 2017; and where at least two-thirds, or such other percentage as may be prescribed, of the total number of its or his employees are as citizens of Mauritius.

(f) A Foreign contractor referred to in paragraph (e) shall, for the purpose of registration, make an application with the CIDB and obtain a valid registration certificate prior to bidding for this project.

(g) Bidders are strongly advised to consult the website of the CIDB cidb.govmu.org for further details concerning registration of contractors.

5.2 (a) Subject to ITB 5.6, a Bidder, and all parties constituting the Bidder, may have the nationality of any country except in the case of open national bidding where the bidding documents may limit participation to citizens of Mauritius or entities incorporated in Mauritius, if so qualified in the BDS.

(b) Bidder may be natural person, private entity, or government-owned entity or any combination of them in the form of a joint venture.

(c) Bids submitted by a joint venture of two or more firms as partners shall comply with the following requirements, unless

otherwise stated in the **BDS**:

- (i) the Bid shall include all the information listed in ITB Sub-Clause 6.2 below for each joint venture partner;
- (ii) the Bid shall be signed so as to be legally binding on all partners;
- (iii) the Bid shall include a copy of the agreement entered into by the joint venture partners defining the division of assignments to each partner and establishing that all partners shall be jointly and severally liable for the execution of the Contract in accordance with the Contract terms; alternatively, a Letter of Intent to execute a joint venture agreement in the event of a successful bid shall be signed by all partners and submitted with the bid, together with a copy of the proposed agreement;
- (iv) one of the partners shall be nominated as being in charge, authorized to incur liabilities, and receive instructions for and on behalf of any and all partners of the joint venture; and
- (v) the execution of the entire Contract, including payment, shall be done exclusively with the partner in charge.

5.3 A Bidder shall not have a conflict of interest. All Bidders found to have a conflict of interest shall be disqualified. A Bidder may be considered to have a conflict of interest with one or more parties in this bidding process, if :

- (a) they have a controlling partner in common; or
- (b) they receive or have received any direct or indirect subsidy from any of them; or
- (c) they have the same legal representative for purposes of this bid; or
- (d) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the Bid of another Bidder, or influence the decisions of the Employer regarding this bidding process; or
- (e) a Bidder participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all Bids in which the party is involved. However, this does not limit the inclusion of the same subcontractor in more than one

bid; or

- (f) a Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the contract that is the subject of the Bid; or
- (g) a Bidder, or any of its affiliates has been hired (or is proposed to be hired) by the Employer as Engineer for the contract.

5.4 (a) A bidder that is under a declaration of ineligibility by the Government of Mauritius in accordance with applicable laws at the date of the deadline for bid submission and thereafter shall be disqualified

(b) Bids from contractors appearing on the ineligibility lists of African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development, Inter-American Development Bank Group and World Bank Group shall be rejected.

Links for checking the ineligibility lists are available on the PPO's website: ppo.govmu.org

5.5 Government-owned enterprises in the *Republic of Mauritius* shall be eligible only if they can establish that they are legally and financially autonomous and operate under commercial law, and that they are not a dependent agency of the Government.

6. Qualifications of Bidders

6.1 All bidders shall provide in Section III, a preliminary description of the proposed work method and schedule, including drawings and charts, as necessary.

6.2 Bidders shall include the information and documents listed hereunder with their bids, unless otherwise **stated in the BDS**. If, after opening of bids, it is found that any document is missing, the Employer may request the submission of that document subject to clause 30. The non-submission of the documents by the Bidder within the prescribed period may lead to the rejection of its bid.

(a) valid registration certificate with the CIDB;

(b) copies of original documents defining the constitution or legal status, place of registration, and principal place of business of the Bidder;

(c) major items of construction equipment proposed to carry out the Contract;

(d) qualifications and experience of key site personnel and technical personnel proposed for the contract;

- (e) report on the financial standing of the Bidder for the last three years, such as certified copies of Financial Statements/Audited Accounts as filed at the Registrar of Companies before the deadline set for submission of bids;
 - (f) evidence of adequacy of cash-flow capital for this Contract (access to line(s) of credit and availability of other financial resources);
 - (g) authority to seek references from the Bidder's bankers;
 - (h) information regarding any litigation, current or during the last five years, in which the Bidder was/is involved, the parties concerned, the issues involved, the disputed amounts, and awards; and
 - (i) proposals for subcontracting components of the Works amounting to more than 10 percent of the Contract Price.
- 6.3 To qualify for award of the Contract, bidders shall meet the following minimum qualifying criteria:
- (a) duly registered with the CIDB under the grade that would allow him to perform the value of works for which he is submitting his bid
 - (b) registered with the CIDB under the class(es) and field of specialisation **specified in the BDS**;
 - (c) proposals for the timely acquisition (own, lease, hire, etc.) of the essential equipment **listed in the BDS**;
 - (d) a Contract Manager/Supervisor with five years' experience in works of an equivalent nature and volume, including no less than three years as Manager or as otherwise **specified in the BDS**; and
 - (e) liquid assets and/or credit facilities, net of other contractual commitments and exclusive of any advance payments which may be made under the Contract, of no less than the amount **specified in the BDS**.²
- Pending litigations against the Applicant or any partner of a Joint Venture may result in Disqualification.

Contents of Bidding Document

7. Sections of Bidding

- 7.1 The Bidding Document consists of all the Sections indicated below, and should be read in conjunction with any Addenda

² Usually the equivalent of the estimated payments flow over 4-6 months at the average (straight line distribution) construction rate. The actual period of reference shall depend on the speed with which the Government shall pay the Contractor's monthly certificates.

Document

issued in accordance with ITB 10.

Section I - Instructions to Bidders (ITB)
Section II- Bidding Data Sheet
Section III - Bidding Forms
Section IV - Evaluation Criteria
Section V - Employer's Requirements
Section VI – General Conditions of Contract
Section VII- Particular Conditions of Contract
Section VIII - Contract Forms

7.2 The Invitation for Bids issued by the *Employer* is not part of the Bidding Document.

8. Clarification of Bidding Document

8.1 A prospective Bidder requiring any clarification of the Bidding Document shall contact the *Employer* in writing at the *Employer's* address **indicated in the BDS**.

The *Employer* will respond in writing to any request for clarification, provided that such request is received 15 days prior to the deadline for submission of bids.

Should the *Employer* deem it necessary to amend the Bidding Document as a result of a request for clarification, it shall do so following the procedure under ITB 10.

9. Site visit/Pre-bid meeting

9.1 Bidders, at the Bidders' own responsibility and risk, are encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing their Bids and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidders' own expense.

9.2 The Bidder or its designated representative is invited to attend a pre-bid meeting, as **provided for in the BDS**. The purpose of the pre-bid meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.

10. Amendment of Bidding Document

At any time prior to the deadline for submission of bids, the *Employer* may amend the Bidding Document by issuing addenda and extend the deadline for submission of bids, if needed.

Preparation of Bids

- 11. Cost of Bidding** 11.1 The Bidder shall bear all costs associated with the preparation and submission of its Bid, and the *Employer* shall in no case be responsible or liable for those costs irrespective of the outcome of the bidding process.
- 12. Language of Bid** 12.1 The Bid, supporting documents as well as all correspondence relating to the bid exchanged by the Bidder and the *Employer* shall be in English Language.
- 13. Documents Comprising the Bid** 13.1 The Bid shall comprise the following:
- (a) Bid submission Form (in the format indicated in Section III);
 - (b) Qualification information and documentary evidence establishing the Bidder's qualifications to perform the contract;
 - (c) Technical Proposal as per ITB 18.1;
 - (d) completed Bill of Quantities / Activity Schedule;
 - (e) Bid Security as per the format provided in section III or as a subscription to a Bid Securing Declaration in the Bid Submission Form; and
 - (f) any other material required to be completed and submitted by bidders, as specified in ITB **and the BDS**.
- 14. Bid Submission Form and Schedules** 14.1 The Bid Submission Form, Schedules, and all documents listed under ITB 13.1 shall be prepared using the relevant forms, if so provided.
- 15. Alternative Proposal** 15.1 Alternative Technical Proposals and completion dates if allowed shall be indicated in Section V- Specifications. The evaluation methodologies for their consideration shall be given in Section IV.
- 16. Bid Prices and Discounts** 16.1 The Contract shall be for the whole Works, as described in ITB Sub-Clause 1.1, based on the priced Activity Schedule/Bill of Quantities³ submitted by the Bidder.
- 16.2 Bidders shall fill in rates and prices for all items of the Works described in the Bill of Quantities.⁴ Items for which no rate or price is entered by Bidders, shall not be paid for by the Public Body when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities. Corrections, if any, shall be made by crossing out, initialing,

³ In lump sum contracts, delete "priced Bill of Quantities" and replace with "priced Activity Schedule."

⁴ In lump sum contracts, delete "described in the Bill of Quantities" and replace with "described in the drawings and specifications and listed in the Activity Schedule."

dating and rewriting.

16.3 All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date 14 days prior to the deadline for submission of bids, shall be included in the rates, prices, and total Bid price submitted by Bidders.⁵

16.4 The price to be quoted in the Bid Submission Form shall be the total price of bid after any discount offered.

The discount if any and the conditions of its application shall be indicated separately.

17. Currencies of Bid and Payment

17.1 The bid price and rates shall be in Mauritian Rupees and fixed for the duration of the contract unless otherwise **specified in the BDS.**

17.2 Unless otherwise **specified in BDS** interim payment for Plant and Material on site is applicable as per GCC 39.7.

18. Documents Comprising the Technical Proposal

18.1 The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in the Bidder Qualification Form (section III), in sufficient details to demonstrate the adequacy of the Bidders' proposal to meet the work requirements and the completion time.

19. Period of Validity of Bids

19.1 Bids shall remain valid for a period of 90 days after the bid submission deadline prescribed by the *Employer unless otherwise specified in the BDS.*

19.2 In exceptional circumstances, prior to expiry of the original bid validity period, the Employer may request that the bidders extend the period of validity for a specified additional period. The request and the responses thereto shall be made in writing.

20. Bid Security/Bid Securing Declaration

20.1 The Bidder shall furnish either a subscription to a Bid Securing Declaration or a Bid Security in its original form with its bid as part of its bid, if so **required in the BDS.**

20.2 Bid Security shall be in the form of a Bank Guarantee from a local commercial bank as per the format contained in section III and shall be valid for a period of *30 days beyond the validity period of the bid or beyond any period of extension.*

20.3 Any bid not accompanied by an enforceable and *substantially* compliant Bid Security or a subscription to a Bid Securing Declaration in the Bid Submission Form, if required in accordance with ITB 20.1, shall be rejected by the *Employer*

⁵ *In lump sum contracts, delete "rates, prices, and."*

as non-responsive.

20.4 Bid Security shall be forfeited or the Bid Securing declaration exercised for non-compliance on the part of the Bidder for reasons mentioned in the Bid Security format contained in Section III or the Bid Suring Declaration contained as Appendix to the Bid Submission Form.

**21. Format and
Signing of Bid**

21.1 The Bidder shall prepare one original of the documents comprising the bid as described in ITB 13.1 and clearly mark it "ORIGINAL". In addition, the Bidder shall submit **two copies** of the bid and clearly mark each of them "COPY." In the event of any discrepancy between the original and the copies, the original shall prevail.

21.2 The original and all copies of the bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder.

Submission and Opening of Bids

**22. Sealing and
Marking of Bids**

22.1 Bidders may always submit their bids by mail or by hand. Procedures for submission, sealing and marking are as follows:

(a) Bidders submitting bids by mail or by hand shall enclose the original and each copy of the Bid, including alternative bids, if permitted in accordance with ITB 15, in separate sealed envelopes, duly marking the envelopes as "ORIGINAL", "ALTERNATIVE" and "COPY." These envelopes containing the original and the copies shall then be enclosed in one single envelope. The rest of the procedure shall be in accordance with ITB sub-Clauses 22.2.

22.2 The inner and outer envelopes shall:

- (a) bear the name and address of the Bidder;
- (b) be addressed to the Employer as indicated in ITB 22.1;
- (c) bear the specific identification of this bidding process indicated in accordance with ITB 1.1; and
- (d) bear a warning not to open before the time and date for bid opening.

**23. Deadline for
Submission of
Bids**

23.1 Bids shall be delivered to the Employer at the address and no later than the time and date **specified in the BDS**.

The *Employer* may, at its discretion, extend the deadline for the submission of bids by amending the Bidding Document in

accordance with ITB 10.

- 24. Late Bids** 24.1 Late bids shall not be considered. They will be returned unopened
- 25. Withdrawal, Substitution, and Modification of Bids** 25.1 No bid may be withdrawn, substituted, or modified in the interval between the deadline for submission of bids and the expiration of the period of bid validity specified by the Bidder on the Bid submission Form or any extension thereof.
- 26. Bid Opening** 26.1 The *Employer* shall open the bids at the time place and address **specified in the BDS** in the presence of Bidders' designated representatives who choose to attend.
- 26.2 The bidders' names, the Bid Prices, the total amount of each bid, any discounts, any alternative bid, bid modifications and withdrawals, the presence or absence of bid security, and such other details as the Employer may consider appropriate, will be announced and recorded by the Employer at the opening.

Evaluation and Comparison of Bids

- 27. Confidentiality** 27.1 Information relating to the examination, evaluation, comparison, and post-qualification of bids and recommendation of contract award, shall not be disclosed to Bidders or any other person not officially concerned with such process.
- 27.2 Any attempt by a Bidder to influence the Employer in the evaluation of the bids or Contract award decisions may result in the rejection of its bid.
- 28. Clarification of Bids** 28.1 To assist in the examination, evaluation, and comparison of the bids, and qualification of the Bidders, the *Employer* may, at its discretion, ask any Bidder for a clarification of its bid. No change in the prices or substance of the bid shall be sought, offered, or permitted, except to confirm the correction of arithmetical errors discovered by the *Employer* in the evaluation of the bids, in accordance with ITB 31.
- 29. Determination of Responsiveness** 29.1 The *Employer's* determination of a bid's responsiveness is to be based on the contents of the bid itself, as defined in ITB13.
- 29.2 A substantially responsive bid is one that meets the requirements of the Bidding Document without material deviation, reservation, or omission.
- 29.3 The *Employer* shall examine the technical aspects of the bid submitted in accordance with ITB 18, Technical Proposal, in particular, to confirm that all requirements of Section IV

(*Employer's* Requirements) have been met without any material deviation, reservation or omission.

29.4 If a bid is not substantially responsive to the requirements of the Bidding Document, it shall be rejected by the *Employer* and may not subsequently be made responsive by correction of the material deviation, reservation, or omission.

30. Nonconformities, Errors, and Omissions

30.1 Provided that a bid is substantially responsive, the *Employer* may waive any non-material non-conformity in the bid, request that the Bidder submit the necessary information or documentation, to rectify nonmaterial nonconformities in the bid related to documentation requirements but not related to any aspect of the price of the bid; and shall rectify quantifiable nonmaterial nonconformities related to the Bid Price.

31. Correction of Arithmetical Errors

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

- (a) only for unit price contracts, 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.

32. Margin of Preference

32.1 Unless otherwise specified in the BDS, Margin of preference shall not apply.

33. Evaluation of Bids

33.1 The Employer shall use the criteria and methodology defined in this clause and no other evaluation criteria or methodologies shall be permitted.

33.2 To evaluate a bid, the *Employer* shall consider the following:

- (a) the bid price, excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities for admeasurement contracts or Schedule of Prices for lump sum contracts, but including Daywork

items, where priced competitively; and

- (b) price adjustment for correction of arithmetic errors, discounts, non-conformities, due to the supplementary criteria as defined in Section IV, and Margin of Preference, if applicable.

33.3 If this Bidding Document allows Bidders to quote separate prices for different contracts, and to award multiple contracts to a single Bidder, the methodology to determine the lowest evaluated price of the contract combinations, including any discount offered in the Bid Submission Form, is specified in Section IV (Evaluation and Qualification Criteria).

33.4 If the bid for an admeasurement contract, which results in the lowest Evaluated Bid Price, is seriously unbalanced, front loaded or substantially below updated estimates or if any item in the Priced Activity Schedule is front loaded or contains an erroneous amount in the opinion of the *Employer*, the *Employer* may after clarification require the Bidder to produce detailed price analysis for any or all items *that the amount of the performance security be increased at the expense of the Bidder*.

- 34. Comparison of Bids** 34.1 The *Employer* shall compare all substantially responsive bids in accordance with ITB 33 to determine the lowest evaluated bid.
- 35. Qualification of the Bidder** 35.1 The *Employer* shall determine to its satisfaction whether the Bidder that is selected as having submitted the lowest evaluated substantially responsive bid meets the qualifying criteria.
- 36. Employer's Right to Accept Any Bid, and to Reject Any or All Bids** 36.1 The *Employer* reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids at any time prior to contract award, without thereby incurring any liability to Bidders.

Award of Contract

- 37. Award Criteria** 37.1 *Subject to ITB 36.1*, the *Employer* shall award the Contract to the Bidder whose offer has been determined to be the lowest evaluated bid and is substantially responsive to the Bidding Document, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.
- 38. Notification of Award** 38.1 Prior to the expiration of the period of bid validity, the *Employer* shall, for contract amount above the prescribed threshold, notify the selected bidder of the proposed award and accordingly notify unsuccessful bidders. Subject to

Challenge and Appeal the Employer shall notify the selected Bidder, in writing, by a Letter of Acceptance for award of contract. The Letter of Acceptance shall specify the sum that the Employer will pay the Contractor in consideration of the execution and completion of the Works (hereinafter and in the Conditions of Contract and Contract Forms called “the Contract Price”) and the requirement for the Contractor to remedy any defects therein as prescribed by the Contract. Within seven days from the issue of Letter of Acceptance, the Employer shall publish on the Public Procurement Portal (publicprocurement.govmu.org) and the Employer’s website, the results of the Bidding Process identifying the bid and lot numbers and the following information:

(i) name of the successful Bidder, and the Price it offered, as well as the duration and summary scope of the contract awarded; and

(ii) an executive summary of the Bid Evaluation Report.

38.2 Until a formal contract is prepared and executed, the notification of award shall constitute a binding Contract.

39. Signing of Contract

39.1 Promptly upon issue of Letter of Acceptance, the *Employer* shall send to the successful Bidder the Contract Agreement.

39.2 Within twenty-one (21) days of receipt of the Contract Agreement, the successful Bidder shall sign, date, and return it to the *Employer*.

40. Performance Security

40.1 Within twenty-one (21) days of the receipt of the Letter of Acceptance from the *Employer*, the successful Bidder shall furnish the Performance Security in accordance with the conditions of contract, using for that purpose the Performance Security Form included in Section VIII (Contract Forms).

40.2 Failure of the successful Bidder to submit the above-mentioned Performance Security or to sign the Contract Agreement within the prescribed delay shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security.

Preference Security

40.3 The successful bidder having benefitted from a Margin of Preference shall provide a Preference Security, **as specified in the BDS**. The amount for the Preference Security shall be the difference between the price quoted by the selected bidder and that of the lowest evaluated bid which would have been selected for award of contract, if the said Margin of Preference was not applicable

- 41. Advance Payment and Security** 41.1 The Public Body shall provide an Advance Payment on the Contract Price as stipulated in the GCC, subject to a maximum amount, as stated in the BDS. The Advance Payment shall be guaranteed by a security as per the format contained in Section VIII.
- 42. Plant and Materials on site** 42.1 Unless otherwise **specified in BDS** interim payment for Plant and Material on site is applicable as per GCC 39.7.
- 43. Debriefing** 43.1 The Employer shall promptly attend to all requests for debriefing for the contract, made in writing, and within 30 days from the date of the publication of the award or date the unsuccessful bidders are informed about the award, whichever is the case, by following regulation 9 of the Public Procurement Regulations 2008 as amended.

Section II- Bidding Data Sheet

A. General	
ITB 1.1	<p>The Public Body is: The Municipal City Council of Port Louis.</p> <p>The Works consist of Construction of Drains and Related works within The Municipal City Council Area of Port Louis on an “as and when required basis” following signature of contract.</p> <p>The name and identification of the Contract are ONB/CCPL/005/17</p>
ITB 1.2	<p>The Intended Completion period of the works would be specified in works orders which would be issued as and when required up to 15th December 2017 after signature of contract. The value of works which would be allocated to the contractor would be any amount up to a maximum of Rs 15m. The contractor would be required to work on several sites simultaneously.</p>
ITB 3.2	<p>(a) The address to file Challenges in respect of this procurement is:</p> <p style="text-align: center;">The Chief Executive, 2nd Floor, The Municipal City Council of Port Louis, City Hall, Jules Koenig Street, Port Louis. Tel: 4056600 ; Fax: 2124258</p> <p>(b) The address to file Application for Review is:</p> <p style="text-align: center;">The Chairman Independent Review Panel, 9th Floor, Wing B Emmanuel Anquetil Building Pope Hennessy Street Port Louis Tel : 2013921</p>
ITB 5.4	<p>The list of debarred firms according to the Debarment process may be obtained from the web site of the Procurement Policy Office: ppo.govmu.org</p>
ITB 6.2	<p>The information required from bidders in ITB Sub-Clause 6.2 is modified as follows: none</p>
ITB 6.2 (g)	<p>The assessment of the financial soundness of the company shall be on a pass/fail basis on its overall performance including its profitability.</p>
ITB 6.3 (b)	<p>(A1) The Contractor shall demonstrate that it is registered with the CIDB under the following class: Civil Engineering Construction works and specialization in the following area(s) Construction of Drains and Related works</p> <p>(A2) The Contractor shall also demonstrate that it meets experience as prime contractor in the Construction of Drains and Related works of a minimum of 2 works of a nature and complexity equivalent to the Works over a period of 3 years</p>

ITB 6.3 (c)	<p>The essential equipment to be made available for the Contract by the successful Bidder shall be: Back hoe Excavator loader, Skid steer loaders, Dumpers, Hand Rollers, Compactors, Asphalt cutters, Concrete mixers, Vibrators, poker Vibrators, trucks required for the Works with details of Ownership or on hire.</p> <p>Particulars as to whether the equipment is owned or on hire have to be specified.</p>
ITB 6.3 (d)	<p>QUALIFICATIONS OF KEY PERSONEL</p> <p>Project Manager: A Civil Engineer registered with the Council of Registered Professional Engineers' of Mauritius having at least 5years post registration experience.</p> <p>Technical Officer: A Diploma in Building & Civil Engineering having at least 5 years experience in Asphalt works/Civil works</p> <p>Foreman:10 years experience dealing with civil or related works</p>
ITB 6.3 (e)	<p>The minimum amount of liquid assets and/or credit facilities net of other contractual commitments of the successful Bidder shall be Rs 3 million.</p> <p>The Bidder should submit documentary evidence mentioning the name of this project and its Procurement Reference. Non-submission of the supporting document may lead to rejection of the bids.</p> <p>Documentary evidence may comprise but not limited to:-</p> <ol style="list-style-type: none"> (1) Bank Certificate (2) Certificate from Auditors (3) Certificate from a Professional Registered Accountant
B. Bidding Documents	
ITB 8.1	<p>The Public Body's address for clarification is:</p> <p>The Chief Executive Officer, 2nd Floor, The Municipal City Council of Port Louis, City Hall, Jules Koenig Street.</p> <p>Tel :4056600 Fax :2124258</p>
ITB 9.2	A pre-bid meeting has been scheduled for : Not Applicable
C. Preparation of Bids	
ITB 13.1 (f)	Any additional materials required to be completed and submitted by the Bidders are none
ITB 17.1	The Contract is not subject to price adjustment in accordance with GCC Clause 44.

ITB 17.2	Interim Payment for Plant and Material on site is not applicable.
ITB 19.1	The Bid shall be valid for 90 days after the deadline set for the submission of bid, i.e., up to <u>16th December 2017</u> , the deadline being counted as day one of the validity period.
ITB 20.1	No Bid Security is required. Bid shall include a subscription to a Bid Securing Declaration
D. Submission of Bids	
ITB 23.1	The deadline for submission of bids shall be <u>Monday 18th September 2017 up to 11.00 hours (Local Time) at latest.</u>
	The Employer's address for the purpose of Bid submission is Attention: The Chief Executive The Municipal City Council of Port Louis 2nd Floor, City Hall Jules Koenig Street. Port Louis.
E. Evaluation and Comparison of Bids	
ITB 26.1	The bid opening shall take place at: The Municipal City Council of Port Louis 2nd Floor, City Hall Jules Koenig Street. Port Louis Date: <u>Monday 18th September 2017</u> ; Time: 11.30 hrs
ITB 32	32.1 A Margin of Preference shall apply as defined hereunder and in Section IV-Evaluation Criteria. The following procedure shall be used to apply the Margin of Preference: (a) responsive bids shall be classified into the following groups: <ul style="list-style-type: none"> • Group A: bids offered by bidders meeting the conditions satisfying eligibility for a Margin of Preference, and • Group B: all other bids; (b) for the purpose of further evaluation and comparison of bids only, all bids classified in Group B shall be increased by the percentage(s) of preference allocated to those in group A. 32.2 Bidders applying for the Margin of Preference shall submit, as part of their bidding documents evidence of:

	<p>(a) their incorporation in the Republic of Mauritius;</p> <p>(b) their Joint Venture Agreement or intention to legally enter into a Joint Venture Agreement to be incorporated in the Republic of Mauritius, where applicable;</p> <p>(c) the percentage of the total man-power to be deployed by local manpower with break-down indicating type of works to be entrusted to the local manpower.</p> <p>(d) A financial statement signed by a certified Accountant vouching that the annual turn-over of the local Small and Medium enterprise (where applicable) does not exceed Rs 50M.</p> <p>(e) their deployment of manpower to demonstrate how they will undertake to employ the local manpower for the project. The evidence may include the number of existing employees that will be involved in the project and the number of workers that may be hired temporarily. <i>Non-submission of the evidence may entail non-eligibility of the bidder for margin of preference.</i></p>
F. Award of Contract	
ITB 40.1	The Standard Form of Performance Security acceptable to the Public Body shall be “a Bank Guarantee”. The Bank guarantee shall be for an amount of Rs 1.5m.
ITB 40.3	For contracts up to 100M, the public body shall either retain money from progressive payments to constitute the preference security or request a security in the form of a bank guarantee at the selected bidder’s option.
ITB 41	The Advance Payment shall be limited to <i>[insert percentage]</i> percent of the Contract Price less the provisional and contingencies sums: Not Applicable
ITB 42.1	Interim Payment for Plant and Material on site is not applicable.

Section III - Bidding Forms

Table of Forms

Bid Submission Form
Qualification Information
Bill of Quantities
Form of Bid Security (Bank Guarantee)

Bid Submission Form

The Bidder must prepare the Bid Submission Form on stationery with its letterhead clearly showing the Bidder's complete name and address.

Note: All italicized text is for use in preparing these form and shall be deleted from the final document.

Date: _____
Bidder's Reference No.: _____
Procurement Reference No.:

To:

We, the undersigned, declare that:

- (a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB) Clause 10;
- (b) We offer to execute in conformity with the Bidding Documents the following Works:
_____;
- (c) The rates are as given in **Bill of Quantities - Price Activity Schedule -Schedule of Rates**;
- (d) The discounts offered and the methodology for their application are:

_____;
- (e) Our bid shall be valid for a period of **90 days** from the date fixed for the bid submission deadline; i.e., up to **16th December 2017** in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
- (f) We hereby confirm that we have read and understood the content of the Bid Securing Declaration attached hereto and subscribe fully to the terms and conditions contained therein, if required. We understand that non-compliance to the conditions mentioned may lead to disqualification.
- (g) If our bid is accepted, we commit to obtain a Performance Security and a Preference Security (if applicable) in accordance with the Bidding Document;
- (h) We, including any subcontractors or suppliers for any part of the contract, do not have any conflict of interest in accordance with ITB 5.4;
- (i) We are not participating, as a Bidder in more than one bid in this bidding process other than alternative offers submitted in accordance with ITB 15;

- (j) Our firm, its affiliates or subsidiaries, including any Subcontractors or Suppliers for any part of the contract, has not been declared ineligible under the laws of Mauritius;
- (k) We are not a government owned entity / We are a government owned entity but meet the requirements of ITB 5.4;⁶
- (l) We hereby “*apply/do not apply*” for Margin of Preference as provided in the bidding document;⁷
- (m) We have taken steps to ensure that no person acting for us or on our behalf will engage in any type of fraud and corruption as per the principles described hereunder, during the bidding process and contract execution:
 - i. We shall not, directly or through any other person or firm, offer, promise or give to any of the Public Body’s employees involved in the bidding process or the execution of the contract or to any third person any material or immaterial benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.
 - ii. We shall not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelisation in the bidding process.
 - iii. We shall not use falsified documents, erroneous data or deliberately not disclose requested facts to obtain a benefit in a procurement proceeding.

We understand that transgression of the above is a serious offence and appropriate actions will be taken against such bidders.

- (n) We understand that this bid, together with your written acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed;
- (o) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive; and
- (p) If awarded the contract, the person named below shall act as Contractor’s Representative:

Name:

In the capacity of:

Signed:

⁶ Use one of the two options as appropriate.

⁷ Strike out as appropriate

Section IV- Evaluation Criteria

Duly authorized to
sign the Bid for and
on behalf of:

Date:

Seal of Company

Bid Securing Declaration

By subscribing to the undertaking in respect of paragraph (f) of the Bid Submission form:

I/We* accept that I/we* may be disqualified from bidding for any contract with any Public Body for the period of time that may be determined by the Procurement Policy Office under section 35 of the Public Procurement Act, if I am/we are* in breach of any obligation under the bid conditions, because I/we*:

- (a) have modified or withdrawn my/our* Bid after the deadline for submission of bids during the period of bid validity specified by the Bidder in the Letter of Bid; or
- (b) have refused to accept a correction of an error appearing on the face of the Bid; or
- (c) having been notified of the acceptance of our Bid by the (*insert name of public body*) during the period of bid validity, (i) have failed or refused to execute the Contract, if required, or (ii) have failed or refused to furnish the Performance Security, in accordance with the Instructions to Bidders.

I/We* understand this Bid Securing Declaration shall cease to be valid (a) in case I/we am/are the successful bidder, upon our receipt of copies of the contract signed by you and the Performance Security issued to you by me/us ; or (b) if I am/we are* not the successful Bidder, upon the earlier of (i) the receipt of your notification of the name of the successful Bidder; or (ii) thirty days after the expiration of the validity of my/our* Bid.

In case of a Joint Venture, all the partners of the Joint Venture shall be jointly and severally liable.

Qualification Information

*[The information to be filled in by **bidders** in the following pages shall be used for purposes of post-qualification or for verification of prequalification as provided for in ITB Clause 6. This information shall not be incorporated in the Contract. Attach additional pages as necessary. Pertinent sections of attached documents should be translated into English. If used for prequalification verification, the Bidder should fill in updated information only.]*

1. Individual Bidders or Individual Members of Joint Ventures

1.1 Constitution or legal status of Bidder: *[attach copy]*

Place of registration: *[insert]*

Principal place of business: *[insert]*

Valid Registration certificate from the CIDB: *[attach copy]*

Evidence of signatory authorized to sign the bid (if applicable): *[attach]*

1.2 Where the specialization category for which the Bidder is required to be registered does not cover adequately the specialization required for the works Bidder shall provide *[insert number]* of works of a nature and amount similar to the Works performed as prime Contractor over the last *[insert number]* years. *[Also list details of work under way or committed, including expected completion date(s).]*

Project/Contract name and country	Name of client and contact person	Type of work performed and year of completion	Value of contract (national currency)
(a)			
(b)			

1.3 Major items of Contractor’s Equipment proposed for carrying out the Works. *[List all information requested below. Refer also to ITB Sub-Clause 6.3 (c).]*

Item of equipment	Description, make, and age (years)	Condition (new, good, poor) and number available	Owned, leased (from whom?), or to be purchased (from whom?)
(a)			
(b)			

- 1.4 Qualifications and experience of key personnel proposed for administration and execution of the Contract. *[Attach biographical data. Refer also to ITB Sub-Clause 6.3 (d).]*

Position	Name	Years of experience (general)	Years of experience in proposed position
(a)			
(b)			

- 1.5 Proposed subcontracts and firms involved. Refer to General Conditions of Contract Clause 7.

Sections of the Works	Value of subcontract	Subcontractor (name and address)	Experience in similar work
(a)			
(b)			

[Bidders have to ascertain that sub-contractors executing works of amount Rs 500 000 are duly registered with the CIDB in accordance with CIDB Act 2008.

- 1.6 Financial reports for the last *[insert number; usually 3]* years: Financial Statements, Audited Accounts, etc. *[List below and attach copies.]*⁸

- 1.7 Evidence of access to financial resources to meet the qualification requirements: cash in hand, lines of credit, etc. List below and attach copies of support documents.

- 1.8 Name, address, and telephone, telex, and facsimile numbers of banks that may provide references if contacted by the Public Body.

- 1.9 Information on current litigation(s) in which the Bidder is involved.

Other party(ies)	Cause of dispute	Amount involved
(a)		
(b)		

- 1.10 Statement of compliance with the requirements of ITB Sub-Clause 5.3.

- 1.11 Proposed program (service work and schedule). Description, drawings and charts, as necessary, to comply with the requirement of the bidding documents.
-

- 2. Joint Ventures**
- 2.1 The information listed in 1.1 - 1.9 above shall be provided for each partner of the joint venture.
 - 2.2 The information in 1.11 above shall be provided for the joint venture.
 - 2.3 Attach the power of attorney or other acceptable document of the signatory (ies) of the Bid authorizing signature of the Bid on behalf of the joint venture.
 - 2.4 Attach the Agreement among all partners of the joint venture (and which is legally binding on all partners), which shows that
 - (a) all partners shall be jointly and severally liable for the execution of the Contract in accordance with the Contract terms;
 - (b) one of the partners will be nominated as being in charge, authorized to incur liabilities, and receive instructions for and on behalf of any and all partners of the joint venture; and
 - (c) the execution of the entire Contract, including payment, shall be done exclusively with the partner in charge.
- 3. Additional Requirements**
- 3.1 Bidders should provide any additional information requested in the Bidding Document.

Bill of Quantities

PRICED ACTIVITY SCHEDULE

SCHEDULE OF RATES

Complete the unit price (rate) for each item listed below. Authorise the prices quoted in the signature block below.

Schedule of Rates

Complete the unit and total prices for each item listed below. Authorize the prices quoted in the signature block below.

Item No	Brief Description of Works	Unit	<u>Unit Price including VAT (Rs)</u>
1	<p>CONCRETE DRAINS (AS PER TYPICAL DRAWINGS)</p> <p><i>As per drawings</i></p>		
1.1	<p><u>Drain Type A-RCC Drain</u> <u>300mm x 300-500mm</u></p> <p>A1-Open drain</p> <p>A2- Covered drain with heavy duty slabs</p> <p>A3- Covered drain with heavy duty metal gratings</p>	m	
1.2	<p><u>Drain Type B-RCC Drain</u> <u>500mm x 500-700mm</u></p> <p>B1-Open drain</p> <p>B2- Covered drain with heavy duty slabs</p> <p>B3- Covered drain with heavy duty metal gratings</p>	m	

Item No	Brief Description of Works	Unit	Unit Price including VAT (Rs)
1.3	<p><u>Drain Type C-RCC Drain</u> <u>700mm x 700-1000mm</u></p> <p>C1-Open drain</p> <p>C2- Covered drain with heavy duty slabs</p> <p>C3- Covered drain with heavy duty metal gratings</p>	<p>m</p> <p>m</p> <p>m</p>	
2	<p>ABSORPTION CONCRETE DRAIN (REF TYPICAL DRAWINGS DETAILS)</p> <p><i>As per drawings</i></p>		
2.1	<p><u>Drain Type D -Absorption Drain</u> <u>700mm x 700mm</u></p> <p>D 1- Covered drain with heavy duty slabs</p> <p>D 2- Covered drain with heavy duty metal gratings</p>	<p>m</p> <p>m</p>	
3	<p><u>Provisional</u></p> <p><i><u>Contingent works as and when required during contract period (Items 3 to 8)</u></i></p> <p>CONCRETE FOOTPATH</p>	<p>m²</p>	
4	<p>REPLACE DAMAGED DRAIN COVER SLAB</p>	<p>m³</p>	

Item No	Brief Description of Works	Unit	<u>Unit Price including VAT (Rs)</u>
5	<p>(a) Excavation in any materials (including rocks, tarmac, boulders, RC concrete, road borders etc.) & cart away</p> <p>(b) Supply and place & compact concrete (m³)</p> <ul style="list-style-type: none"> - grade 15 concrete (mass) - grade 25 structural concrete - grade 30 structural concrete <p>(c) Formwork: Supply & fixing formwork (including striking off)</p> <p>(d) Reinforcement :Supply & fix</p> <p>(e) Supply lay & compact crusher run 0/20</p> <p>(f) Spalls: Supply lay & compact (size: 100-200)</p> <p>(g) Geotextile: Supply, transport to site, cut and lay geotextile as per requirements</p> <p>(h) Refilling or repair of roads as described elsewhere, including Compaction, tack & prime coat as required & tarring with Asphalt Concrete (0/14) min. 50mm thick, etc</p> <p>(i) Precast (or cast in situ) concrete kerbs</p> <p>KERB-K1</p> <p>KERB-K2</p> <p>KERB-K3</p> <p>KERB-K4</p> <p>(j) Felling of trees & cart away</p> <ul style="list-style-type: none"> (i) (1) Girth up to 600mm (2) Girth above 600mm 	<p>m³</p> <p>m³</p> <p>m³</p> <p>m³</p> <p>m²</p> <p>Kg</p> <p>m³</p> <p>m³</p> <p>m²</p> <p>m²</p> <p>m</p> <p>m</p> <p>m</p> <p>m</p> <p>unit</p> <p>unit</p>	

Section IV- Evaluation Criteria

Item No	Brief Description of Works	Unit	<u>Unit Price including VAT (Rs)</u>
8	CLEANING OF DRAINS open drains covered drains	m m	

Bill of Quantities -Priced Activity Schedule – Schedule of Rates Authorised By:

Name:		Signature:	
Position:		Date:	
Authorised for and on behalf of:		Company	
Tel No.:			
Fax No.:			
Email:			

ITEMS OF WORKS TO BE CONSIDERED AS AND WHERE APPLICABLE AND PRICING INFORMATION

FORMWORK

The prices include the following:

- Supply of all materials and plants
- Erect formwork to line and level as specified
- Formwork for kickers, cambers and falls
- Linings and taking measures to produce the required finish to the surfaces of the concrete, as directed by Engineer
- Cutting and fitting around projecting members, pipes, reinforcement and the like,
- Maintaining in place until striking and allowing for any variation from the minimum period for striking arising from prevailing weather conditions,
- Striking, taking down and removing,

Any miscellaneous costs arising.

The Unit of measurement for above Items shall be the area in **SQUARE METRE (m²)** of formwork fixed.

CONCRETE FOOTPATH

The price quoted for this item shall include:-

- Preparatory works including excavations in any materials (including rocks)
- All necessary supplies for in-situ reinforced concrete work for footpath
- Supply and fixing of formworks of good quality
- Cleaning surface of all debris, to receive the crusher run and concrete,
- Supply, Spread, level and compact 150mm thick crusher run 0/20
- Supply and fixing of wire mesh reinforcement (A142)Supply, Placing, vibrating and curing, of 150 mm thick Class 20 concrete
- Provide weep holes/drainage pipes under footpath as directed by the Engineer
- Provide joints as directed by the Engineer and

Any miscellaneous cost arising.

The Unit of measurement for above Item shall be the area in **SQUARE METRE (m²)** of concrete footpath completed.

OPEN / COVERED CONCRETE DRAIN (REF TYPICAL DRAWINGS DETAILS)

The price quoted for this item shall include:-

- excavation in any type of material including rocks and any extra excavation due to natural ground level and removal of water
- part return, fill, trimming of unlined drains
- supply on site of all necessary plant and materials
- Blinding layer
- making and erecting formwork, supply, cutting and placing of concrete Grade 25.
- reinforcement bars, prefabricated concrete elements, and of sound masonry stones to lines and levels, concrete curing and supplying and applying material for impregnation of concrete surfaces.
- supply and placing of concrete bed, mortar jointing, etc.
- supply and placing of expansion joint and water stops, all details shall be supplied by Contractor and approved by Engineer.
- striking off formwork.
- Flow test and flushing of drains
- backfill and making good/re-instatement the sides of the constructed drains as directed by the Engineer
- disposal of any surplus excavated material as directed by the Engineer
- connection to soakways or manholes, details to be supplied by Contractor and approved by the Engineer.
- allowing for and complying with connection details of raised kerbs with Gullies
- allow for open-able precast covers and/or metal grating for covered drains
- cleaning of drains during maintenance period, frequency as directed by the Engineer
- Reinstatement of asphaltic surface of road using asphalt cutter, including for compaction of subgrade, laying of 200mm crusher run (min. thickness) and 50mm asphalt concrete, all compacted to 90% BS heavy compaction or as directed by the Engineer.
- Any miscellaneous cost arising.

The Unit of measurement for above Item shall be the length in **LINEAR METRE (m)** of drains completed.

ABSORPTION CONCRETE DRAIN (REF TYPICAL DRAWINGS DETAILS)

The price quoted for this item shall include:-

- excavation in any type of material including rocks and any extra excavation due to natural ground level and removal of water
- part return, fill, trimming of unlined drains
- supply on site of all necessary plant and materials
- Blinding layer
- making and erecting formwork, supply, cutting and placing of concrete Grade 25.
- Fill underneath of drain (minimum depth 500mm) with spall or boulders including geotextile as per specification and as directed by Engineer.
- reinforcement bars, prefabricated concrete elements, and of sound masonry stones to lines and levels, concrete curing and supplying and applying material for impregnation of concrete surfaces.
- supply and placing of concrete bed, mortar jointing, etc.
- supply and placing of expansion joint and water stops, all details shall be supplied by Contractor and approved by Engineer.
- striking off formwork
- backfill and making good the sides of the constructed drains
- disposal of any surplus excavated material as directed by the Engineer
- allowing for and complying with connection details of raised kerbs with Gullies
- allow for openable precast covers and/or metal grating for covered drains
- cleaning of drains during maintenance period, frequency as directed by the Engineer
- Reinstatement of asphaltic surface of road using asphalt cutter, including for compaction of subgrade, laying of 200mm crusher run (min. thickness) and 50mm asphalt concrete, all compacted to 90% BS heavy compaction or as directed by the Engineer.
- Any miscellaneous cost arising.

The Unit of measurement for above Items shall be the length in **LINEAR METRE (m)** of drains completed.

PRECAST (OR CAST IN-SITU) CONCRETE KERB

The price quoted for this item shall include:-

- Supply of all necessary materials and plants,
- Manufacture, supply, transport to any distance and laying on site of concrete precast kerbs in compliance with drawings and Specifications including concrete bed and backing to support kerbs, cutting and jointing
- Excavation in any material, including rock
- Mixing mortar and concrete
- erecting formwork, cutting and bending into place of any reinforcement
- Placing and curing the concrete for in situ kerbs and for bedding/ backfilling of precast kerbs
- Striking the formwork, any necessary backfilling, smoothing and jointing
- spoiling excess cut
- Concrete for bedding and backfilling shall be class C15
- Reinstated with asphalt concrete /concrete where required and directed by Engineer
- Concrete for kerbs shall be class C25
- -allowing for all necessary alignments adjustment as instructed by the Engineer

Any miscellaneous cost which may arise.

The Unit of measurement for above Items shall be the length in **LINEAR METRE (m)** of kerbs placed.

METAL GRATINGS COMPLETE WITH FRAME WORK

The price quoted for this item shall include:-

- Manufacture, supply, transport and fix hot dipped galvanised (after manufactured) metal grating, as per drawing;
- All related works involved as required
- Any miscellaneous cost which may arise.

The unit of measurement for above Item shall be the area in **SQUARE METRE (m²)** of metal grating completed and placed.

REPLACE DAMAGED DRAIN COVER SLAB

The price quoted for this item shall include:-

- Remove damaged slab and cart away as directed by Engineer;
- Cast 150 mm thick reinforced concrete slab, (Grade 25) in yard and allow for curing
- Supply of any necessary plant and material
- Transport to site;
- Construction of any supporting walls if required and as directed
- Place, levelling of slab(s) on drain as directed by engineer
- Provide safety measures for pedestrians until work is completed and
- Any miscellaneous cost which may arise.

The Unit for above Item shall be **CUBIC METRE (M³)** Calculated as the theoretical volume of reinforced concrete placed

CLEAN OPEN DRAINS/COVERED DRAINS

The price quoted for this item shall include:-

- Removal of existing drain slabs/grills covers
- Loosening and removal of silted deposits; pump stagnant water and dispose of;
- Carting away of removed materials;
- Provide safety measures for pedestrians until work is completed
(*Works are inclusive of removal and refixing of existing rc slabs & metal gratings*)

Any miscellaneous cost which may arise.

The unit of measurement for above Item shall be the length in **LINEAR METRE** of open/covered drains cleaned.

SUPPLY AND LAY GEOTEXTILES

The price quoted for this item shall include:-

- Supply including transport to site of the geotextile material as per specifications and approved by Engineer
- Cut, fix, overlap and place as shown in drawings or as directed by the Engineer;

Any miscellaneous cost arising

The Unit of measurement for above Item shall be the area in **SQUARE METRE (m²)** of geotextile laid (area of overlapping will not be considered for measurement)

REPROFILING

- Reprofilng or repair of roads including Compaction, priming /tack coat (Works to include scarification/application of crusherun 0/20 max. 200mm thickness)
- Tack coat and/or prime coat to be applied as required.
- Supply, transport, lay, water and compact crusher run as required.
- Supply and transport to site asphaltic concrete (0/14), lay, level and compact to the lines and levels including trimming of edges all as per specifications and site instructions.
- Tarring with Asphaltng Concrete 0/14 min. 50mm thick

Any miscellaneous cost arising

The Unit of measurement for above Item shall be the area in **SQUARE METRE (m²)** of road reprofilled or repaired.

Important:

The Municipal City Council of Port Louis may not cause each and every item of works to be carried out following this Bid exercise and will not be liable for non-issue of works orders for implementation.

1. The exact extent of works will be determined at the time of joint survey at the start of works. The exact extent of works shall be subject to remeasurement. However the total amount of works to be undertaken shall be any amount up to a maximum Rs 15 million.
2. The sides of the drain along the road must be backfilled with selected fill and compacted in layers. The road must be reinstated with 50mm compacted thickness asphaltic concrete of grade 0/10 of required bitumen content and finished so as to allow run-off to flow to the drain.

Note: (1) **Rates quoted to include preliminary & General costs.**

- (2) The Priced Activity Schedule is not and does not purport to be either exhaustive or explanatory of all the obligations and duties of the contractor who shall be deemed to have satisfied himself as to the correctness and sufficiency of the rates and prices stated in the Priced Activity Schedule, all of which shall cover all his obligations under the contract and all matters and things necessary for the proper execution and completion of the works.
- (3) The contractor shall be deemed to have inserted against each item in the Priced Activity schedule such rates and prices as he may deem necessary to cover the requirements of the contract.
- (4) Where the Priced Activity schedule does not include separate items for the Contractor's equipment, temporary works and tests to be carried out, the contractor shall be deemed to have covered his obligations in these respects in the rates and prices for permanent works

Payments:

All payments will be made on measured quantity of work satisfactorily completed and payments will be effected following joint site measurement of work (s) satisfactorily completed and as duly certified by the Head Public Infrastructure Department or a representative delegated by him.

VAT to be applied as required.

Form of Bid Security (Bank Guarantee)

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

Beneficiary: *Name and Address of Public Body*.....

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 execution of*name of contract*..... under Invitation for Bids No.....*IFB number*..... (the "IFB").

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

At the request of the Bidder, we*name of Bank*..... hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of*amount in figures*..... (*amount in words*.....) upon receipt by us of your 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 the Public Body 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*Public Body to insert date*.....

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

Section IV - Evaluation Criteria

This section contains supplementary criteria that the Employer shall use to evaluate bids.

1. Evaluation

In addition to the criteria listed in ITB 33 the following criteria shall apply:

Schedule of Markings

Please refer to ITB clause 33.1 “Notes of Bidders” for evaluation and award of contract.

Item No	Brief Description of Works	Unit	Maximum mark
1.1	<p><u>Drain Type A-RCC Drain</u> <u>300mm x 300-500mm</u></p> <p>A1-Open drain</p> <p>A2- Covered drain with heavy duty slabs</p> <p>A3- Covered drain with heavy duty metal gratings</p>	m	3
1.2	<p><u>Drain Type B-RCC Drain</u> <u>500mm x 500-700mm</u></p> <p>B1-Open drain</p> <p>B2- Covered drain with heavy duty slabs</p> <p>B3- Covered drain with heavy duty metal gratings</p>	m	5
1.3	<p><u>Drain Type C-RCC Drain</u> <u>700mm x 700-1000mm</u></p> <p>C1-Open drain</p> <p>C2- Covered drain with heavy duty slabs</p> <p>C3- Covered drain with heavy duty metal gratings</p>	m	4
		m	10
		m	5

2.1	<p><u>Drain Type D -Absorption Drain</u> <u>700mm x 700mm</u></p> <p>D 1- Covered drain with heavy duty slabs</p> <p>D 2- Covered drain with heavy duty metal gratings</p>	m	5
3	<p><u>Provisional</u> <u>Contingent works as and when required during contract period (Items 3 to 8</u></p> <p>CONCRETE FOOTPATH</p>	m ²	0.5
4	<p>REPLACE DAMAGED DRAIN COVER SLAB</p>	m ³	4
5	<p>(a)Excavation in any materials (including rocks, tarmac, boulders, RC concrete, road borders etc.)& cart away</p> <p>(b)Supply and place & compact concrete (m³)</p> <ul style="list-style-type: none"> - grade 15 concrete(mass) - grade 25 structural concrete - grade 30 structural concrete <p>(c)Formwork: Supply & fixing formwork (including striking off)</p> <p>(d)Reinforcement :Supply & fix</p> <p>(e)Supply lay & compact crusherun 0/20</p> <p>(f)Spalls: Supply lay & compact (size: 100-200)</p> <p>(g)Geotextile:Supply, transport to site, cut and lay geotextile as per requirements</p> <p>(h) Refilling or repair of roads as described elsewhere , including Compaction,tack & prime coat as required & tarring with Asphalt Concrete (0/14) min.50mm thick, etc</p>	<p>m³</p> <p>m³</p> <p>m³</p> <p>m³</p> <p>m²</p> <p>kg</p> <p>m³</p> <p>m³</p> <p>m²</p> <p>m²</p>	<p>2</p> <p>2</p> <p>2</p> <p>1</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>1</p> <p>2</p>

	(i) Precast(or cast in situ) concrete kerbs		
	KERB-K1	m	1
	KERB-K2	m	1
	KERB-K3	m	1
	KERB-K4	m	1
	(j) Felling of Trees		
	(1)Girth up to 600mm	unit	0.5
	(2)Girth above 600mm	unit	0.5
	(k) DEMOLITION OF MASONRY STRUCTURES, CONCRETE STRUCTURES, STONES KERBS AND WALLS	m ³	0.5
6	<u>Raising of Rcc drains</u> <u>(both borders inclusive)</u> Open drain (both borders inclusive)	m	1
	Covered drain including RC slabs and metal grating (both borders inclusive)	m	1
7	(METAL GRATINGS Complete with frame work (Hot dipped galvanised)- Various dimensions - Heavy duty type	m ²	5
8	<u>Cleaning of Drains</u>		
	<u>Open Drains</u>	m	0.5
	<u>Covered Drains</u>	m	0.5
TOTAL			100

IMPORTANT

The financial evaluation of the bids will be based on an assessment of the rates quoted. A marking system will be used to assess the rates. For each item, the bidder having quoted the lowest rate will obtain the maximum mark. The other bidders will be allocated marks according to the following formula:

$$M = \frac{M_{\max} \times R_{\text{lowest}}}{R}$$

Where

- M is the mark to be allocated
- M_{max} is the maximum mark allocated to the lowest rate
- R is the rate under consideration
- R_{lowest} is the lowest rate for the item under consideration

Bidder having scored the Total highest mark will be recommended for award of Contract.

(a) Adequacy of Technical Proposal

Evaluation of the Bidder's Technical Proposal will include an assessment of the Bidder's technical capacity to mobilize key equipment and personnel for the contract consistent with its proposal regarding work methods, scheduling, and material sourcing in sufficient detail and fully in accordance with the requirements stipulated in Section V (Employer's Requirements).

(b) Multiple Contracts

Pursuant sub-clause 1.1 of the Instructions to Bidders, if Works are grouped in multiple contracts, evaluation will be as follows: **Not Applicable**

(c) Completion Time: Not Applicable

An alternative Completion Time, if permitted under ITB 15.1, will be evaluated as follows:

(d) Technical Alternatives: Not Applicable

Technical alternatives, if permitted under ITB 15.1, will be evaluated as follows:

(e) Margin of Preference

A Margin of Preference for employment of local manpower shall be applicable as follows:

1.1 For International Bidding

A bidder, incorporated in the Republic of Mauritius, who undertakes to employ local manpower for 80% or more of the total man-days deployed for the execution of a works contract referred hereto, shall be eligible for a preference of 15%.

1.2 For National Bidding

- (a) A local Small and Medium enterprise, having an annual turnover not exceeding Rs 50million or a joint venture consisting of local Small and Medium Enterprises having an aggregate annual turnover not exceeding Rs 50million who undertakes to employ local manpower for 80% or more of the total man-days deployed for the execution of the works contract referred hereto, shall be eligible for a Margin of Preference of 20%.
- (b) Any bidder incorporated in the Republic of Mauritius not satisfying all the conditions mentioned in (a) above but undertakes to employ local manpower for 80% or more of the total man-days deployed for the execution of the works contract referred hereto, shall be eligible for a Margin of preference of 10%.

Note: Local manpower shall mean employees on the payroll of the Contractor as well as those for subcontractors for executing the works contract on the site.

PART 2 – Employer’s Requirements

Section V - Employer's Requirements

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SPECIFICATIONS

Specifications and Performance Requirements

Construction of Drains and Related works within The Municipal City Council Area of Port Louis

The site of works will be communicated to the successful bidder/contractor on issue of works orders during the contract period.

THE WORKS:

A. TYPE A: R.C.C. DRAIN - 300 mm x 300 - 500 mm

A1- Open drain

A 2- Covered drain with heavy duty slabs

A 3- Covered drain with heavy duty metal gratings

B. TYPE B: R.C.C. DRAIN - 500 mm x 500 - 700 mm

B1- Open drain

B2- Covered drain with heavy duty slabs

B3- Covered drain with heavy duty metal gratings

C. TYPE C: R.C.C. DRAIN - 700 mm x 700 - 1000mm

C1- Open drain

C 2- Covered drain with heavy duty slabs

C 3- Covered drain with heavy duty metal gratings

D. TYPE D: ABSORPTION DRAIN -700 X 700mm

D 1- Covered drain with heavy duty slabs

D 2- Covered drain with heavy duty metal gratings

E. RAISING OF DRAINS-

E 1 -Open drain (both borders inclusive)

E 2 -Covered drain (both borders inclusive, remove slabs and metal grating and refix)

SCOPE OF WORKS

Type A, B, C - Reinforced Concrete Drain & D- Absorption Drain

The works consist of the following:-

- Cleaning of site for drain construction to be free of all obstructions, hedges, trees, shrubs etc. including carting away
- Excavate for trial pit (at contractor's costs) on site to locate any services to determine alignment of drain to be approved by the Council Engineer or his representative.
- Excavate trench (in any materials, including rocks, boulders, tarmac, concrete, pavements etc..) to appropriate dimensions and to required slope, to be confirmed on site. Cutting with asphalt cutter in straight edge to be done prior.
- Contractor to record site levels and submit final invert level of drain showing levels, slopes to gradients.
- Allow for excavation of absorption trench 500 x 500mm deep below level of absorption drain all along trench.
- Loading and disposal of all excavated and excess materials to approved dumping site.
- Shaping, trimming and compaction of drain profiles and leveling of bottom of trench to receive spalls for absorption drain.
- Shaping, trimming and tamping of drain profiles and leveling of bottom of trench for drain Types A, B, and C.
- Compaction of bottom of excavation to 90% BS prior to laying of blinding layer 50mm concrete class C15.
- Laying of Geotextile in absorption trench 500mm wide x 500mm deep as per drawings for absorption drain. (Sample of Geotextile to be submitted for prior approval.)

The geotextile used in the works shall:

- I. sustain a tensile load of not less than 5 KN/m at break and have a minimum failure strain of 10% when determined in accordance with BS 6906: Part 1;
 - II have a minimum puncture resistance of 1200N when determined in accordance with BS 6906: Part 4;
 - III have a minimum tear resistance of 200N when determined in accordance with ASTM Standard D4533-85;
 - IV have a size distribution of pore openings in accordance with BS 6906: Part 2, or other appropriate
 - V allow water through it, in either direction, normal to its principal plane under a constant head of water of 100mm and a maximum breakthrough head of 50mm when determined in accordance with BS 6906: Part 3.
- Supply and lay spalls 100 – 200mm in absorption trench 500mm wide x 500mm deep.
 - Construction of R.C.C drains/ Absorption drains, types A, B, C and D including laying of blinding layer of thickness 50mm concrete grade C15 to level, compaction and curing;
 - Supply and erection of formwork, striking, removal and making good.
 - Supply, cutting, bending and placing of reinforcement as per specifications and drawings and cut to dimensions as required. (Details are given on annexed drawings).
 - Supply, mixing, placing, curing of concrete as per specification.
Concrete Grade C25 to be used. Test certificates to be submitted for each respective site and every 50 m of drain constructed.
 - Surface to be smooth clear float finish.
 - Curing of concrete and supply and placing of mortar joint etc.
 - Striking of formwork.
 - Cleaning of drain.

- Manufacture, supply & lay precast/in situ heavy duty RC slabs covers and metal gratings covers as required to suit drains as per specification and as shown on annexed drawings. Exact location to fix metal grating covers on drain to be decided on site by Council Engineer or his representative.

- Manufacture and supply of heavy duty metal gratings and as shown on annexed drawings.

The metal gratings to be manufactured to required dimensions and should be hot dipped galvanized after manufacture (min.60 microns) and supplied to Council stores/site as per instructions and drawings and on an **“as and when required basis.”**

- Raising of existing drain to be as per site requirements, levelled up to newly tarred surface or as instructed, and n.e. 200 mm height.

ALL CONCRETE WORKS FOR THIS CONTRACT TO BE GRADE 25 EXCEPT WHERE OTHERWISE SPECIFIED.

-Road borders to be reinstated with Asphalt Concrete (0/10) 50mm thick including supply and application of tack coat as required.

-Any damage to the road and road borders to be reinstated with Asphalt Concrete (0/10) 50mm thick. Asphalt surface to be cut in straight line with asphalt cutter prior to reinstatement of road. Tack coat to be applied 0.6L/m² prior to lay asphalt concrete where required.

Works will involve levelling, cutting and removal of damaged asphalt, supply, transport, lay, water and compact 200mm thick crusher run as required. Supply and application of prime coat as required. Supply and transport to site asphaltic concrete, lay, level and compact to lines and levels for any width including trimming of edges all as per specifications and site instructions. All excavated and surplus materials to be removed and cart away.

-Reinstatement of site on completion of works.

CLEARING AND CLEANING OF EXISTING DRAINS

Works shall include Clearing & cleaning of existing drains involving removal & cart away all deposited materials by mechanical means including water, stones, silt etc.” where required” to the satisfaction of Council.

ANY DAMAGES CAUSED TO THE ROAD STRUCTURE AND ANY OTHER SERVICES MUST BE MADE GOOD FORTHWITH BY THE CONTRACTOR TO THE SATISFACTION OF THE CONCERNED AUTHORITY & THE CITY COUNCIL OF PORT LOUIS.

OTHER REQUIREMENTS

- **Clearances**
The Contractor to seek and obtain appropriate clearance from such Authorities as the Central Water Authority, Waste Water Authority, Mauritius Telecom, Emtel, Central Electricity Board, Police authorities, Mauritius Fire and Rescue Services, Traffic Management & Road Safety Unit, etc. before starting any site works. To also liaise with these authorities for location of services.
- **Program of Work**
The work shall be carried out in accordance with a program drawn up by the Contractor and agreed upon the Head, Public Infrastructure Department.
- **Transport**
Transport of all materials to sites of works including the metal gratings to be provided by the Contractor.
- **Materials ,Plant and Equipment**
Construction materials, tools and all required plant and equipment to be provided by the Contractor.
- **Materials and Plant of Contractor**
The Municipal Council will not be responsible for any damage caused to plant and materials on the site.
- **Clearance of Site of Work on completion**
The sites of works to be cleared of all surplus materials, and tidied up before the handing over and the contract will be considered as having been fulfilled only after the site would have been cleared to the satisfaction of the Head, Public Infrastructure Department or his representative.

Note: Prospective Bidders/Contractors are required to acquaint themselves to site conditions in Port Louis prior to submitting their bids. Contractor to make his own arrangement for water and electricity for use on site and bear all costs thereof.

Specifications

SECTION 1- DRAINAGE

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ARTICLE NO

- 1.1 GENERAL
- 1.2 DRAINAGE PROGRAMME
- 1.3 DRAINAGE EXCAVATION
- 1.4 TIMBERING AND SHORING OF EXCAVATIONS
- 1.5 TRENCHES AND HOLES EXCAVATION AND BACKFILLING
- 1.6 LINED TRAPEZOIDAL DITCH
- 1.7 UNLINED TRAPEZOIDAL DITCH
- 1.8 PIPE CULVERTS
- 1.9 BOX CULVERTS
- 1.10 GULLIES AND MANHOLES
- 1.11 MASONRY WORKS
- 1.12 RIP RAP
- 1.13 RAINWATER DOWNSPOUTS
- 1.14 WATER PROOFING

Article 1.1 - General

The present section includes the construction of:

- Drains
- Pipe and box culverts including head works, wing walls and cover slabs
- Gullies and Manholes
- Retaining walls, paving slabs
- Masonry works (including retaining walls, stone facing, rainwater downspout etc)
- Riprap

Article 1.2 - Drainage programme

The Contractor shall submit to the Engineer for his approval immediately after the signature of the Contract a carefully prepared programme for the drainage works which shall allow for completion of all drainage systems necessary for drainage during construction, before works are started.

Article 1.3 - Drainage Excavation

The Contractor shall excavate all drainage systems to the lines, levels, gradients and dimensions shown on the drawings or as directed by the Engineer.

Excavation for drainage systems shall be carried out in accordance with the requirements of the relevant section of these technical specifications.

Should excavations be executed to greater depth or dimensions than necessary through the incidence of boulders or through other causes, the Contractor shall backfill and make good, with approved materials thoroughly compacted, to the correct level and dimensions and to the approval of the Engineer.

The material excavated for drainage systems shall be, if suitable, set aside for use as backfill and if unsuitable or in excess, run to spoil tips.

Article 1.4 - Timbering and Shoring of Excavations

The sides of excavations such as trenches, holes shall, where required, be timbered and shored to the satisfaction of the Engineer. The Contractor shall remain liable for any damage or injury consequent upon removal of timbering or shoring.

Where directed by the Engineer the timbering and shoring shall be left in excavations and measured and paid for except if, in the Engineer's opinion, the necessity for leaving the timber in has arisen from carelessness or neglect on the part of the Contractor.

Article 1.5 - Trenches and Holes Excavation and Backfilling

1.5.1 The trenches and holes excavations shall be of sizes sufficient to enable the bottom to be compacted as required, the bed to be laid, the pipes and concrete to be placed accurately and proper backfilling and ramming to be carried out.

1.5.2 Where required the bottom of such excavations shall be compacted to 90-95% B.S H.M.D.D.

1.5.3 Where rock is met at level of the intended bottom of the trench or hole, it shall be cut to a depth of 20 cm below this level and replaced with sand, granular material or other material to the approval of the Engineer.

1.5.4 Trenches and holes shall be kept free from water until any works such as concrete or joints therein are sufficiently set; the Contractor shall construct any temporary drains that the Engineer may deem necessary.

1.5.5 Where seepage of water occurs in trenches or holes, bedding and backfilling shall be carried out using sand, granular material or crushed stones or other material as directed by the Engineer.

1.5.6 Material for backfilling shall be to the approval of the Engineer and shall be deposited in layers not exceeding 15 cm of loose material, compacted with power rammers, the moisture content of the material being adjusted to facilitate thorough compaction. The density of each compacted layer shall not be less than 95% of B.S H.M.D.D.

Article 1.6 - Lined trapezoidal ditch

Lined trapezoidal ditches shall be built in masonry to the cross-section as shown in the drawing or as directed by the Engineer, and the invert level shall be finished to a steady longitudinal gradient not less than 0.5% and the fall shall be in all cases towards a culvert.

Article 1.7 - Unlined trapezoidal ditch

Unlined trapezoidal ditches shall be constructed to the cross section as shown on the drawing or as directed by the Engineer.

The invert level shall be finished to a steady longitudinal gradient of not less than 1% and the fall shall be in all cases towards a culvert.

Article 1.8 - Pipe Culverts

Pipe culverts shall be placed after cleaning their inside. Any damaged pipe shall be rejected.

Pipes shall be embedded in class 15 concrete to the line and level as shown on the drawings or as directed by the Engineer.

The method, tools for placing the pipes, joints to be used shall be to the approval of the Engineer.

A properly fitted plug shall be well secured at the end of each pipe already laid and shall be removed only when the next pipe line is being laid or on completion of the pipe line or culvert.

Where required by the Engineer, bedding shall curve upward along the culvert to correct for expected settlement and to ensure tightness in the lower half of the joints.

The flow line of the pipes shall be within a range of 0.5 cm of the specified level shown on the drawings or as directed by the Engineer.

Backfilling shall be brought up evenly on both sides of the pipe. Special care shall be taken to compact thoroughly the material under the haunches of the pipe and to ensure that backfilling material is in intimate contact with the pipe.

Jointed pipes shall be tested as directed by the Engineer.

Masonry works shall comply with the requirements of Article 1.11 and the end of all pipes shall be neatly built into the walls and finished with cement mortar.

No separate payment shall be made for excavation of pipe culverts and the cost thereof shall be deemed to be included in the rate for provision and laying of the pipe.

Article 1.9 - Box Culverts

Box culverts shall be built to the lines, levels and dimensions shown on the drawings or as directed by the Engineer. The base shall rest on firm soil and if the nature of the soil encountered requires the foundation to be lowered, the extra depth excavated shall be filled up with class 15 concrete containing 25% of plums.

The bottom of the excavation shall be filled with class 15 blinding concrete.

The top of the base slab shall be finished smooth to a steady gradient and the fall shall be as directed by the Engineer. The base slab and the cut-off walls shall be executed in class 30 concrete.

The supporting walls and the wing walls shall be built with class 30 concrete. All exposed surfaces shall have a smooth off shutter finish and construction joints shall be rubbed down to a smooth finish. The supporting walls and the wing walls may be built in masonry at the option of the contractor.

The top of the supporting walls shall be finished smooth to a perfectly level surface (by a layer of concrete in the case of masonry walls) so that no rocking of the precast apron slabs occurs once the latter is fixed in position.

The apron slabs shall be cast to have a smooth off shutter finish to the dimensions and levels given in the drawings or as directed by the Engineer in class 30 concrete. These slabs may be

cast in-situ or precast at the option of the contractor. If they are precast, they shall, in all respects, comply with the requirements for precast concrete as given in relevant sections.

Article 1.10 - Gullies and Manholes

Gullies and Manholes shall be built to the lines, levels, dimensions, and details given in the drawings or as directed by the Engineer. The bottom of the excavation shall be blinded with class 15 concrete. The base slab and the walls shall be built with class 30 concrete. The internal surfaces shall be of off-shutter finish with the construction joints rubbed down to make a uniform level surface. The top edge of the wall shall be carefully finished smooth and level so that no rocking of the precast cover slabs occurs.

Article 1.11 - Masonry Works

The stones for masonry works shall be in accordance with the requirements of the relevant section.

The masonry shall be laid to line and in courses roughly levelled up. The bottom courses shall be composed of large selected stones to be approved by the Engineer and all courses shall be laid with bearing beds parallel to the natural beds of the material.

Each stone shall be cleaned and thoroughly saturated with water before being set and the bed which is to receive it shall be clean and well moistened. All stones shall be well bedded in freshly made mortar. The mortar joints shall be full and the stones carefully settled in place before the mortar has set.

Wherever possible, the face joints shall be properly pointed before the mortar becomes set. Joints which cannot be so pointed shall be prepared for pointing by racking them out to a depth of 5 cm before the mortar has set.

The face surfaces of stones shall not be smeared with the mortar forced of the joints or that used in pointing.

Vertical joints in each course shall break with those adjoining courses at least 15 cm. In no cases shall a vertical joint be so located as to occur directly above or below a header.

In case any stone is moved or the joint broken, the stone shall be taken up, the mortar thoroughly cleaned from bed and joints, and the stone reset in fresh mortar.

Joints not pointed at the time the stone is laid shall be thoroughly wet with clean water and filled with mortar. The mortar shall be well driven into the joints and finished with an approved pointing tool. The wall shall be kept wet while pointing is being done and in hot or dry weather the pointed masonry shall be protected from the sun and kept wet for a period of at least four days after completion. After the pointing is completed and the mortar has set, the wall shall be thoroughly cleaned and left in a neat condition.

Article 1.12 - Riprap

The stones for riprap shall be as specified in relevant sections. They shall be laid with closed joints from the bottom of the slope of the embankment or existing ground, upward, the larger stones being laid at the bottom.

Article 1.13 - Rainwater Downspouts

The stones for rainwater downspouts shall be as specified in relevant sections. They shall be laid and bedded in class 15 concrete to the lines, levels and dimensions given in drawings or as directed by the Engineer.

Article 1.14 Waterproofing

1.14.1 General

Proprietary waterproofing systems incorporated in the Permanent Works shall have a current British Board of Agreement Roads and Bridge Certificate or equivalent approved certificate. The system will be as per the advice of the manufacturer with regard to site conditions including climatic and environmental limitations together with compatibility of materials and details at the interface of the waterproofing system with the drainage outlets and bridge deck movement joints. No departure from the specified constituent materials and methods of installation as stated on the British Board of Agreement Roads and Bridges Certificate will be permitted.

Proprietary waterproofing systems shall be installed only by applicators approved by the manufacturers.

The formation of defects affecting the integrity of the membrane including pinholes (continuous or non-continuous), blowholes and blisters in the waterproofing shall:

- (i) Be made good by repair in accordance with the Waterproofing System Data Sheets and the manufacturer's installation procedure and to the satisfaction of the Engineer before any subsequent layers are applied; or
- (ii) Require the system to be replaced where directed by the Engineer.

For sheet membranes bonded with oxidized bitumen the heating and the temperature of the bitumen shall comply with the manufacture's requirements within the limits stated in BS 8000.

A means of checking the bitumen temperature shall be provided.

Sheet membranes shall wherever possible be laid in the direction that the additional protective layer or surfacing will be laid and compacted by roller.

Unless otherwise specified in the British Board of Agreement Roads and bridges Certificate, joints between sheets shall be lapped with end laps of at least 150mm and side laps of at least 100mm. The joints shall be arranged so that:

- (i) At no point are there more than 3 thicknesses of sheeting and,
- (ii) Water will drain away from the exposed edge.

Proprietary waterproofing systems shall be laid to follow the contours of the concrete surface. Laps, ridges and ripples in waterproofing sheeting, and peaks and steps at butt joint in waterproofing boards, shall not be greater than 10mm in height.

1.14.2 Additional Bituminous protection

All proprietary waterproofing systems shall be protected with a bituminous layer of sand asphalt complying with BS594: Part 1 recipe Type F wearing course mixture designation 0/3 thickness 25mm. An additional warning layer of red coloured slurry seal shall be applied to this bituminous protective layer. This slurry seal will comply with the following specification, aggregate shall be light colour.

Aggregate Sieve	Grading % Passing
6.3	100
5	90-100
2	60-87
1	40-67
424mm	22-38
300	18-30
150	10-20
75	5-15

5% of the total mix is to be unreactive red pigmat and regarded as part of the filler. Cement is to be included as a fluxing agent at minimum 0.75% of the total mix which is also to be regarded as part of the filler content.

The emulsion may be anionic A4 or cationic K3 (depending on reaction with filler) and at a rate of 15-25% of the total mix, additional water up to a maximum of 10% of the mix may be added. Rate of application will be of the order of 250 m²/m³. Mixing may be by concrete mixer and spreading by hand application using a spreader box, rolling may be required by pneumatic tyred roller after initial curing.

The additional protective layer or surfacing laid on the waterproofing system shall be firmly bonded to the system. Where a tack coat for the additional protective layer or surfacing is not provided as part of the waterproofing system a satisfactory bond to the membrane shall be obtained from:

- (i) A separate compatible tack coat; or
- (ii) The binder within the directly applied additional protective layer or surfacing. Where the tack coat is the type activated by the heat of the succeeding bituminous layer the rolling temperature of this layer shall be sufficient to ensure adhesion.

SECTION 1.1A-GENERAL

1.1A THIRD PARTY OBLIGATIONS

The Contractor shall not demolish or otherwise interfere with any dwelling or building or anything connected therewith unless and until permitted to do so.

The Contractor shall take special care to prevent injury, damage, trespass on private lands, crops, fences, entrances and other properties including the adjoining sites of other contracts, adjacent to the works.

The Contractor must make all necessary arrangements in this connection with adjoining land owners and other contractors or with the officer appointed for the purpose in case of Government property, and assure the observance by his workmen of all regulations and laws appertaining thereto.

The Contractor shall make his own arrangements with the land owners concerned for access to the site of works. Similarly the Contractor shall make his own arrangements for access to and for procurement of, any materials for the construction of the works.

The Contractor shall indemnify the Employer against all claims from failure to fulfill the above obligations and against all other claims arising from failures of a similar nature.

1.1.2A 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.

1.1.3 ALIAISON WITH POLICE AND OTHER OFFICIALS

The Contractor shall keep in close contact with the Authorities of the areas concerned regarding their requirements in the control of workmen, movement of traffic, passage through urban areas, or other matters and shall provide all assistance or facilities, which may be required by such officials, in the execution of their duties.

1.1.4 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 handrailing and fencing off dangerous areas, e.g, excavations on roads.

1.1.5A ALTERATIONS TO AND PRESERVATION OF SERVICES

Where work is being 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 162 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 works is completed, and then shall be made safe and permanent.

Should the Contractor expose any existing services which may interfere with or be damaged by the construction, he shall submit details of such services 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.

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

Should any existing services be uncovered in the area of works, the Contractor shall be responsible for arranging, for the protection of such services including removal, modification or diversion if necessitated by the works, subject to the approval of the Engineer, to the services such as power lines, water lines, telephone lines, etc. (Prices and a provisional sum for these works are included in the Bill of Quantities).

The Contractor shall also seek the approval from the authorities concerned whenever required.

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.

1.1.6A TRAFFIC DEVIATIONS, TRAFFIC CONTROL AND SIGNS

The Contractor shall be responsible for the safe and easy movement of road and pedestrian traffic, by day and night through the sections of the existing road where he is working.

The Contractor shall bear the cost of all these temporary warning signs of EUROPEAN STANDARD 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. All such arrangement shall receive the approval of the Engineer.

Provisions and maintenance of traffic diversion will be the responsibility of the Contractor. The Contractor shall ensure that neither his own operations nor trespass by his employees shall interfere with the operation and maintenance of traffic diversions.

1.1.7A PROGRAMME TO BE FURNISHED

Within 3 (three) days after the issue of the Works Order, the Contractor shall submit to the Engineer for his approval.

A general programme 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.

The organisation, staff, labour, equipment and plant proposed for the execution of the Contract.

1.1.8A SETTING OUT

The Contractor shall be responsible for the full and proper setting out of the Works where required. 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 operators, gangmen 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, then the Contractor shall replace or reinstate such marks to the satisfaction of the Engineer.

The Contractor will be required to prepare and submit layout drawings, longitudinal and cross sections of the project road prior to the start of the works in any stretch of road. He shall also give the Engineer not less than 24 hours notice, of his intention to set out or take levels for any part of the work before and after the completion of wearing course, so that arrangements can be made for checking. The Contractor shall provide all the necessary instruments, appliances, labour etc. that the Engineer may require.

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

1.1.9A TEMPORARY WORKS

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.

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 land owners at his own expense.

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.

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.

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.

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.

1.1.10A MAINTENANCE OF EXISTING ACCESS AND SERVICES

The Contractor shall provide at all times, access for vehicles and pedestrians to their premises for owners and occupiers of land along the route of the works. Provision must be made to ensure that sanitary services remain unimpeded at all times.

The Contractor shall be responsible for the maintenance of the existing roads of which he has been given possession.

1.1.11A 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.

1.1.12A 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 surface of the ground and nature of the materials to be excavated, the possibility of subsidence from soft ground and bad broken materials, and falls of rock in or arising out of the Works, and the rates and prices in the Bills of Quantities will be held to cover all such contingencies.

1.1.13A FAULTY WORK

Any work which fails to comply with his Specifications 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.

1.1.14A 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.

1.1.15A PROTECTION FROM WATER

The Contractor shall keep the whole of the Works free from water 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.

1.1.16A 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.

1.1.17A 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.

1.1.18A 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 items listed in the Works Order 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 works, shall entitle the Engineer to disallow any claim for extras arising therefrom. The fact that joint measurement took place in no way commits the Engineer to recognising 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.

SECTION 2 – CONCRETE WORKS

2.1 MATERIALS

This Section deals with reinforced and unreinforced concrete works, formwork and falseworks of any kind, and the reinforcement.

(1) Cement

Ordinary Portland Cement and rapid hardening Portland Cement shall comply with the requirements of MS 36: Portland Cement (Ordinary and Rapid-Hardening).

Each consignment of cement shall be accompanied by the manufacturer's certificate giving results of tests. If such certificate is not available, representative samples shall be taken from different bags or containers of each consignment, suitably packed and sent for testing, to prove its compliance with the requirements of MS 36 to an approved laboratory or where directed by the Engineer, all at the Contractor's expense.

All bagged cement shall be stored in a waterproof shed on a wooden floor raised at least 150mm above the surrounding ground and any Cement which shall have become injuriously affected by dampness or other causes shall at once be removed from the Site. Cement which has been rebagged either by the importing agent or by the Contractor, whether through the breakage of the original bag or any cause, shall not normally be accepted, but may be used in special cases and in certain parts of the work, if the written approval of the Engineer is first obtained.

(2) Aggregates

Aggregates for concrete shall consist of naturally occurring material complying with the requirements of BS-882 Concrete Aggregates from Natural Sources. The fine aggregates for concrete shall consist of clean sharp sand or crusher dust or a mixture of sand and crusher dust and shall not contain any iron pyrites, coal, mica, shale or similar laminated materials, flaky or elongated materials, shells and other porous or fragile particles, soluble matters, sulphates, alkalis and other deleterious materials in such a form or in a sufficient quantity as to affect adversely the strength or durability of concrete, or in addition to the above for reinforced concrete, any materials which would attack the reinforcement.

Aggregates shall be clean and free from adherent coatings, such as clay. The fine aggregate shall comply in all respects with the requirements of BS 882 for fine aggregate.

The coarse aggregate shall consist of crushed or natural gravel or shingle or alternatively of broken hard, close grained stone of an igneous or other rock, to the approval of the Engineer. It shall be free from adherent coatings and shall, if necessary, be washed to achieve this, and shall conform to the following requirements:

(a) The amount of deleterious substance shall not exceed the following limits:

	Max. Permissible % by weight
Clay lumps	0.25
Material passing 75 micron BS Sieve	1.00
Calcium sulphate expressed SO	0.25
Sodium Sulphate Soundness (BS 1438 Appendix B) Weight loss after 5 cycles	12.00
Thin or elongated pieces (length greater than 5 times average thickness)	15.00
Maximum Flakiness Index (BS 812 sieve method)	
For 35mm aggregates	40
For 20mm aggregates	35

(b) The abrasion loss, as determined on representative samples in accordance with ASTM C131 shall not exceed 40%.

The aggregate crushing value, as determined on representative samples in accordance with BS 812, shall not exceed 35% as an average or 40% as an absolute maximum.

The drying shrinkage of the aggregate when tested in accordance with the British Building Research Establishment Standard test shall not exceed the following:

For precast	0.04%
For all other concrete	0.06%

(3) Grading of Aggregate
Fine Aggregate

i) Grading of fine aggregates shall comply with Grading Zones given in the following table:-

Percentage by weight passing BS Sieve

BS Sieve Size mm	Grading Zone 1	Grading Zone 2	Grading Zone 3	Grading Zone 4
10	100	100	100	100
5	90-100	90-100	90-100	95-100
2.35	60-95	75-100	85-100	90-100
1.18	30-70	55-90	75-100	90-100
0.60	15-34	35-59	60-79	80-100
0.30	5-20	10-30	15-40	15-50
0.15	0-10	0-10	0-10	0-15

ii) Any fine aggregate which does not comply with the requirements of these Specification shall be immediately removed from the Site or placed in a stockpile for use in other parts of the Works, if it complies with the requirements thereof, as directed by the Engineer.

Coarse Aggregate

i) The Contractor shall arrange for the delivery of the coarse aggregate to Site in separate nominal sizes. The grading of such nominal size of aggregate shall be in accordance with the requirements indicated in the following table:

Percentage by weight passing B.S Sieve

BS Sieve Size	Nominal size of single sized aggregate				
	63mm	38mm	20mm	12mm	9.5mm
75mm	100				
63mm	85-100	100			
37.5mm	0-30	85-100	100		
20mm		0-20	85-100	100	
14mm				85-100	100
10mm		0-5	0-20	0-45	85-100
5mm			0-5	0-10	0-20
2.36mm			0-2	0-2	0-5

ii) For Class 15(40) concrete, volumetric proportioning of coarse aggregate and of fine aggregate will only be permitted at the Engineer's discretion.

For all other concrete mixes the Contractor will be required to produce coarse aggregate grading by weight batching the single sized aggregates.

iii) The single-sized aggregate shall be combined in proportions to give overall gradings for coarse aggregates in accordance with the requirements of BS 882 as set out in the following table:

Percentage by weight passing B.S Sieve

BS Sieve Size	Nominal size of single sized aggregate		
	30mm to 5mm	20mm to 5mm	12mm to 5mm
63mm	100		
37.5mm	95-100	100	
20mm	30-70	95-100	100
14mm			90-100
10mm	10-35	25-55	40-85
5mm	0-5	0-10	0-10

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- iv) **The amounts or proportions of each single-sized aggregate to be combined to form the coarse aggregate shall be varied from time to time as may be rendered necessary by the nature and source of the coarse and fine aggregates adopted by the Contractor, in order to produce at all times a concrete of the maximum density and workability with the minimum water cement ratio.**
- (v) **No claim of any kind will be accepted in respect of any such variation in the amounts or proportions of the single-sized aggregates and the Contractor shall allow in his tender for such variations. Under no circumstances shall more than one single-sized aggregate be delivered to the place of gauging in one truck or lorry.**

(4) Storing of Aggregates

Aggregate shall be stored in single sizes in separate bins or on areas covered with tightly laid wood planks, sheet metal, hard compact gravel, concrete or other hard and clean surfaces, which surfaces shall be self-draining, and in such a manner that will preclude the inclusion of foreign material. Aggregate of different gradings and sizes and from different sources shall be stored in separate piles and if these piles are close together they shall be separated by bulkheads. Adequate stocks of fine aggregates shall be maintained to ensure uniformity of moisture content when used.

The Engineer shall have the power to reject any aggregate which does not conform to the above requirement. Rejected materials shall be immediately removed from site or disposed of at the expenses of the Contractor. The variation of grading between the approved samples and subsequent consignments of single-sized aggregate shall not exceed 5 per cent.

2.2 NORMAL CONCRETE MIXES

Concrete mixes shall be designed in accordance with “Design of Normal Concrete Mixes’ 1976, published by the UK Department of the Environment, or in accordance with other approved method.

2.2.1 STANDARD MIXES

- (i) **The concrete shall attain the strength shown in Table No. 5, both in the test cubes and throughout the whole of the placed work. The cement content must not fall below the minimum specified in Table No. 5.**
- (ii) **Aggregates shall be batched by weight for all classes of concrete and hoppers shall be an approved adjustable type. With the written approval of the Engineer, volume batching may be permitted for batching aggregates for concrete Class 15(40). Where aggregates are batched by volume, stout gauge boxes, approved by the Engineer, shall be used. The volume of the gauge boxes shall take into account the bulking of the aggregates.**
- (iii) **When bagged cement is used, the total volume or weight of aggregates per batch shall be such that a whole bag of cement is utilised; the use of cement from broken bags will not be permitted. When cement in drums or from a bulk-silo is used, the batching of the cement shall be by weight.**

2.3 CONCRETE SCHEDULES

Concrete Class	Minimum Concrete Strength N/mm ²		Minimum Cement Content Kg/m ³	Part of Works
	7 days	28 days		
15(40)	10	15	250	Blinding Layer Surround to pipe
20(20)	14	20	290	Concrete Bedding Backing to kerb
25(20)	17	25	340	Kerbs Bases to Post
30(20)	20	30	400	Culverts Bridge Decks

Notes

1. The class of concrete is denoted by the specified minimum 28 days cube strength, in N/mm² of the works cubes. The maximum size of aggregate is 20mm for all mix classes except for class 15(40) where 40mm maximum aggregate size is allowed.
2. The design mixes are based on Portland cement complying with MS 36 or BS 4027, and natural aggregates complying with BS 882. No special cement or light weight aggregates are to be used.

2.4 MIXING WATER

Mixing water for use with cement shall be from a source and of a quality approved by the Engineer. It shall be clean and free of oil, acid, alkali, salt, organic matter or other deleterious substances.

2.5 WATER/CEMENT RATIO

The quantity of water used for each class of concrete shall be just sufficient to produce a dense concrete of adequate strength and workability for its purpose. The moisture content of the coarse and fine aggregate in stockpiles shall be periodically determined as directed by the Engineer, and due allowance for the water present in them shall be made when determining the amount of water to be added at the mixer.

2.6 MIXING ON SITE

Unless otherwise authorised by the Engineer, concrete shall be machine mixed at the Site.

Concrete shall be thoroughly mixed in a batchmixer of an approved size and type which will ensure a uniform distribution of the materials throughout the mass. The mixer shall be equipped with adequate water storage and with a device for accurately measuring and automatically controlling the amount of water used in each batch. A mechanical means shall be provided for recording the number of revolutions for each batch and automatically preventing the discharge of the mixer until the materials have been mixed to the approval of the Engineer.

The entire contents of the mixer shall be removed from the drum before materials for a succeeding batch are placed therein. No mixer having a rated capacity of less than one batch shall be used nor shall a mixer be charged in excess of its rated capacity. All concrete shall be mixed for a period of not less than 1 minutes after all materials, including water, are in the mixer. During the period of mixing, the mixer shall operate at the speed for which it has been designed, but this speed shall not be less than 14 nor more than 20 revolutions per minute.

Prior to producing the first daily batch of concrete to be used in the works, or after the mixer has been cleaned, the mixer shall be operated with a sufficient quantity of water, cement and aggregates to thoroughly coat the inside of the mixer drum, to obviate a deficiency of these materials in the first batch of Works concrete produced. On completion of this coating process, the coating batch shall be removed from the mixer and deposited in an approved location away from the Works. Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before further concrete is mixed. The mixing plant and concrete transporting equipment shall be thoroughly cleaned before changing from one type of cement to another. The contractor will allow in his tender for all costs involved in complying with the above requirements.

2.7 READY MIXED CONCRETE

Ready mixed concrete, as defined in BS 5328 and batched off the site may only be used with the approval of the Engineer and shall comply with all requirements of the Specification. Ready mixed concrete shall be mixed and delivered to the site of the works by means of one of the following combination of operations:

- (a) Mixed completely at a central plant and the mixed concrete transported to the point of delivery in truck agitators.
- (b) Mixed partially at a central point and the mixing completed in a truck mixer.
- (c) Mixed completely in a truck mixer.

Mixing at a central plant shall conform to the requirements for mixing on Site. The organization supplying premixed concrete shall have sufficient plant capacity and transporting apparatus to ensure continuous delivery at the rate required. Mixers may be stationary mixers or truck mixers. Agitators may be truck mixers operating at agitating speed or truck agitators. Each mixer and agitator shall have attached thereto

in a prominent place a metal plate or plates on which is plainly marked the various uses for which the equipment is designed and the manufacturer's guaranteed capacity of the drum or container in terms of volume of mixed concrete and the speed of the rotation of mixing drum or blades.

Truck mixers, unless otherwise authorised by the Engineer, shall be of the revolving drum type, watertight, and so constructed that the concrete can be mixed to ensure a uniform distribution of the materials throughout the mass. All solid materials for the concrete shall be accurately measured as specified and charged into the drum at the proportioning plant.

Except as subsequently provided, the truck mixer shall be equipped with a tank for carrying mixing water.

Only the prescribed amount of water shall be placed in the tank unless the tank is equipped with a device by which the quantity of water added can be readily verified. The mixing water may be added directly to the batch, in which case a tank shall not be required. Truck mixers may be required to be provided with means by which the mixing time can be readily verified by the Engineer.

Concrete transported in a truck mixer, agitator, or other transportation device shall be discharged at the site and placed in its final position in the forms within 45 minutes after the introduction of the mixing water to the cement and aggregate or the cement to the aggregate except that in hot weather or under other conditions contributing to quick setting of the concrete, the maximum allowable time may be reduced by the engineer. The maximum volume of mixed concrete transported in an agitator shall be in accordance with the specified rating.

2.8 HANDLING AND PLACING OF CONCRETE

(1) General

In preparation for the placing of concrete, all sawdust, chips, and other construction debris and extraneous matter shall be removed from the interior of forms. Struts, stays and braces, serving temporarily to hold the forms in correct shape and alignment, pending the placing of concrete at their locations, shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. These temporary members shall be entirely removed from the forms and not buried in the concrete.

No concrete shall be placed until the Engineer has approved the formwork and reinforcement. The Contractor shall give at least 24 hours notice to the Engineer of the times he proposes to concrete and the Engineer may order that no concreting shall take place until either he or his representative is present. No concrete operation shall fall in a weekend or on a public holiday except absolutely necessary and unless written approval of the Engineer is priorily obtained.

(2) Handling

Concrete shall be transported in watertight containers in such as a manner that will avoid the segregation of the constituent materials. The time elapsing between the initial mixing of the concrete and final placing in the work shall not exceed 45 minutes when Portland Cement is used. Where other cements are used, the Engineer will stipulate the maximum time allowed. Concrete remaining unplaced at the end of this period shall not be placed in the Works but shall be removed from the Site and disposed of at the Contractor's expense.

(3) Placing

Concrete shall not be dropped through a height exceeding 1.5 metres. For lowering concrete through heights in excess of 1.5 metres special methods shall be used, such as chutes, tremies, bottom dumping hoppers or bagged placing and only with the approval of the Engineer. All containers, troughs, chutes and apparatus through and in which the concrete is passed shall be kept clean and entirely free from hardened concrete or cement and free from contamination by extraneous material, and where there is an interruption of concreting exceeding 30 minutes, these shall be cleaned and hosed down with water.

When Concrete is placed in horizontal layers it shall not be more than 300mm thick except as hereinafter provided. When less than a complete layer is placed in one operation, it shall be terminated in a vertical bulkhead. Each layer shall be placed and compacted before the preceding batch has taken initial set to prevent injury to the green concrete and avoid surfaces of segregation between the batches.

Each layer shall be compacted so as to avoid the formation of construction joints with a preceding layer which has not taken initial set. When in-situ concrete has been in place for 4 hours no further concrete shall be placed against it for a further 20 hours.

The concrete placed immediately adjacent to existing concrete shall contain only two-thirds the normal quantity of coarse aggregate, and shall be thoroughly compacted and worked against the existing concretes. A competent steel fixer shall be in attendance the whole time concrete is being cast around reinforcement. Immediately following the discontinuance of placing concrete, all accumulations of mortar splashed upon the reinforcement steel and the surface of forms shall be removed.

Dried mortar chips and dust shall not be puddled into the unset concrete. If the accumulations are not removed prior to the concrete becoming set, care shall be exercised not to injure or break the concrete steel bond at and near the surface of the concrete, while cleaning the reinforcement steel.

2.9 COMPACTION OF CONCRETE

Concrete during and immediately depositing, shall be thoroughly compacted to produce a dense homogeneous mass. The compaction shall be done by mechanical vibration subject to the following provisions:

-
- i) The vibration shall be internal unless special authorisation of other methods is given by the Engineer or as provided herein.**
 - ii) Vibrators shall be of a type and design approved by the Engineer. They shall be capable of transmitting vibration to the concrete at frequencies of not less than 4,500 impulse per minute.**
 - iii) The intensity of vibration shall be such as to visibly affect a mass of concrete of 25mm slump over a radius of at least 450mm to 600mm.**
 - iv) The Contractor shall provide a sufficient number of vibrators to properly compact each batch immediately after it is placed in the forms.**
 - v) Vibrators shall be manipulated so as to thoroughly work the concrete around the reinforcement and embedded fixtures, and into the corners and angles of the forms. Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete. The vibrators shall be inserted and withdrawn out of the concrete slowly.**
 - vi) The vibration shall be of sufficient duration and intensity to thoroughly compact the concrete, but shall not be continued at any one point to the extent that localised areas of grout are formed. Application of vibrators shall be at uniformity spaced points and not farther apart than twice the radius over which the vibration is visibly effective.**
 - vii) Vibration shall not be applied directly or through the reinforcement to sections or layers of concrete which have hardened to the degree that the concrete ceases to be plastic under vibration. It shall not be used to make concrete flow in the forms over the distances so great as to cause segregation, and vibrators shall not be used to transport concrete in the forms.**
 - viii) Vibration may be supplemented by such spading as is necessary to ensure smooth surfaces and dense concrete within the forms.**

2.10 PROTECTION AND CURING OF CONCRETE

Immediately after compaction and for 10 days thereafter concrete shall be protected against harmful effects of weather including rain, drying winds, rapid temperature changes, running or surface water and shockloads. It shall be protected by keeping it covered with damp hessian, straw, damp sand or other approved material and kept moist.

All curing methods to be used shall be subject to the approval of the Engineer. The formwork shall also be kept damp and, if struck earlier than seven days, shall be replaced for the remaining period with other approved damp material.

All concrete surfaces in contact with earth fill material shall be waterproofed with two coats of approved bituminous emulsion, either brushed or sprayed on, and on such

surfaces curing membrane shall not be used. Care shall be taken to ensure that no bituminous paint where used is exposed to view after backfilling of the structures. All unsightly marks or spray shall be removed and the concrete made good at the Contractor's expense.

2.11 TOLERANCES

The concrete work shall be constructed as accurately as possible and the following tolerances will be permitted in the finished concrete work:

- i) in the cross-sectional dimensions of structures not more than 3 mm.**
- ii) in dimensions, other than cross-sectional dimensions of structures not more than 6mm.**
- iii) in any surface the irregularity shall not exceed 5mm measured from a 3m long straight edge.**
- iv) no member shall be out of line by more than 5mm.**
- v) no wall shall be out of plumb by more than 5mm or, if battered, out of batter by more than 5mm.**

2.12 SAMPLING AND TESTING

Immediately on starting production on site, samples of concrete shall be taken as follows:

On each of the first 4 days of concreting, for each class of concrete, shall be made 6 test cubes from 2 separate samples. Three test cubes from each samples to be tested at 7 days, the other 3 at 28 days. One test result shall be the average crushing strength from the three cubes in the same sample, tested either at 7 days or at 28 days.

For the concrete to be acceptable the following conditions must be satisfied.

- a) not more than one individual result in the same test shall fall below the specified works cube strength.**
- b) no individual result to fall below 90% of the specified works cube strength.**
- b) no test result (average of three cubes in one sample) to fall below the specified works cube strength.**

When at least 4 consecutive working days concrete production has been proved satisfactory, the frequency of testing may be reduced at the Engineer's discretion. The frequency and number of tests required by the Engineer for any concrete subsequently used in the Works will be at the discretion of the Engineer, and the Contractor will be deemed to have included for all costs required in the carrying out of the tests for trial

mixes, and subsequent concrete quality control tests, in his tender for all parts of the Works, and for the whole duration of the contract.

2.13 LOADING CONCRETE STRUCTURES

No concrete structure will be subjected to loading including its own mass which will induce a compress stress of one third of its compressive strength at time of loading or of the specified 28 days strength.

2.14 FAULTY CONCRETE

Any concrete which, in the opinion of the Engineer, fails to comply with the Specification shall be declared defective, and shall be cut out, removed from the site and any steelwork, reinforcement or other material damaged by the cutting out shall be replaced to the approval of the Engineer and at the Contractor's expense. The Contractor may submit to the Engineer details of his proposals for rectifying the defects and shall comply with the Engineer's instructions regarding the method of carrying out the work. Notwithstanding the Engineer's approval, should the remedial work prove again unsatisfactory, the Contractor shall further make good all defective and rejected work at his own expense.

2.15 PRECAST CONCRETE

1) *General*

Precast concrete structural members shall generally comply with the requirements of British Standard Code of Practice 116, except where varied by the requirements of these Specification or the Drawings.

The Contractor shall set up on Site an adequate precasting yard undercover, capable of handling all the precast concrete works and shall provide a suitably qualified Engineer to supervise the working on the yard all to the satisfaction of the Engineer. The contractor shall provide full details and drawings showing his proposals for the precasting yard, and until approval is given in writing no work on erection of the yard or producing precast concrete shall commence.

2) *Concrete Grades*

Concrete grades shall be all as shown on the Drawings and in accordance with the Schedule of Concrete Mixes.

3) *Casting Method*

The precast units shall each be cast complete in one operation, on suitable and sufficient platforms and moulds, all to the satisfaction of the Engineer. Before casting is commenced the Contractor shall submit, for the approval of the Engineer fully detailed drawings showing the proposed layout of casting beds, together with the details of the method of assembling and dismantling of the moulds, and lifting assembly of the units.

In cases where the finished thickness of the concrete is small, and compaction by internal or surface vibration will be difficult, the mould may be constructed so that external vibration of the shutter will satisfactorily compact the concrete, or vibrating tables may be used. The soffit shutter shall be adequately supported to prevent any settlement which might cause cracking of the concrete.

Provision shall be made to hold firmly and maintain in position all projecting reinforcement, bolts, screwed sockets and lifting holes, so that they are correctly located in the completed unit or member concerned.

4) *Weather Protection and Curing*

The precast units shall at all times be cast under suitable shelter to provide complete protection from the sun, rain and drying winds. They shall remain under the shelter for at least seven days or until the units are strong enough to be lifted from the casting beds, whichever is the longer period. Similar to in-situ concrete, all exposed precast concrete shall be protected and cured as described in Sub-section 6.12. Thereafter, the units may be transferred to a storage area or be erected in their final position.

5) *Surface Finishes Generally*

The methods used for compacting the concrete must be such that pinholes or airholes on the surface are avoided. Upon removal of the formwork, any units having a concrete face with rough, uneven, segregated, honeycombed or imperfect finish, or which shall be permanently discoloured, may be rejected at the Engineer's discretion. Where carrying out of remedial work is approved by the Engineer, irregularities shall be eliminated by grinding, or where an area shows airholes, these shall be filled and thoroughly rubbed over to leave the desired surface. Unsightly encrustations and stains shall be removed from all exposed surfaces. Remedial work of all kinds must be carried out strictly in accordance with the Specification and any further instructions which may be given by the Engineer. Any units which are rejected shall be disposed of away from the Site at the Contractor's expense.

6) *Lifting and Handling of Units*

No items may be lifted from the casting beds until they have gained sufficient strength to avoid damage through lifting, handling, stacking or erection. Notwithstanding any guidance given by the Engineer on the concrete strength necessary to prevent damage, the Contractor shall be entirely responsible for the sufficiency of strength of units before lifting. Any items found damaged or cracked during and after lifting operation will be rejected by the Engineer, and rejected items must not be incorporated in the works and must be disposed of and replaced at the Contractor's expense.

Before casting, the Contractor shall submit to the Engineer, for his approval, full details of the proposed method of hoisting precast units including the location of proposed lifting points. The contractor shall be responsible for the design and provision of extra reinforcement that may be required to facilitate the handling of the precast units and his tendered price shall include for this. The edges of precast units shall be protected by

tenders of timber or other approved material during the lifting, handling and erection stages.

7) *Stacking of Precast Units*

Where members are stored; they shall be firmly supported at such bearing positions that will ensure that stresses induced in them are always less than the permissible design stresses. Ample space is to be provided for the storage and stacking of the units. Units shall not be walked on or come into contact with the ground or with dirty or greasy hands or with ropes and cables. Nor shall wet slabs come into contact with dirty packs or pieces of timber which will discolour them. The units shall be stacked in such a way that the faces are protected both from damage and from staining. Where precast units have reinforcement left projecting, great care must be taken to ensure that any rust from these bars will not stain the finished concrete surfaces.

8) *Tolerances*

The dimensional tolerances shall be in accordance with the requirements of British Standard Code of Practice 116, except where otherwise specified or indicated on the Drawings.

2.16 FORMWORKS

All formwork shall be approved by the Engineer before casting in-situ concrete.

2.17 STEEL REINFORCEMENT FOR STRUCTURES

All reinforcing steels shall conform to MS 10. The Contractor shall, when called upon by the Engineer, provide representative sample pieces for testing.

Alternatively, the reinforcement of concrete may comply with the following requirements:

Hot rolled Mild Steel	BS 4449
Medium Tensile Steel	BS 4449
High Tensile Steel	BS 4449
Cold Worked Steel	BS 4461
Steel Fabric	BS 4483
Stainless Steel	BS 970

All reinforcement shall be from an approved manufacturer, and, if required by the Engineer, the Contractor shall submit a test certificate of the rolling. The Contractor shall when requested by the Engineer, provide sample pieces for testing in an approved Materials Testing Laboratory, all at the Contractor's expense.

All reinforcement shall be free from scale, rust, grease, paint or other substances likely to reduce the bond between the steel and the concrete.

When placed in the Works, reinforcement shall be free from coatings of dirt, detrimental scale, paint, oil or other foreign substance.

Reinforcement shall be stored off the ground and be protected from rusting, coatings of deleterious material and excessive distortions. Any bar that, in the opinion of the Engineer, has been adversely affected by storage shall be cleaned, or removed from the Site and replaced by the Contractor at his own expense.

Bar reinforcement shall be cut and bent to shapes shown on the Drawings and according to bending schedules, prepared by the Contractor and approved by the Engineer.

The reinforcement shall be fixed rigidly and accurately in the forms in accordance with the details shown on the Drawings so that the specified spacing and concrete cover are maintained throughout.

No concrete shall be deposited in the forms until the Engineer has inspected the reinforcement and has given permission to place concrete.

2.18 CONCRETE DRAINS

Precast concrete drains shall be constructed to the cross section shown in the drawing in lengths not exceeding 2 metres, and the ends shaped so as to interlock with each other. The joints shall be mortared and rubbed down to a smooth finish. The top edge of the wall shall be carefully finished smooth and level so that any precast covers placed on it will not rock.

In built-up areas where drains will be provided along the road, the Contractor will have to realign CWA house service connections under the drains as directed by the Engineer using 20,25,50 or 62 mm diameter polyethylene pipes and appropriate fitting.

2.19 CONCRETE KERBS

Precast concrete kerbs, shall comply with the requirements of BS 340 and BS 368 and with the Drawings.

Specially cast radial curves shall be used on curves where the radius is 5m or less.

All kerbs shall be butt jointed and all joints shall be mortared. The quality of concrete, used in kerbs shall be in accordance with relevant sections in these Specification.

Special attention shall be given to the programming of the work so as to avoid clashes and possible removal of installed kerbs.

2.20 TOLERANCE ON LAYING CONCRETE KERBS

Any concrete kerbs deviating in line or level by more than 3mm when tested with a 1 metre straight edge shall be made good by relaying to the satisfaction of the Engineer at the Contractor's own costs.

2.21 CEMENT MORTAR

Mortar shall consist of 1 part cement to 3 parts sand with such minimum quantity of water as is necessary to produce the suitable plasticity for the work for which it is required and shall be used within one hour of mixing.

2.22 CEMENT GROUT

Cement grout shall consist of cement and such minimum quantity of water as is necessary to produce the suitable plasticity for the work for which it is required. It shall be used while fresh and within thirty minutes of mixing.

2.23 LIME MORTAR

Lime mortar shall consist of one part of hydrated lime to two and a half parts of sand, and such quantity of water as is necessary to produce the suitable plasticity for the work for which it is required, and, shall be used within one hour of mixing.

2.24 HYDRATED LIME

Lime for stabilisation shall be Hydrated Calcium Lime (Not Magnesium) and shall generally comply with BS 890, Class B, and with a free lime content of 50 %.

Locally manufactured limes may be accepted by the Engineer in lieu of lime to BS 890 and contractors are advised to ascertain from the Engineer what local limes may be suitable. All percentages of lime specified are based upon hydrated Calcium Limes complying with BS 890 and an adjustment of these percentages may be required for some locally made limes.

The Contractor shall submit with all consignments at his own expense, the manufacturer's data sheets certifying that it complies with BS 890.

2.25 BASALT SAND FOR MORTAR

Sand for mortar shall comply with BS 812 and the grading shall be within the limits specified. Test for purity (ASTM C40) shall be made for each consignment, and at least once a day when sand is used.

2.26 MASONRY WORKS

Stones for masonry works shall consist of sound undecomposed basalt obtained from approved boulders and be of even texture and colour.

The masonry shall be laid to line and in courses roughly levelled up. The bottom courses shall be composed of large selected stones and all courses shall be laid with bearing beds parallel to the natural beds of the material.

Each stone shall be cleaned thoroughly, saturated with water before being set and the bed which is to receive it shall be clean and well moistened. All stones shall be well bedded in freshly made mortar. The mortar joints shall be full and the stones carefully settled in place before the mortar has set.

Wherever possible, the face joints shall be properly pointed before the mortar becomes set. Joint which cannot be so pointed shall be prepared by racking them out to a depth of 5 cm before the mortar has set.

The face surfaces of stones shall not be smeared with the mortar forced in the joints or that used in pointing.

Vertical joints in each course shall break with those adjoining courses at least 15 cm. In no case shall a vertical joint be so located so as to occur directly above or below a header.

In case any stone is moved or the joint broken, the stone shall be taken up, the mortar thoroughly cleaned from beds and joints, and the stone is reset in fresh mortar.

Joints not pointed at the time the stone is laid shall be thoroughly wet with clean water and filled with mortar. The mortar shall be well driven into the joints and finished with an approved pointing tool. The wall shall be kept wet while pointing is being done and in hot and dry weather the pointed masonry shall be protected from the sun and kept wet for a period of at least four days after completion. After the pointing is completed and the mortar has set, the walls shall be thoroughly cleaned and left in a neat condition.

2.27 PHOTOGRAPHS

If for the purpose of the works, the contractor has to demolish any wall, fence, gate, shed, post, shrine or planted hedge located in a private property, he shall, as directed by the Engineer, take photographs of the existing structure before proceeding with any demolition work. A copy of each photograph taken shall be submitted to the Engineer.

2.28 LABORATORY TESTS

All tests 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 of address of the laboratory where he intends to carry out other 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 to comply with quality of materials and workmanship 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:

(i) Cement, Concrete and Concrete Aggregates

<i>Description of Test</i>	<i>Relevant Specification</i>
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

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

<i>Description of Test</i>	<i>Relevant Specification</i>
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 subject to the Engineer's approval by Speedy Moisture Content to maker's instructions with calibration against Oven-drying method	BS 812
Test for slit, clay and impurities of fine aggregate Sedimentation or decantation method (in case of discrepancies the Sedimentation method shall rule)	BS 1377 Test 1A
Bulk density of filter 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
,C535	ASTM C131
California Bearing Ration (CBR)	BS 1377

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.

(iii) 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
(i) Particle size analysis	BS 812
(ii) Extraction of bitumen	BS 598 : Part 102
(iii) Marshall stability and flow	BS 598, ASTM
	D1559
(iv) Specific gravity	ASTM D1188 or
	2726 as
	appropriate

2.29 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 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.

2.30 FELLING OF TREES

Bushes, trees and roots shall be cut down, grubbed up or otherwise removed in a manner to be directed by the Engineer. Trees, defined as having a girth of 0.6metre and over, measured one metre from the ground, shall be taken down in stages, the higher branches being first sawn or loped off then the corresponding position of the trunk shall be sawn off and the sequence repeated. Holes left by the removal of roots shall be backfilled and compacted to 90% B.S. Heavy Compaction with approved material up to the existing ground level or up to the top of the sub- grade level if the area is to be excavated, whichever is the lesser. The Contractor must seek the approval of the Forestry Department prior to the removal of any tree.

2.31 RAISING OF MAN-HOLES/DRAINS

All works shall be done in the presence or with the authorisation of the Authority concerned (CWA, CEB, MT, WWA)/EMTEL and following strictly their methodology and specifications.

SECTION 8 – STRUCTURAL CONCRETE

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Article 8.1 - Structural Concrete

8.1.1 Material

Structural concrete shall consist of Portland cement, aggregate and water which shall conform to the requirements of Part 2 of these Technical Specifications.

8.1.2 Concrete Mix Design

At least 30 days before commencing any concrete construction, the Contractor shall carry out trial mixes to determine the grading of aggregates, the relative proportion of fine and coarse aggregates, water and cement in order to produce a concrete of satisfactory strength and workability in accordance with these Technical Specifications.

The trial mixes shall be mixed in an approved type of concrete mixer similar to that which the Contractor proposes to use on site.

For each class of concrete the Contractor shall prepare 2 sets of 18 cubes (for compressive strength) and 2 sets of 18 cylinders (for indirect tensile strength). One set shall be tested at 7 days and the other set at 28 days. The results of these tests, called "preliminary tests" shall comply with the requirements of Table 2 in article 8.1.3 hereafter.

Should one cube crushed at 7 days or at 28 days fall below the specified requirements, the Contractor shall carry out further trial mixes altering the mix design and/or the source of aggregate, gradation, preparations of aggregate, cement, water until a satisfactory standard of concrete for each grade is attained.

The results of the concrete mix design shall be submitted to the Engineer for his approval.

The cost of such trials and tests shall be deemed to be included in the tendered rates and prices.

8.1.3 Classes of Concrete

Various classes of concrete are provided for in these Technical Specifications. Each class of concrete shall be used in that part of the structure where called for in Table 1 hereafter, on the Drawings or as directed by the Engineer.

TABLE 1

CLASS	GRADATION OF AGGREGATE mm	PART OF THE WORKS
40	0 - 20	Slab deck of bridges, Parapets
35	0-20	Abutments, walls, footings and foundation of bridges
30	0 - 20	Wing walls of bridges, box culverts
25	0 - 20	Precast or in situ kerbs Precast or in situ channels Precast or in situ cover slabs Precast or in situ footpath slabs Drains
20	0 - 20	Mass concrete filling, Benching
15	0 - 40	Blinding Bedding Base for masonry wall

TABLE 2

	CLASS 40		CLASS 30		CLASS 25		CLASS 15	
	Preliminar Test	Work Test	Preliminary Test	Work Test	Preliminar Test	Work Test	Preliminar Test	Work Test
Minimum weight of cement per cubic metre of concrete - Kg	425	425	400	400	350	350	250	250
Minimum cube compressive strength at 28 days - N/mm ²	50	40	40	30	30	25	17.8	15
Slump	←----- 5cm -----→							

Max Free water cement ratio shall be 0.45 or as instructed by the Engineer.

Article 8.2 - Mixing of Concrete

8.2.1 General

Concrete shall be mixed in an approved batch type machine at the Site. No hand mixing shall be allowed. Aggregates and water shall be cooled as necessary to produce concrete within the placing temperature limits stated hereinafter.

8.2.2 Mixing at Site

Concrete shall be thoroughly mixed in a batch mixer of an approved size and type manufactured in accordance with B.S. 1305 and having a mixing performance within the limits specified therein and which will ensure a uniform distribution of the materials throughout the mass.

The mixer shall be equipped with adequate water storage and a device for accurately measuring and automatically controlling the amount of water used in each batch. Their accuracy shall be maintained within the tolerances described in B.S. 1305 and checked against accurate weights and volumes. Preferably, mechanical means shall be provided for recording the number of revolutions for each batch and automatically preventing the discharge of the mixer until the materials have been mixed in the specified minimum time.

The entire contents of the mixer shall be removed from the drum before materials for a succeeding batch are placed therein. No mixer having a rated capacity of less than a 1-bag batch shall be used nor shall a mixer be charged in excess of its rated capacity.

All concrete shall be mixed for a period of not less than 1 1/2 minutes after all materials, including water, are in the mixer. During the period of mixing, the mixer shall operate at a speed for which it has been designed, but this speed shall be not less than 14 nor more than 20 revolutions per minute.

The first batch of concrete materials placed in the mixer shall contain a sufficient excess of cement, sand and water to coat the inside of the drum without reducing the required mortar content of the mix. Upon the cessation of mixing for a considerable period, the mixer shall be thoroughly cleaned before a fresh batch of concrete is made in it.

8.2.3 Ready-Mixed Concrete

Ready-mixed concrete as defined in B.S. 1926, batched off the Site, may be used only with the agreement of the Engineer and shall comply with all requirements of the Contract. Mixing at a central plant shall conform to the requirements for mixing at the site. The organisation supplying concrete shall have sufficient plant capacity and transporting apparatus to ensure continuous delivery at the rate required.

The concrete shall be carried in purpose made agitators, operating continuously, or truck mixers. The concrete shall be compacted in its final position within 60 minutes of the introduction of cement to aggregates unless a longer time is agreed by the Engineer. The time of such introduction shall be recorded on the Delivery Note together with the weight of the constituents of each mix. When truck mixed concrete is used, water shall be added under supervision either at the site or at the central batching plant as agreed by the Engineer but in no circumstances shall water be added in transit. Unless otherwise agreed by the Engineer, truck mixer units and their mixing and discharge performance shall comply with the requirements of BS 4251. Mixing shall continue for the number and rate of revolutions recommended in accordance with BS 4251.

Each mixer, agitator and truck shall have attached thereto in a prominent place a metal plate or plates on which is plainly marked the various uses for which the equipment is designed, the manufacturer's guaranteed capacity of the drum or container in terms of volume of the mixed concrete, and the speed of the rotation of mixing drum or blades.

8.2.4 Weather Precautions

If the weather forecast normally available is neither sufficient nor frequent enough, the Contractor shall at his own expense arrange for special detailed forecasts from the nearest meteorological authorities.

Article 8.3 - Handling and Placing of Concrete

8.3.1 General

In preparation for the placing of concrete all sawdust, chips and other construction debris and extraneous matter shall be removed from the interior of forms. Struts, stays and braces, serving temporarily to hold the placing of concrete at their locations, shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. These temporary members shall be entirely removed from the forms and not buried in the concrete.

No concrete shall be placed until the Engineer's approval has been given.

The Contractor shall give at least 48 hours' notice to the Engineer of the times he proposes to concrete and the Engineer may order that no concreting shall take place until either he or his representative and laboratory staff are present.

Concrete shall be transported in water-tight containers in such a manner that will avoid the segregation of the constituent materials. The time elapsing between the initial mixing of the concrete and finally placing in the work shall not exceed 30 minutes. Concrete remaining unplaced at the end of this period shall not be placed in the work but shall be removed from the Site and disposed of at the Contractor's expense.

The temperature of mixed concrete immediately before placing shall not be more, than 32°C or not less than 5°C.

Concrete shall not be dropped through a height exceeding 1.2 metres.

For lowering concrete through heights in excess of 1.2 metres special methods shall be used, such as chutes, tremies, bottom dumping hoppers, or bagged placing and then only with the approval of the Engineer. All containers, troughs and chutes and apparatus through and in which the concrete is passed shall be kept clean and entirely free from hardened concrete or cement and free from contamination by extraneous material, and where there is an interruption of concreting exceeding 20 minutes, these shall be cleaned and bored down with water.

Concrete shall be placed so as to avoid segregation of the materials and the displacement of the reinforcement. Concrete shall be placed in horizontal layers not more than 20 cm thick except as hereinafter provided. When less than a complete layer is placed in one operation, it shall be terminated in a vertical bulkhead. Each layer shall be placed and compacted before the preceding batch has taken initial set to prevent injury to the green concrete and avoid surfaces of separation between the batches. Each layer shall be compacted so as to avoid the formation of a construction joint with a preceding layer which has not taken initial set.

A competent steel fixer shall be in attendance the whole time concrete is being cast around reinforcement.

Immediately following the discontinuance of placing concrete, all accumulations of mortar splashed upon the reinforcement steel and the surfaces of forms shall be removed. Dried mortar chips and dust shall not be puddled into the unset concrete. If the accumulations are not removed prior to the concrete becoming set, care shall be exercised not to injure or break the concrete steel bond at and near the surface of the concrete, while cleaning the reinforcement steel.

8.3.1.1 Pumping

The placing of concrete by pumping will be permitted only if authorised by the Engineer. The Contractor shall submit fill design mix for the Engineer's approval. The equipment shall be so arranged that no vibration will occur that might damage freshly placed concrete.

Where concrete is conveyed and placed by mechanically applied pressure the equipment shall be suitable in kind and adequate in capacity for the Work. The operation of the pump shall be such that a continuous stream of concrete without air pockets is obtained. When pumping has been completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients. After this operation, the entire equipment shall be thoroughly cleaned. The placing of concrete by pumping method shall allow the Contractor no claim for extra cost in any way. This method shall be deemed to be included in the prices in the Bill of Quantities or elsewhere.

8.3.2 Placing of Concrete in Foundations

Before placing concrete in foundations the bottom shall be thoroughly rammed and cleaned up to a neat horizontal plane, or such profile as is shown on the Drawings or as directed by the Engineer. No steps on batters shall be permitted unless shown on the Drawings or approved by the Engineer.

Where shown on the Drawings or ordered by the Engineer that the sides of the concrete shall be cast against the existing ground without using shuttering, the faces of the earth shall be trimmed neat and true to line. Where such a hole is over-excavated due to the Contractor's method of working, the void shall be filled with concrete of the same class as specified for the foundation at the Contractor's expense.

8.3.3 Placing of Concrete in Culverts

The base slab or footings of box culverts shall be placed and allowed to set before the remainder of the culvert is constructed.

Before concrete is placed in the sidewalls, the culvert footings shall be thoroughly cleaned of all shavings, sticks, sawdust, or other extraneous material and the surface carefully chipped and roughened in accordance with the method of bonding construction joints as specified in article 8.4.2 hereinafter.

The concrete in the walls shall be placed and allowed to set before the top slab is placed.

Each wing wall shall be constructed as a monolith. Construction joints, where unavoidable, shall be horizontal and so located that no joint will be visible in the exposed face of the wing wall above the ground line.

8.3.4 Placing of concrete in Bridge decks

It shall be as per general requirements but it shall also include the following: The concrete shall be uniformly levelled and screeded to produce a plain surface. When the concrete has sufficiently hardened to prevent laitance being worked, it shall be floated to produce a uniform surface free from screed marks and exposed aggregate. Finally the surface shall be textured by brushing or otherwise to the waterproofing manufacturer's requirements as agreed by the Engineer. The accuracy of the finished surface shall be such that it does not deviate from the required profile by more than 10mm over a 3m gauge length or have any abrupt irregularities more than 3 mm.

8.3.5 Compaction of Concrete

Concrete, during and immediately after depositing, shall be thoroughly compacted. The compaction shall be done by mechanical vibration subject to the following provisions:

(a) The vibration shall be internal unless special authorisation of other methods is given by the Engineer.

(b) Vibrators shall be of a type and design approved by the Engineer. They shall be capable of transmitting vibration to the concrete at frequencies within the range of 9000 to 20000 impulses per minute.

(c) The intensity of vibration shall be such as to visibly affect a mass of concrete of 2.5 cm slump over a radius of at least 30 cm.

(d) The Contractor shall provide a sufficient number of vibrators to properly compact each batch immediately after it is placed in the forms.

(e) Vibrators shall be manipulated so as to thoroughly work the concrete around the reinforcement and embedded fixtures, and into the corners and angles of the forms.

Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete. The vibrators shall be inserted and withdrawn out of the concrete slowly. The vibration shall be of sufficient duration and intensity to thoroughly compact the concrete, but shall not be continued so as to cause segregation. Vibration shall not be continued at any one point to the extent that localised areas of grout are formed.

Application of vibrators shall be at points uniformly spaced and not further apart than twice the radius over which the vibration is visibly effective.

(f) Vibration shall not be applied directly or through the reinforcement to sections or layers of concrete which have hardened to the degree that the concrete ceases to be plastic under vibration. It shall not be used to make concrete flow in the forms over distances so great as to cause segregation, and vibrators shall not be used to transport concrete in the forms.

(g) Vibration shall be supplemented by such spading as is necessary to ensure smooth surfaces and dense concrete along form surfaces and in corners and locations impossible to reach with the vibrators.

(h) Sufficient numbers of vibrators in usable condition shall be on site so that in the event of breakdowns spare equipment is available.

8.3.6 Faulty Concrete work

The Contractor shall on the order of the Engineer remove and reconstruct any such portion of the work which, in the opinion of the Engineer, is unsatisfactory as regards quality of concrete incorrect dimensions of the cast portion, badly placed or insufficient reinforcement, honey-combing or other such cause as shall render the construction not up to the standard required and which, in the opinion of the Engineer, may prejudicially affect the strength or durability of the construction.

Article 8.4 - Construction Joints

8.4.1 General

Construction joints shall be made only where located on the plans, or shown in the pouring schedule, unless otherwise approved by the Engineer.

If not detailed on the plans, or in the case of emergency, construction joints shall be placed as directed by the Engineer. Shear keys or inclined reinforcement shall be used where necessary to transmit shear or to bond the two sections together.

8.4.2 Bonding

Before depositing new concrete on or against concrete which has hardened, the forms shall be re-tightened. The surface of the hardened concrete shall be roughened as required by the

Engineer, in a manner that shall not leave loosened particles of aggregate or damaged concrete at the surface. It shall be thoroughly cleaned of foreign matter and laitance, and saturated with water.

The placing of concrete shall be carried continuously from joint to joint. The face edges of all joints which are exposed to view shall be carefully finished true to line and elevation.

When the placing of concrete is temporarily discontinued, the concrete, after becoming firm enough to retain its form, shall be cleaned of laitance and other objectionable material to a sufficient depth to expose sound concrete.

To avoid visible joints as far as possible upon exposed faces, the top surface of the concrete adjacent to the forms shall be smoothed with a trowel. Where a "feather edge" might be produced at a construction joint, an inset form shall be used to produce a blocked out portion in the preceding layer which shall produce an edge thickness of not less than 15 cm in the succeeding layer. Work shall not be discontinued within 45 cm of the top of any face.

Article 8.5 - Curing Concrete

Concrete surfaces exposed to conditions causing premature drying shall be protected by covering as soon as possible with canvas, straw, burlap, sand or other satisfactory material and kept moist. Curing shall continue for a period of not less than seven days after placing the concrete. Details of the method to be used shall be subject to the approval of the Engineer.

The formwork shall also be kept damp, and if struck earlier than seven days, shall be replaced for the remaining period with other approved damp material.

Concrete surfaces of structures which are to be buried in the ground shall be cured as specified above, but care shall be taken to avoid excessive water from curing running into the foundation of the footings.

Article 8.6 - Tolerances

The concrete work shall be constructed as accurately as possible with the following tolerances:

- (a) In the cross-sectional dimensions not more than 3 mm
- (b) In dimensions, other than cross-sectional dimensions, not more than 6mm
- (c) In any surface, the irregularity shall not exceed 5 mm measured from a 3 metre long straight edge
- (d) No member shall be out of line by more than 5 mm
- (e) No wall shall be out of plumb by more than 5 mm or if battered, out of batter by more than 5 mm.

Article 8.7 - Loading Concrete Structures

No concrete structure shall be loaded until the concrete is at least 28 days old and has achieved the specified cube strength and only then with the approval of the Engineer, and subject to such conditions as he may lay down.

Article 8.8 - Forms, Falsework or Centering

8.8.1 Forms

All forms shall be built mortar tight and of sufficient rigidity to prevent distortion due to the pressure of the concrete and other loads incident to the construction operations. Forms shall be constructed and maintained so as to prevent warping and the opening of joints due to shrinkage of the lumber.

The forms shall be substantial and unyielding and shall be so designed that the finished concrete will conform to the proper dimensions and contours. The design of the forms shall take into account the effect of vibration of concrete as it is placed. They shall be so constructed that they can be removed from the moulds before any concrete is deposited in them.

Form clamps, bolts and anchors shall be used to fasten forms. The use of wire ties to hold forms in position during placing of concrete shall not be permitted. Bolts and clamps shall be of such type that they can be entirely removed or cut back to a depth of at least 2 cm from the finished surface of the concrete without injury to the concrete. The cavities shall be filled with grout and the surface left sound, smooth, even and uniform in colour. All forms for the outside surfaces shall be constructed with stiff wailers at right angles to the studs and all form clamps shall extend through and fasten such wailers.

All forms shall be treated with approved mould or similar oil or be soaked with water immediately before placing concrete to prevent adherence of concrete. Any material, which will adhere to or discolour concrete, shall not be used.

All forms shall be set and maintained true to the line designated until the concrete is sufficiently hardened. Forms shall remain in place for periods, which shall be as specified in Article 8.8.4 hereinafter. When forms appear to be unsatisfactory in any way, either before or during the placing of concrete, the Engineer shall order the work stopped until the defects have been corrected.

All formwork shall be approved by the Engineer before concrete is placed within it. The Contractor shall provide the Engineer with copies of his calculations of the strength and stability of the formwork or falsework, but notwithstanding the Engineer's approval of these calculations, nothing shall relieve the Contractor of his responsibility for the safety or adequacy of the formwork.

8.8.2 Falsework and Centering

Detailed plans for falsework or centering shall be supplied by the Contractor for the Engineer's consent at least 45 working days in advance of the time the Contractor begins construction of the falsework.

All falsework shall be designed and constructed to provide the necessary rigidity and to support the loads from the weight of green concrete and shuttering and incidental construction loads.

Notwithstanding the approval by the Engineer of any designs for falsework submitted by the Contractor, the Contractor shall be solely responsible for the strength, safety and adequacy of the falsework or centering.

Falsework or centering shall be founded upon a solid footing safe against undermining and protected from softening. The Engineer may require the Contractor to employ screw jacks, or hard wood wedges to take up any settlement in the formwork either before or during the placing of concrete.

Falsework shall be set to give the finished structure the required grade. The Contractor shall submit to the Engineer all camber details / calculations which are required for the construction of the post tensioned decks, parapets, etc...

The Contractor shall make available to the Engineer a copy of the latest edition of the following British standards within 4 weeks from the issue of the order to start the works:

BS 5268: Structural use of timber, part 2: Code of practice for permissible stress, design, materials and workmanship

BS 5973: Code of practice for access and working scaffolds and special scaffold structures in steel.

BS 5974: Code of practice for temporarily installed suspended scaffolds and access equipment.

BS 5975: Code of practice for falsework.

8.8.3 Forms for construction joints

Where permanent or temporary joints are to be made in horizontal or inclined members, stout stopping off boards shall be securely fixed across the mould to form a watertight joint. The form of the permanent construction joint shall be as shown on the Drawings. Temporary construction joints shall have blocks of timber at least 8 cm thick, slightly tapered to facilitate withdrawal and securely fixed to the face of these stopping off board. The areas of the key or keys so formed shall be at least 30% of the area of the member. The blocks shall be kept back at least 5 cm from the exposed face of the concrete.

Where reinforcement passes through the face of a construction joint the stopping off board shall be drilled so that the bars can pass through, or the board shall be made in sections with a half round indentation in the joint faces for each bar so that when placed the board is a neat and accurate fit and no ground leaks from the concrete through the bar holes or joints.

8.8.4 Removal of Forms and Falsework

In the determination of the time for the removal of forms, falsework and housing, consideration shall be given to the location and character of the structure, the weather and other conditions influencing the setting of the concrete and the materials used in the mix.

Forms shall be removed in such a manner as will not injure the concrete and no formwork shall be removed before the concrete has sufficiently set and hardened.

The minimum periods which shall elapse between the placing and compacting of normal Portland cement concrete for the various parts of the structure are given in the following table, but compliance with these requirements shall not relieve the Contractor of obligation to delay the removal of the forms if the concrete has not set sufficiently hard:

PARTS OF WORK	DELAY
Sides of walls and footings	1½ day
Soffits of beams and slabs (props left in)	7 days
Removal of props (beams and main slabs)	16 days

Concrete shall not be subject to disturbance / vibration between 4 hours and 36 hours after compaction except with the agreement of the Engineer.

8.8.5 Verifying of Reinforcement and Tendons concrete covers

The Contractor shall provide an electromagnetic cover measuring devices to verify the depths of the reinforcement and Tendons after concreting and removing of forms. The Contractor shall carryout this work under the Engineer’s supervision and shall produce and submit all necessary reports. BS 4408: Part 1 shall be consulted for this purpose.

Article 8.9 - Concrete Surface Finish

8.9.1 Unexposed Surface Finish

Unexposed surface finish, unless otherwise specified, shall be considered as a final surface finish on the surfaces which are buried in the ground, or covered with embankment or surfaces which are to be enclosed. The removal of fins and form marks and the rubbing of mortared surfaces to a uniform colour will not be required for unexposed surface finish.

All formwork bolts or other devices shall be removed to a depth of 3 cm from the surface, and all holes, cavities and honey-combing in the surface shall be cleaned out and roughened to form a good key. These holes shall then be filled with cementitious (Non shrinkable) grout and approved by the Engineer

The irregularities in the finish shall be no greater than those obtained from the use of wrought thickened tongue and grooved boards arranged in uniform pattern.

8.9.2 Exposed Surface Finish

Exposed surface finish shall be considered as final surface finish on all surfaces of the retaining walls.

The formwork shall be lined with a material approved by the Engineer to provide a smooth finish of uniform texture and appearance. This material shall leave no stain on the concrete and shall be so joined and fixed to its backing that it imparts no blemishes.

It shall be of the same type and obtained from one source as far as possible. The Contractor shall make good any imperfections in the resulting finish as required by the Engineer. Internal ties and embedded metal part will be allowed only with the Engineer's specific approval. The Contractor shall ensure that permanently exposed concrete surfaces are protected from rust marks, spillage and stains of all kinds.

Article 8.10 - Steel Reinforcement

8.10.1 Bar Bending Schedule

Bar bending schedules are incorporated in the Drawings but the Contractor shall be responsible for their accuracy and shall satisfy himself as to errors or omissions and all other things regarding their suitability for the work. When new bar bending schedules are required or the existing ones required to be amended the Contractor shall prepare such lists and submit them to the Engineer for his approval.

8.10.2 Fabrication

Bar reinforcement shall be bent to shapes shown on the Drawings and bending schedules. All bars shall be bent cold, unless otherwise permitted by the Engineer. All hooks, bends, etc., unless otherwise shown on the Drawings, shall be to BS EN ISO 3766:2003. Bar reinforcement shall be bundled and each bundle of steel shall be tagged with identifying tags, showing the size and mark of the bar.

8.10.3 Placing and Fastening

The reinforcement shall be accurately placed and held in the positions as shown on Drawings and subject to the approval of the Engineer.

The minimum spacing centre to centre of parallel bars shall be 2 1/2 times the size of the bar, but in no case shall the clear distance between bars be less than 1 1/2 times the maximum size of coarse aggregate in the concrete.

Distances from the forms shall be maintained by means of blocks or plastic spacers or other approved supports. Blocks for holding reinforcement from contact with the forms shall be precast mortar blocks of approved shape and quality and dimensions or approved metal chairs.

Layers of bars shall be separated by metal chairs or stirrups or other approved supports.

8.10.4 Splicing and Lapping

All reinforcement shall be provided in full lengths as indicated on the drawings and bending schedule. splicing of bars, except where shown on the Drawings, shall not be permitted without the written approval of the Engineer. Splices shall be staggered, as directed by the Engineer.

In lapped splices, the bars shall be placed in contact and wired together in such a manner as to maintain a clearance specified in the code of practice for reinforced concrete BS 8110.

Sheets of mesh or bar mat reinforcement shall overlap each other sufficiently to maintain a uniform strength and shall be securely fastened at ends and edges. The edge lap shall not be less than 40 diameters of the mesh reinforcement bar or two meshes in width whichever is the greater or as directed by the Engineer.

8.10.5 Approval before concreting

The Contractor shall in all cases request the approval of the steel work by the Engineer in sufficient time to allow an inspection to be made and shall not commence concreting until such approval and his intention to commence concreting shall not be less than one clear normal working day and the Engineer may require a longer period if, in his opinion, the reinforcement is of such complexity as to require it.

Such approval shall not relieve the Contractor of his responsibilities under the contract.

Article 8.11 - Mortar

The mortar for jointing masonry works shall be a mix of

- 1,000 litres of sand passing the 5 mm B.S. Sieve
- 450 kilograms of Portland Cement
- sufficient water to obtain a workable mix.

The mortar shall be mixed using concrete mixers. Hand mixing will not be allowed.

Article 8.12 - Precast Concrete

Precast concrete members, kerbs, channels, cover slabs, paving slabs, etc., shall generally comply with the requirements of British Standard Code of Practice BS 8110, except where varied by the requirements of this specification or the drawings.

The Contractor shall set up an adequate precasting yard undercover, capable of handling all the precast concrete works and shall provide a suitable qualified Engineer to supervise the working of the yard all to the satisfaction of the Engineer. The Contractor shall provide full details and drawings showing his proposals for the precasting yard and until approval is given in writing no work on erection of the yard or producing precast concrete shall commence.

8.12.1 Concrete Mixes

Concrete mixes shall be as shown on the drawings and in accordance with the Specifications.

8.12.2 Formwork

The precast units shall each be cast complete in one operation, on suitable and sufficient platforms and moulds, all to the satisfaction of the Engineer. Before casting is commenced the Contractor shall submit, for the approval of the Engineer fully detailed drawings showing the proposed layout of casting beds, together with the details of the method of assembling and dismantling of the moulds. In cases where the finished thickness of the concrete is small, and compaction by internal or surface vibration will be difficult, the mould may be constructed so that external vibration of the shutter will satisfactorily compact the concrete, or vibrating tables may be used. The soffit shutter shall be adequately supported to prevent any settlement which might cause cracking of the concrete.

Provision shall be made to hold firmly and maintain in position all projecting reinforcement, bolts, screwed sockets, etc., so that they are correctly located in the completed unit or member concerned.

8.12.3 Weather Protection and Curing

The precast units shall at all times be cast under suitable covering to provide complete protection from the sun, rain and drying winds. They shall remain under the cover for at least four days or until the units are strong enough to be lifted from the casting beds, whichever is the longer period. During this period, all exposed concrete shall be protected and cured as described in article 8.5. Thereafter, the units may be transferred to a storage area or be erected in their final position.

8.12.4 Surface finishes generally

The methods used for compacting the concrete must be such that pinholes or airholes on the surface are avoided. Upon removal of the formwork, any units having a concrete face with rough, uneven, honeycombed or imperfect finish, or which shall be permanently discoloured, will be rejected at the Engineer's discretion. Where carrying out of remedial work is approved by the Engineer, irregularities shall be eliminated by grinding, or where an area shows air holes, these shall be filled and thoroughly rubbed over to leave the desired surface.

Unsightly encrustations and stains shall be removed from all exposed surfaces. Remedial work of all kinds must be carried out strictly in accordance with the Specification and any further instructions which may be given by the Engineer. Any units which are rejected shall be disposed of away from the Site at the Contractor's expense.

8.12.5 Lifting and Handling of Units

No items may be lifted from the casting beds until they have gained sufficient strength to avoid damage through lifting, handling, erection or stacking. Notwithstanding any guidance given by the Engineer on the concrete strength necessary to prevent damage, the Contractor shall be entirely responsible and any items so damaged or cracked will be rejected by the

Engineer. They may not be included in the works and must be disposed of, to the approval of the Engineer, at the Contractor's expense.

Before casting, the Contractor shall submit to the Engineer, for his approval, full details of the proposed method of hoisting precast units including the location of proposed lifting points. The Contractor shall be responsible for the design and provision of extra reinforcement that may be required to facilitate the handling of the precast units and his price for precast units should include for this.

The edges of precast units shall be protected by fenders of timber or other approved material during the lifting, handling and erection stages.

8.12.6 Stacking of precast units

Where members are stored, they shall be firmly supported at such bearing positions that will ensure that the stresses induced in them are always less than the permissible design stresses.

Ample space is to be provided for the storage and stacking of the units. Units shall not be walked on or come into contact with the ground or with dirty or greasy hands or with ropes and cables. Nor shall wet slabs come into contact with dirty packs or pieces of timber which will discolour them.

The units shall be stacked in such a way that the faces are protected both from damage and from staining.

Article 8.13 - Measurement and payment for concrete works

8.13.1 In situ Concrete

The unit of measurement for in-situ concrete shall be per cubic metre, measured in place in the work, as set forth in the Bill of Quantities, and shall distinguish between the various classes of concrete and position in the work.

The rate for in-situ concrete shall include for complying with the provisions of the Specification herein described. Reinforcement and shuttering will be paid for separately.

8.13.2 Precast Concrete Units

Precast concrete units will be measured either by number, or in linear metre as indicated in the Bill of Quantities. The rate for precast concrete shall include for complying with the provisions of the specifications herein described and in addition any shuttering and reinforcement, unless specifically shown separately in the Bill of Quantities.

8.13.3 Measurement and Payment for Formwork

Formwork shall be measured as the area of concrete actually in contact with the mould, except that in the case of small fillets and chambers of size 30mm x 30mm and less, the overall area of the concrete shall be taken as though the fillets and chambers had been

omitted. Formwork for temporary construction joints will not be paid for and will be deemed to be included in the Contractor's rates for concreting.

The formwork for in-situ concrete will be paid for separately according to the type of finish and according to whether it is vertical, horizontal and/or inclined as set out in the Bill of Quantities.

Formwork will not be measured and paid for to blinding concrete.

8.13.4 Measurement and payment for Reinforcement

Reinforcement shall be paid for the net calculated weight of reinforcement shown on the Drawings or ordered by the Engineer, and no allowance will be made for waste, rolling margins, binder wire, or spacer bars.

When laps are made for splices for the convenience of the Contractor other than those shown on the Drawings, the extra steel shall not be measured.

8.13.5 Joints

Items for joint surfaces are measured where joints are expressly itemised in the Bill of Quantities, with or without formwork and with or without filler material.

The unit of measurement shall be per linear metre or per square metre as set forth in the Bill of Quantities.

8.13.6 Waterproofing/Impregnation

The unit of measurement for waterproofing/impregnation shall be per square metre, measured in place in the work, as set forth in the Bill of Quantities.

The measured area shall be that of the covered surface, without deduction for holes and openings each less than 0.5 m².

SECTION 2 - MATERIALS

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Article 2.1 - 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 do 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.

Article 2.2 - 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.

Article 2.3 - 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.

Article 2.4 - Handling and Storage of Materials

2.4.1 The Contractor shall make his own arrangements for the storage space and yards.

2.4.2 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.

2.4.3 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.

Coral sand for concrete shall be washed as necessary and as required by the Engineer.

2.4.4 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.

2.4.5 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.

2.4.6 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.

2.4.7 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.

2.4.8 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.

Article 2.5 - Borrow Pits and Spoil Tips

2.5.1 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 Article 2.7.1 and 2.7.2. 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 Articles 2.7.1 and 2.7.2 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.

2.5.2 The Contractor is required to make all arrangements for land and access thereof in compliance with Clause 1.14 of the Specification.

Article 2.6- 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.

Article 2.7 - 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.

2.7.1 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%

2.7.2 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%

Article 2.8 - Subgrade in Cut

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.

Article 2.9 - 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.

Article 2.10- 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 1052:1980 having a tensile strength of not less than 40 Kg/mm², and PVC coated.

Galvanising shall comply with the requirements of BS EN 10244-2:2009

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.

Article 2.11- 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%

Article 2.12 - 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.

Article 2.13 - Grading Limits for Sub-Base and Granular Base

The gradation of the materials shall be within the limiting curves given in articles 2.14 and 2.15 hereof and shall be approximately parallel to these limiting curves.

Article 2.14 - 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.

Article 2.15 - 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.

Article 2.16 - Material For Bituminous Course

2.16.1 Classes of Aggregates

Aggregates for bituminous course shall be obtained by mixing 3 or more classes 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

$$\frac{D \text{ mm} + d \text{ mm}}{2} \text{ within the range } 1/3 - 2/3$$

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.

2.16.2 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

2.16.3 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.

2.16.4 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%

Article 2.17- Material for Wearing course 0/14

2.17.1 Materials for wearing course and reshaping shall comply with the requirements of Article 2.16.1 hereof.

2.17.2 The job Standard Mix 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

2.17.3 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.

Article 2.18 - 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.

2.18.1 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 Article 2.14.

2.18.2 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%.

2.18.3 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%.

Article 2.19 – Coloured Asphalt

2.19.1 Type of Mix

It shall be coloured cold asphalt 0/6mm (with 2% pigment in total mix).

2.19.2 Cold Bin Settings

The asphalt should be constituted of 70% 4/6mm and 28% 0/4.

2.19.3 Bitumen Content

The percentage of bitumen by dry aggregates shall be 8.5%.

Article 2.20 - Material for Concrete

2.20.1 Coarse Aggregate

Coarse aggregate shall consist of crushed basalt, complying with BS EN 12620:2002+A1:2008. 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 EN 12620:2002+A1:2008. 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 EN 12620:2002+A1:2008. The flakiness index shall not exceed 35. The Los Angeles value shall not exceed 35.

2.20.2 Fine Aggregate

Fine aggregate complying with the grading zones of BS EN 12620:2002+A1:2008 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 75.

For class 15 concrete the sand equivalent value shall exceed 70.

Coral sand shall not be used.

Crushed basaltic sand shall be washed.

Article 2.21 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 150 mm 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.

Article 2.22 - Filter Material

Filter material for under drains shall consist of sand or granular material to be approved by the Engineer

Article 2.23 - 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 BS EN 1008:2002 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.

Article 2.24 - 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.

(e) Rock Armour

The rock armour consists of loose assemblage of big size broken stones erected in water or on soft ground as revetments of road or earth embankments. Its permeability allows it to dissipate the energy of storm waves and prevent corrosion. The rocks are placed against a cliff, bank or existing seawall in order to reduce the energy of incident waves. Dissipation of the wave energy should reduce wave reflection from the structure, thus reducing scour from the toe of the defence. The median of the rock armour is approximately to about 1400 kg.

(ii) **Article 2.25 – 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

Article 2.26 - 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 BS EN 197-1: 2011

Article 2.27 - Steel Reinforcement

Steel reinforcement shall comply with the requirements of BS 4449:2005+A3:2016. 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 BS 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 BS as regards Test and Inspection.

Article 2.28 - 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.

Article 2.29 - Material for Forms, Falsework and Centering

All timber used for forms, false work 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.

Article 2.30 - Concrete Pipes

Concrete pipes shall comply with the requirements of BS 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 required. Technical Specifications.

Article 2.31 - Concrete Porous Pipes

Concrete porous pipes for French drain shall comply with the requirements of BS 1194.

Article 2.32 - Precast Concrete

Precast kerbs, slabs, channel edging and quadrants shall comply with the requirements of BS EN 1339:2003 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 BS, be manufactured in steel moulds on a vibrating table or as directed by the Engineer.

Article 2.33 – Admixtures

Unless agreed by the Engineer, neither admixtures nor cement containing additives shall be used.

Article 2.34 - Bitumen Products

2.34.1 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.

2.34.2 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%

2.34.3. 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 degree 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.

Article 2.35 - Hydrated Lime

Lime for stabilisation shall be Hydrated Calcium Lime (not Magnesium) and shall generally comply with BS EN 459-1:2015, 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 BS EN 459-1:2015, or his chemical analysis.

Article 2.36 - 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.

Article 2.37 (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.

Article 2.38 - 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.

Article 2.39 – Geotextiles

2.39.1 General Characteristics

Geotextile shall be of the non-woven type having the following characteristics:

	French Drains		Subgrades
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 O ₉₀ (dry)	≤100 Mm	≤100 Mm	
Permeability (10 cm head)	130 ℓ/s/m ²	160 ℓ/s/m ²	

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.

2.39.2 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.

2.39.3 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.

Article 2.40 – Cast Iron Gully

Cast iron gully shall of Grade A type and shall comply with the requirements of BS EN 124-1:2015.

Article 2.41 – 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.

SECTION 3 - TESTING

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ARTICLE NO

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- 3.15 CONTROL OF SURFACES
- 3.16 RESPONSABILTY OF THE CONTRACTOR

Article 3.1 - 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.

Article 3.2 - Tests

3.2.1 General

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 should note that all tests to comply with quality of materials and workmanship are deemed to be included in the unit price for the works and that no extra claim would be entertained under laboratory tests.

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 BS, LCPC, AASHTO and ASTM as specified in these Technical Specifications.

3.2.2 Design of Mixes

The Contractor shall carry out tests to establish proper proportions and characteristics of mixes.

3.2.3 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.

3.2.4 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.

3.2.5 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.

3.2.6 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.

Article 3.3 - 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.

Article 3.4 - 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.

Article 3.5 - 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.

Article 3.6 - 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.

Article 3.7 - Sampling of Materials

3.7.1 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.

3.7.2 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.

3.7.3 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.

Article 3.8 - Testing of Naturally Occurring Materials

3.8.1 Preparation of Disturbed Samples for Testing

The preparation of disturbed samples for testing shall be carried out in accordance with the procedure given in BS 1377.

3.8.2 Tests on Naturally Occurring Materials

The tests shown below shall be conducted in accordance with the relevant British Standard

Moisture Content : BS 1377

Speedy Moisture Content : as directed by the Engineer

Liquid Limit	: BS 1377
Plastic Limit	: BS 1377
Plasticity Index	: BS.1377
Linear Shrinkage	: BS.1377
Specific Gravity	: BS EN 932-1:1997
Bulk Density	: BS EN 932-1:1997
Particle Size Distribution	: BS 1377
Particle size analysis by Hydrometer method: (If required at the discretion of Engineer)	BS 1377
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.

3.8.3 Compaction Tests

The tests shall be carried out in accordance with BS 1377.

3.8.4 California Bearing Ratio Test

The test shall be carried out in accordance with BS 1377 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.

Article 3.9 - Testing of Aggregates

3.9.1 Sampling of Aggregates

The sampling of aggregates shall be carried out in accordance with the procedure given in BS EN 932-1:1997.

3.9.2 Tests on Aggregates

Sieve Analysis	:	BS EN 932-1:1997
Amount passing No. 200 BS Sieve	:	BS EN 932-1:1997

Flakiness Index Test	:	BS EN 932-1:1997
Specific Gravity	:	BS EN 932-1:1997
Bulk Density	:	BS EN 932-1:1997
Los Angeles Abrasion Test	:	AASHTO Designation T 96-49
Sand Equivalent Test	:	AASHTO T 176
Moisture Content Moisture content of soil or aggregate subject to the Project Manager's approval by Speedy Moisture Content to maker's instructions with calibration against Oven-drying method	:	BS EN 932-1:1997
Test for silt, clay and impurities of fine aggregate by Sedimentation or decantation method (in case of discrepancies the Sedimentation method shall rule)	:	BS EN 933-1:2012

Article 3.10 - Tests for Water Purity

The tests shown below shall be conducted in accordance with the relevant BS EN 1008:2002.

Article 3.11 - 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 EN 197-1:2011 or BS 4027 as appropriate. The tests shall be carried out in accordance with BS EN 197-1:2011 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 EN 197-1:2011, 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:

3.11.1 Ordinary and Rapid Hardening Portland cement

Compressive Strength Test	: BS 4550
Consistency of Standard Cement Paste	: BS 4550
Initial and Final Setting	: BS 4550
Soundness Test	: BS 4550
Fineness Test	: BS 4550

3.11.2 Bituminous Materials

Sampling Bituminous Materials	: AASHTO T 40
Specific gravity	: ASTM D70
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

3.11.3 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.

Article 3.12 – General Control and Tests During Construction

3.12.1 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.

3.12.2 Field Moisture Content Test

This test shall be carried out in accordance with BS 1377 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.

3.12.3 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.

3.12.4 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.

3.12.5 Bituminous Concrete and Road Base

Sampling of Bituminous Mixture	:	AASHTO T 41
Bulk Density	:	as directed by the engineer
Specific gravity	:	ASTM D1188 or 2726
Bitumen Content	:	AASHTO T 58
Marshall	:	ASTM D 1559
Duriez/LCPC	:	Mode opératoire LCPC

The samples for Marshall tests shall be compacted with 50 blows on each face.

3.12.6 Surface Treatment

As directed by the Engineer

3.12.7 Concrete

Sampling	:	BS 1881
Slump Test	:	BS 1881
Compressive Strength Test	:	BS 1881

Indirect Tensile Strength : BS 1881

Compressive Strength of
Concrete Pipes : BS 556

3.12.8 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.

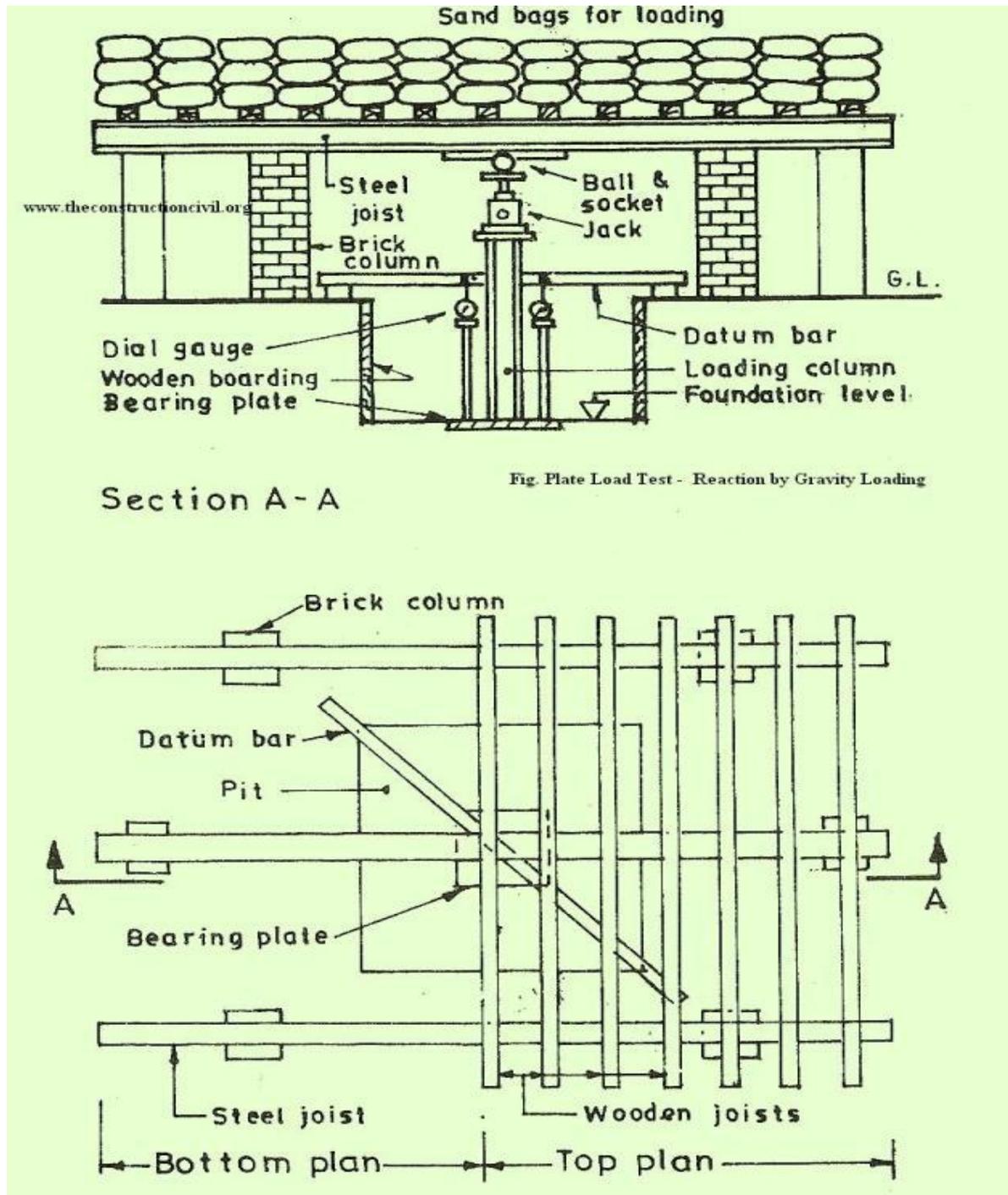
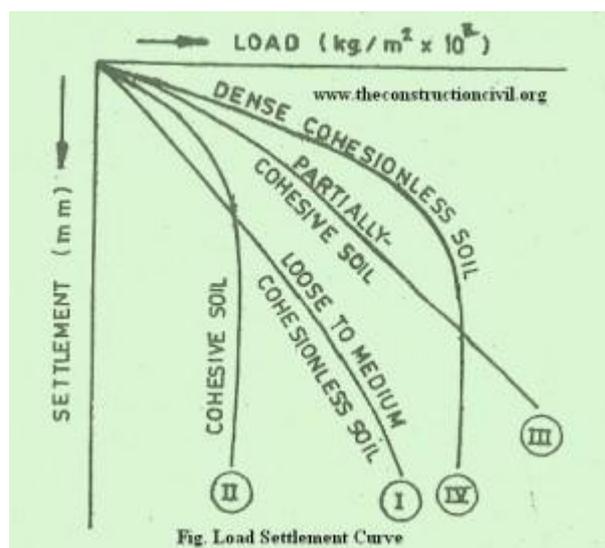


Plate load Test Method – Reaction by gravity loading

3. Interpretation of Results:

The load intensity and settlement observations of the plate load test are plotted in the form of load settlement curves.



Load Settlement Curves

The figure below shows four typical curves applied to different soils. **Curve I** is typical for loose to medium noncohesive 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

Article 3.13 - 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.

Article 3.14 - 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.

Article 3.15 - 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.

Article 3.16–Responsibility of the contractor

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

STANDARD SPECIFICATIONS

The Government of Mauritius Standard Specifications issued by the Ministry of Public Infrastructure Land Transport & shall be deemed to form part of these documents, as every contractor registered with the Ministry of Public Infrastructure & Land Transport has, de facto, a copy of the said specifications.

However, should any bidder require a fresh copy of the Specifications in connection with this Tender, he/they should make an application in writing to the Permanent Secretary, Ministry of Public Infrastructure & Land Transport, Quantity Surveying Section, Phoenix.

All materials used in this project should be to the approval of the Head, Public Infrastructure Department.

Additional Notes

With reference to the 'Standard Specifications' issued by the 'Government of Mauritius', kindly note that:-

Page 35 of the Standard Specifications – Paragraph (c)

An Approved Testing Authority is further defined as:-

- (i) Materials Testing Laboratory
- (ii) Mauritius Standard Bureau
- (iii) The Laboratory of the University of Mauritius.

THE DRAWINGS

9(Nine) pages are annexed in this Bidding Document.

DR/01/17

DR/02/17

DR/03/17

DR/04/17

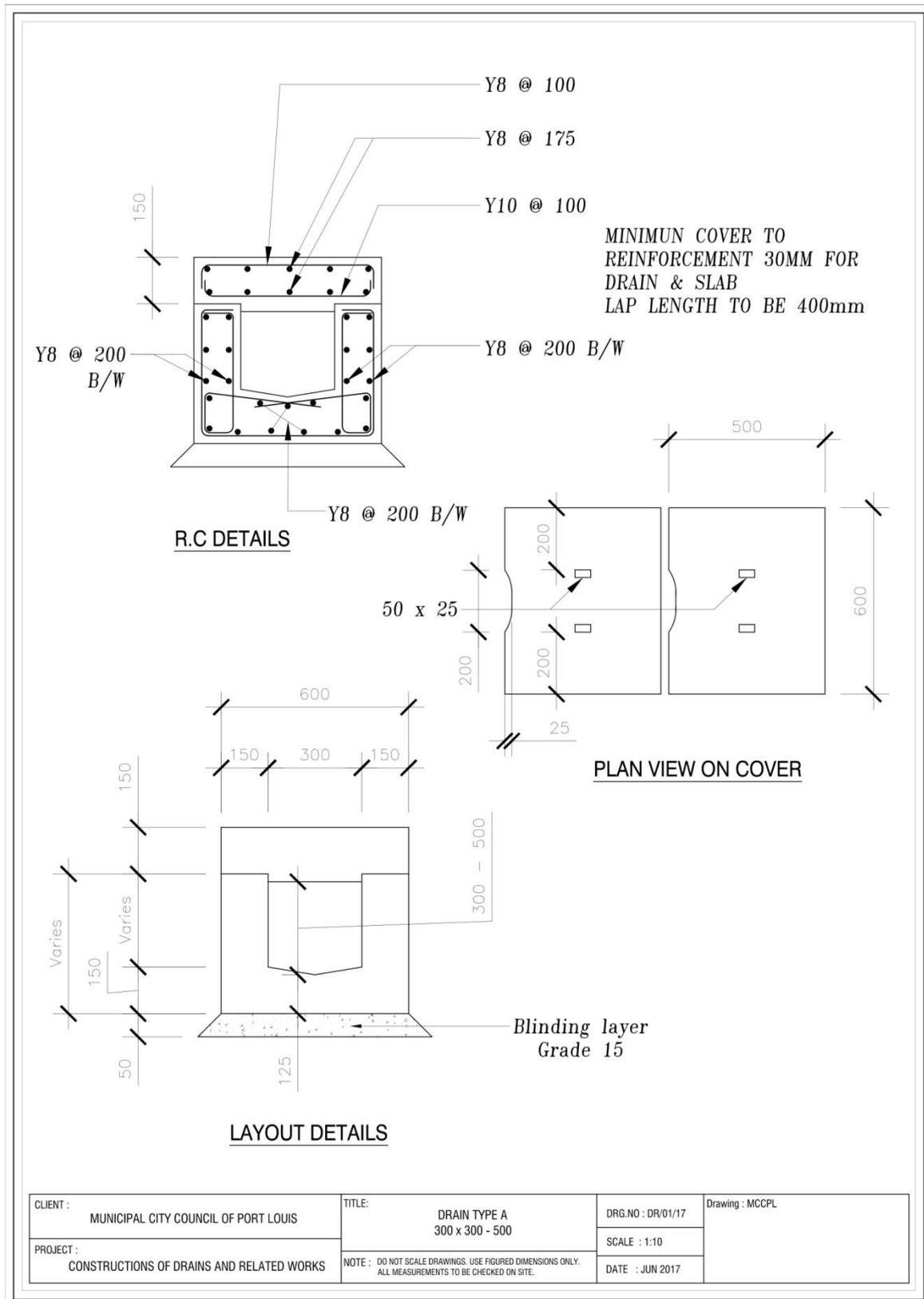
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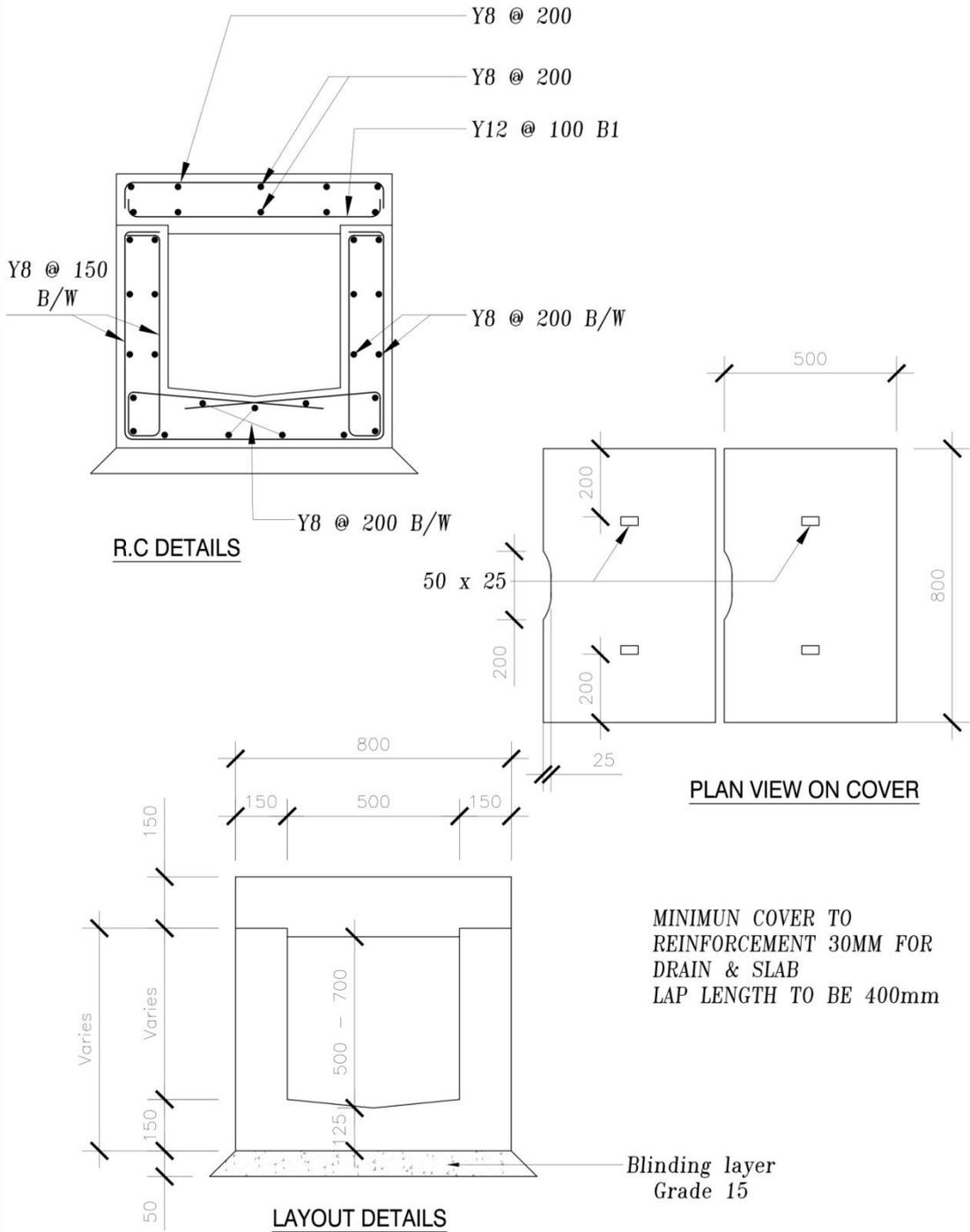
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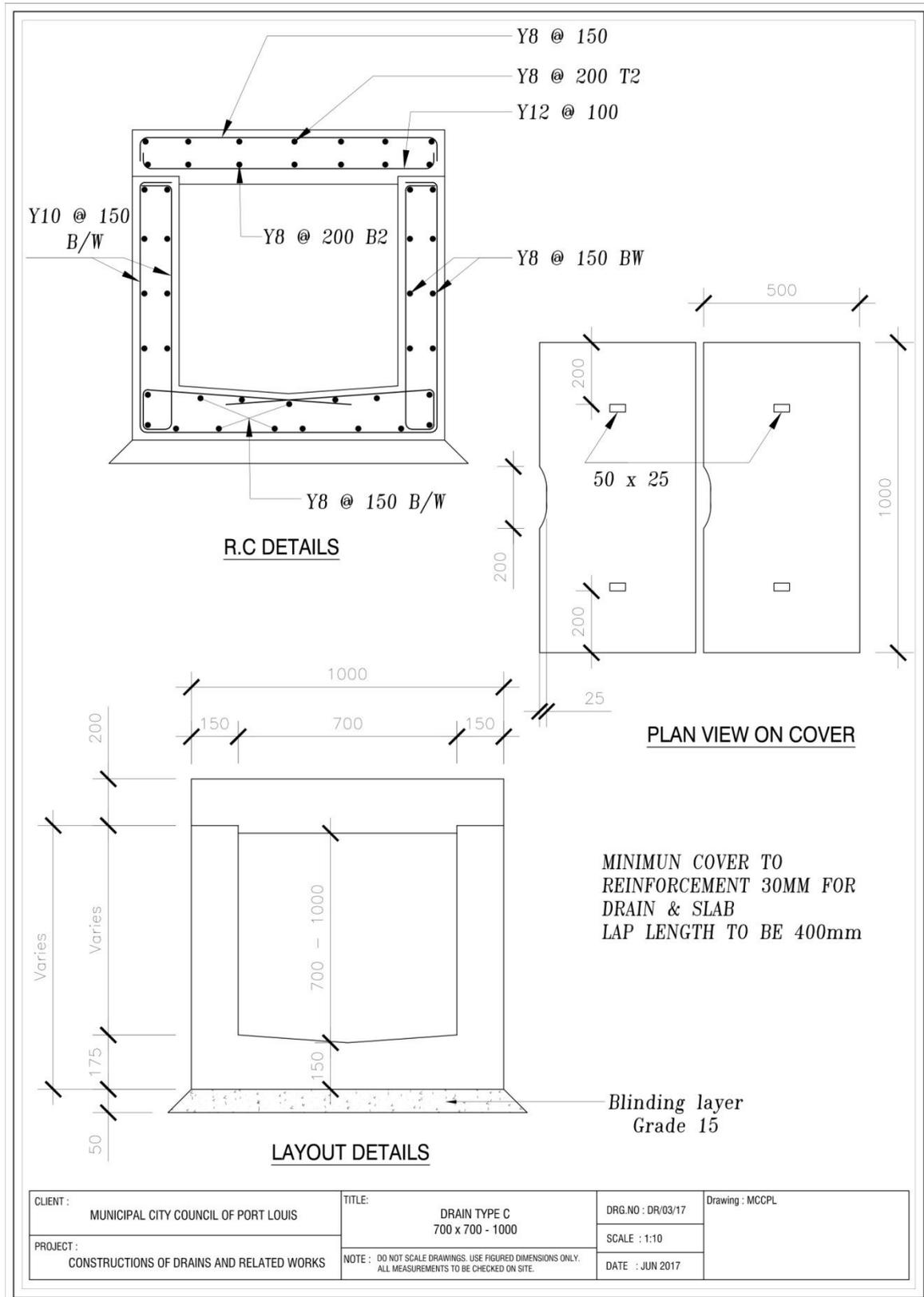
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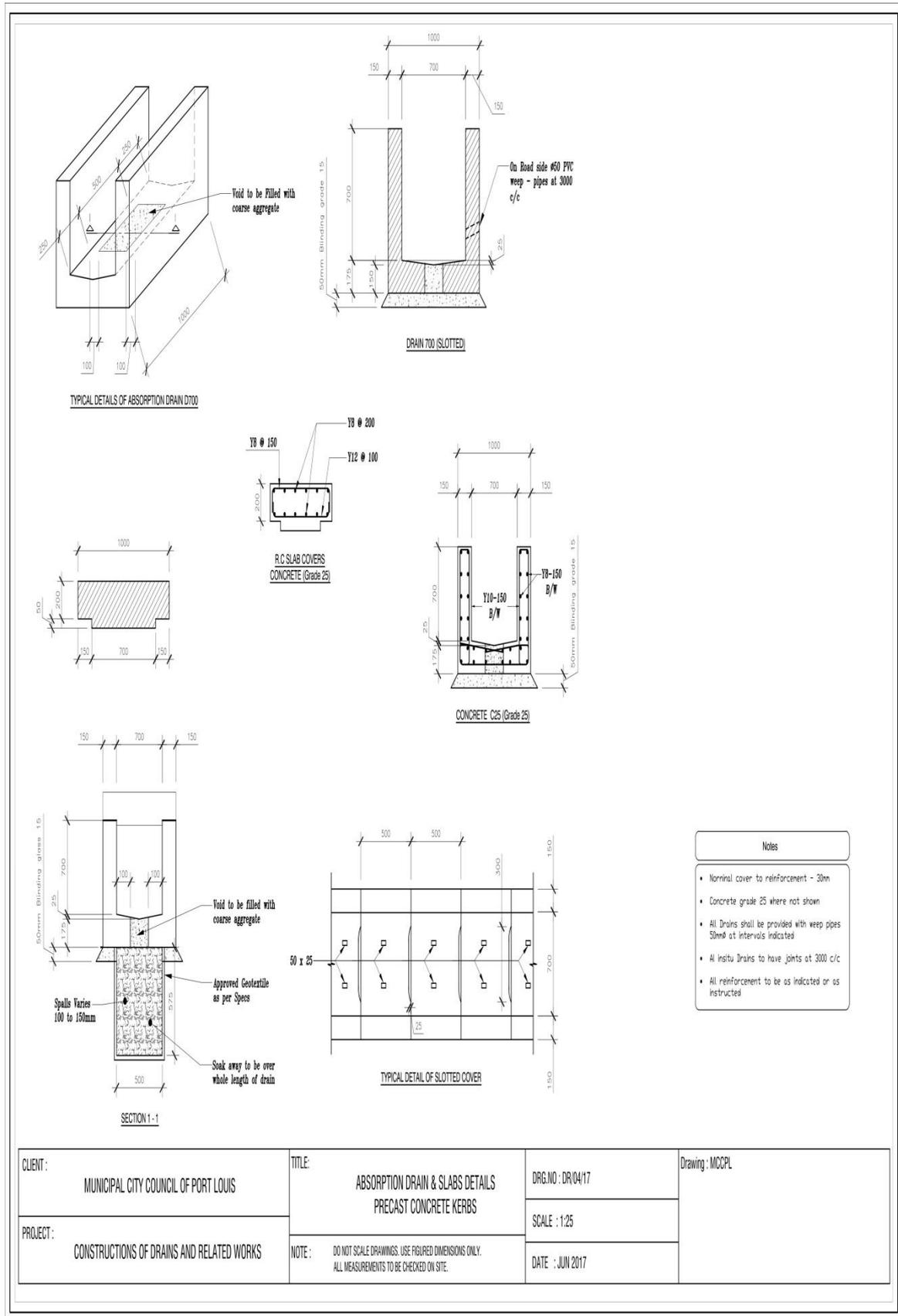
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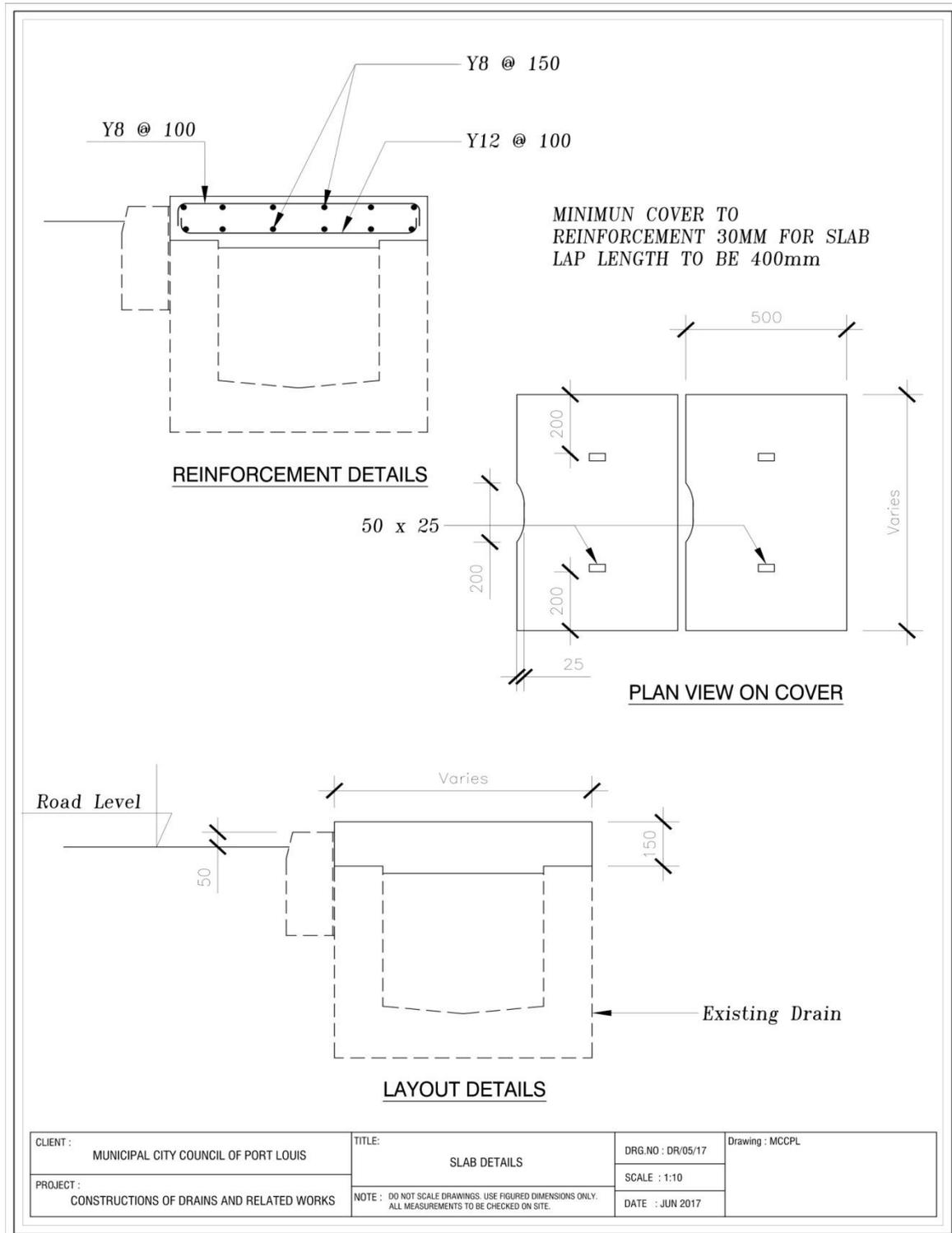




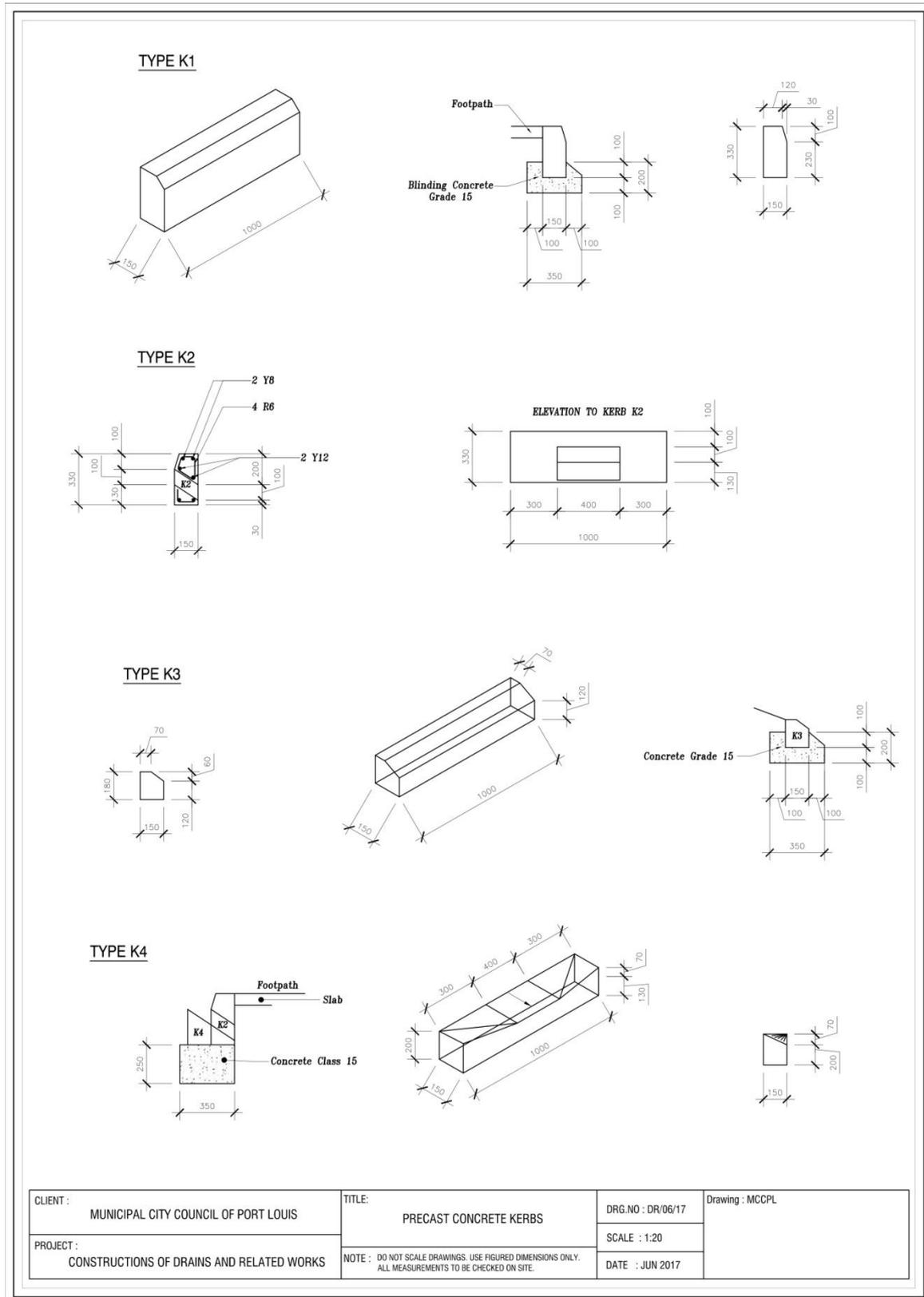
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PROJECT : CONSTRUCTIONS OF DRAINS AND RELATED WORKS	NOTE : DO NOT SCALE DRAWINGS. USE FIGURED DIMENSIONS ONLY. ALL MEASUREMENTS TO BE CHECKED ON SITE.	DATE : JUN 2017	





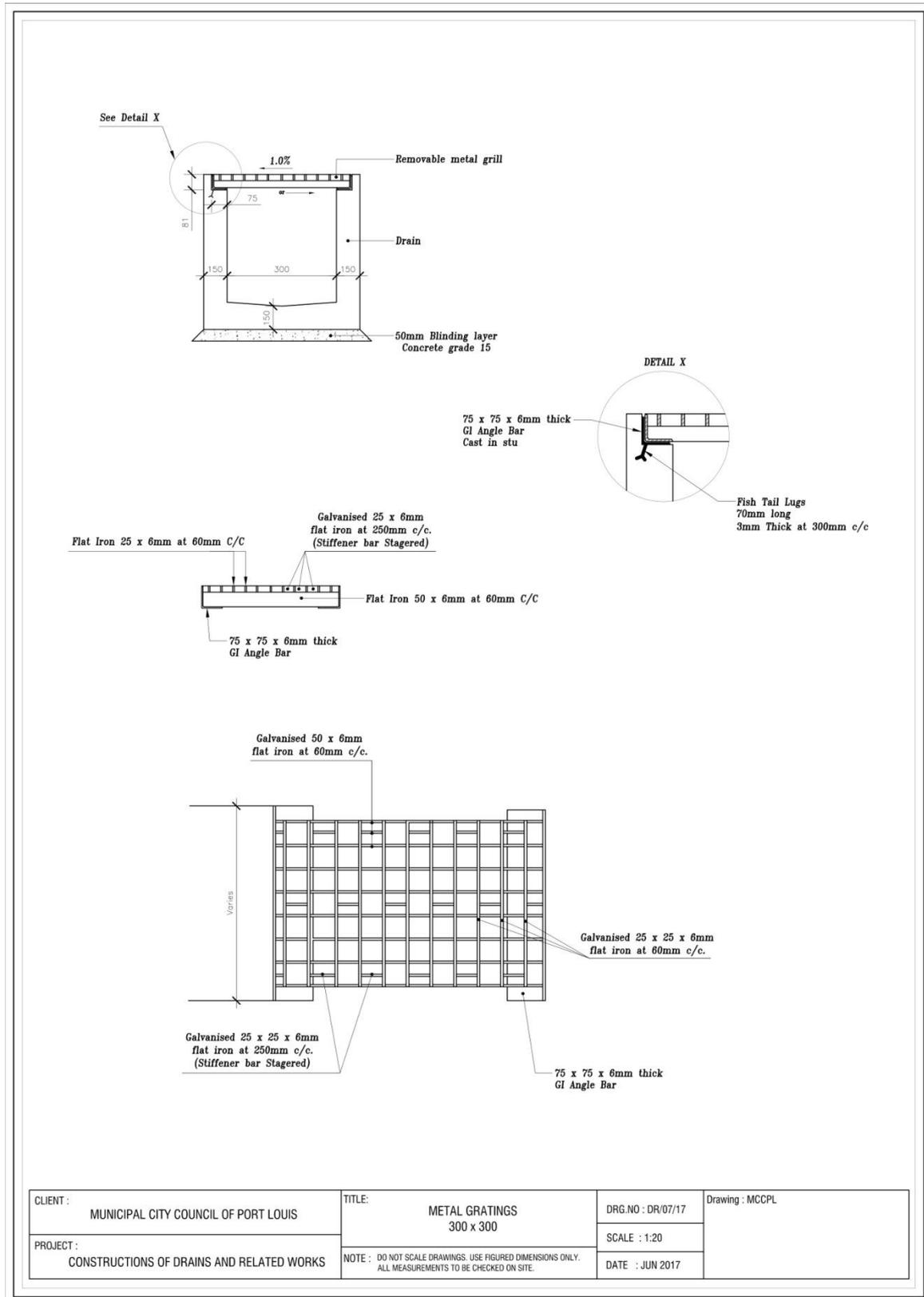


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		DATE : JUN 2017	



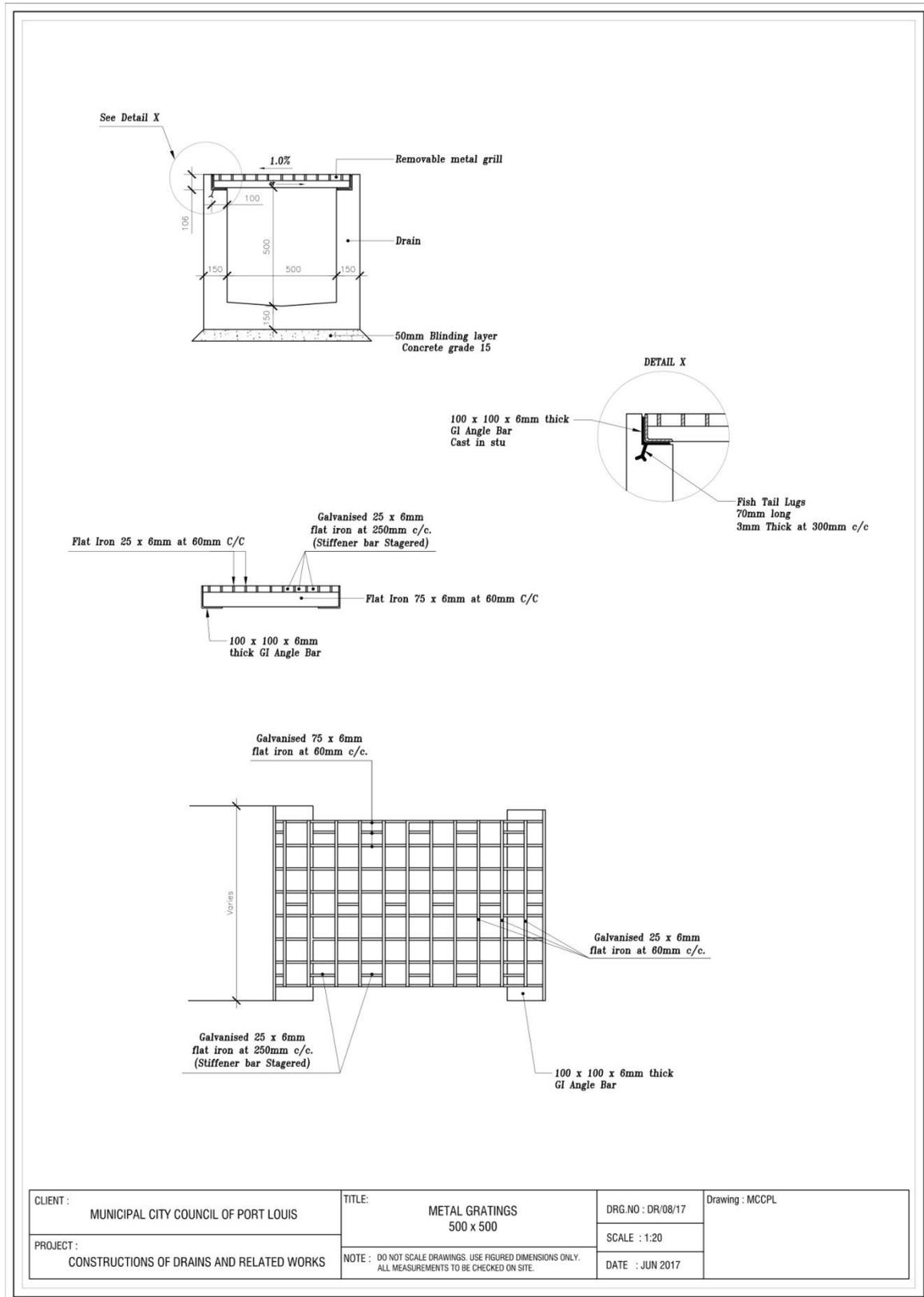
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Section V- Employer's Requirements

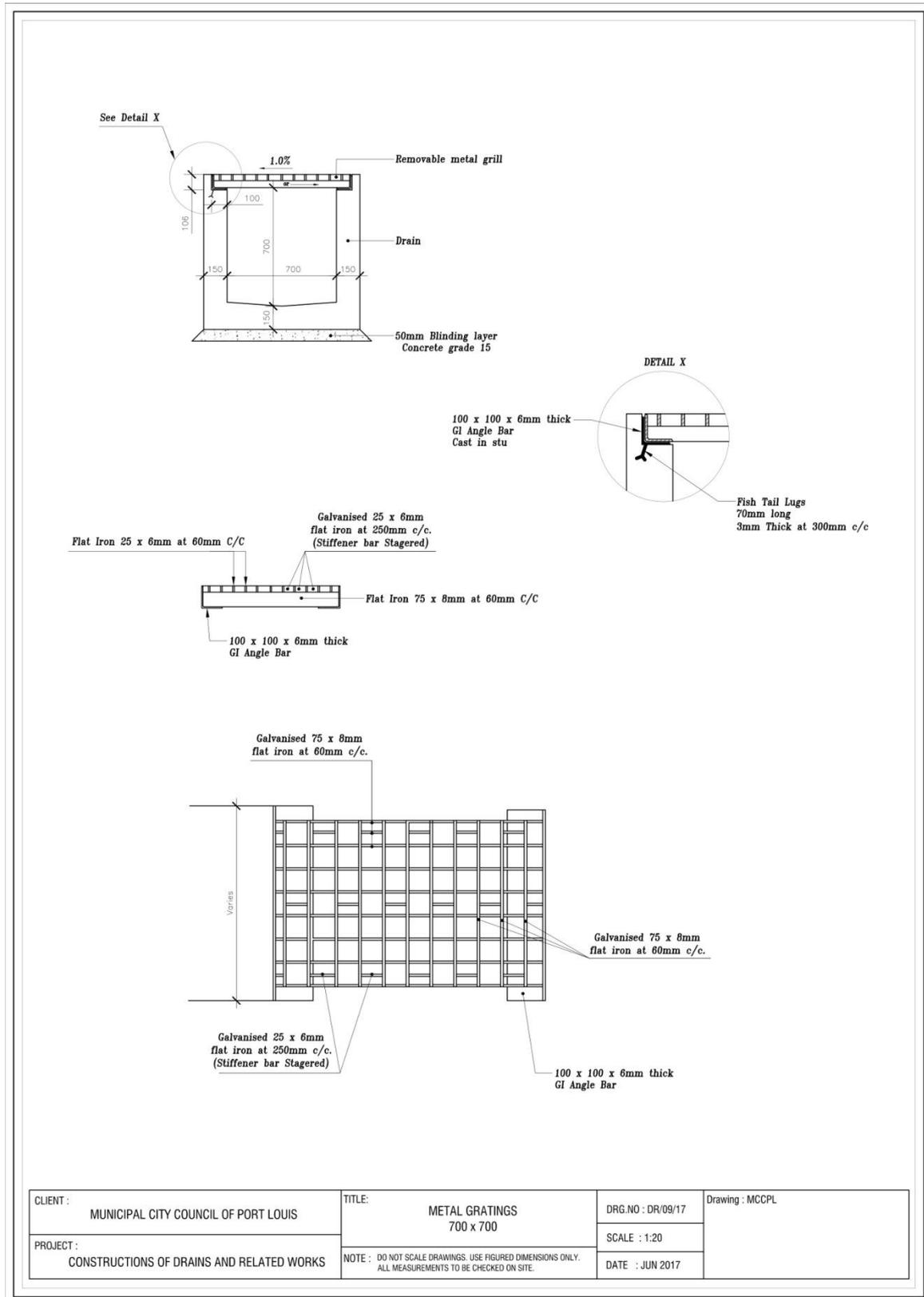


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		DATE : JUN 2017	

Section V- Employer's Requirements



Section V- Employer's Requirements



CLIENT: MUNICIPAL CITY COUNCIL OF PORT LOUIS	TITLE: METAL GRATINGS 700 x 700	DRG.NO : DR/09/17	Drawing : MCCPL
PROJECT: CONSTRUCTIONS OF DRAINS AND RELATED WORKS	NOTE : DO NOT SCALE DRAWINGS. USE FIGURED DIMENSIONS ONLY. ALL MEASUREMENTS TO BE CHECKED ON SITE.	SCALE : 1:20 DATE : JUN 2017	

PART 3 – Conditions of Contract and Contract Forms

Section VI. General Conditions of Contract

The General Conditions of Contract (GCC) applicable for this procurement is available on the web site of the Procurement Policy Office ppo.govmu.org under Ref. No. **W/SBD28/05-17 dated 09th May 2017** and **W/GCC10/05-14 dated 06th May 2017**

The GCC can be used for both admeasurement contracts and lump sum contracts.

Section VII. Particular Conditions of Contract

Except where otherwise indicated, all PCC should be filled in by the Employer prior to issuance of the Bidding Documents. Schedules and reports to be provided by the Employer should be annexed.

These clauses should be read in conjunction with the General Conditions of Contract

A. General	
GCC 1.1 (r)	The Employer is The Municipal City Council of Port Louis. Chief Executive, Jules Koenig Street, Port Louis
GCC 1.1 (v)	The Intended Completion period of the works would be specified in works orders which would be issued as and when required up to 15th December 2017 after signature of contract. The value of works which would be allocated to the contractor would be any amount up to a maximum of Rs 15m. The contractor would be required to work on several sites simultaneously.
GCC 1.1 (y)	The Project Manager is <i>The Head, Public Infrastructure Department,</i> <i>The Municipal City Council of Port Louis.</i>
GCC 1.1 (aa)	The Site is located at Areas within the jurisdiction of The Municipal City Council of Port Louis
GCC 1.1 (dd)	“The Start Date shall be within 7 days after handing over of site ”
GCC 1.1 (hh)	The Works consist of Construction of Drains and Related works
GCC 2.2	Sectional Completions are: As would be specified in the works orders/handling over certificate or as instructed by the Project Manager or his representative.

GCC 2.3(i)	<p>The following documents also form part of the Contract:</p> <p>Scope of works Performance Security Insurance Policies Addendum (if any) The Contract Agreement The Letter of Acceptance The Letter from the Bidder The Bid Submission Form The General Conditions of Contract The Particular Conditions of Contract The Employer’s Requirements Filled Priced Activity Schedule Specifications The Bidder’s Qualifications</p>
GCC 3.1	<p>The language of the contract is English</p> <p>The law that applies to the Contract is the law of Mauritius.</p>
GCC 5.1	<p>The Project manager may delegate any of his duties and responsibilities.</p>
GCC 8.1	<p>Schedule of other contractors: Not Applicable</p>
GCC 13.1	<p>Except for the cover mentioned in (d)(i) hereunder, the other insurance covers shall be in the joint names of the Contractor and the Employer and the minimum insurance amounts shall be:</p> <p>(a) for the Works, Plant and Materials: <i>(for the full amount of the works including removal of debris, professional fee etc...)</i> Rs 15.0 M</p> <p>(b) for loss or damage to Equipment: <i>(for the replacement value of the equipment that the contractor intends to use on site until the taking over by the Employer.</i> Rs 5.0 M</p> <p>(c) for loss or damage to property (except the Works, Plant, Materials, and Equipment) in connection with Contract <i>for an amount representing the value of the properties that are exposed to the action of the contractor in the execution of the works. It will extend to the property of the Procuring Entity as well).</i> Rs 5.0 M</p> <p>(d) for personal injury or death:</p> <p>(i) of the Contractor’s employees: <i>[The Contractor shall take an adequate insurance cover for its employees for any claim arising in the execution of the works].</i> Rs 5.0 M</p> <p>(ii) of other people: <i>[This cover shall be for an adequate amount for Third Party extended to the Employer and its representatives].</i> Rs 5.0 M</p>

	<p>(e) for loss or damage to materials on-site and for which payment have been included in the Interim Payment Certificate, where applicable. Not Applicable</p> <p>The Contractor shall choose to take the insurance covers indicated above as separate covers or a combination of the Contractor's All Risks coupled with the Employer's liability and First Loss Burglary, after approval of the Employer. All insurance covers shall be of nil or the minimum possible deductibles at sole expense of the contractor.</p>
GCC 14.1	Site Data are: No site data is available
GCC 20.1	The Site Possession Date(s) shall be: <i>As defined in Works Orders</i>
GCC 23.1 & GCC 23.2	Appointing Authority for the Adjudicator: No Adjudicator shall be appointed for this Contract.
GCC 24.	<p>In case a dispute of any kind arises between the Employer and the Contractor in connection with, or arising out of, the contract or the execution of works or after completion of works and whether before or after repudiation or other termination of Contract, including any dispute as to any opinion, instruction, determination, certificate or valuation of the Employer's Representative, the matter in dispute shall, in the first place, be referred in writing to the employer's representative, with a copy to the other party.</p> <p>The Employer and the Contractor shall make every effort to resolve the dispute amicably by direct informal negotiation. If, after twenty-eight (28) days, the parties have failed to resolve their dispute or difference by such mutual consultation, then either the Public Body or the Contractor may give notice to the other party of its intention to refer the matter to:</p> <p>commence arbitration, as hereinafter provided, as to the matter in dispute, and no arbitration in respect of this matter may be commenced unless such notice is given.</p>
GCC 24.3	Hourly rate and types of reimbursable expenses to be paid to the Adjudicator: Not applicable.
GCC 24.4	Not Applicable"
B. Time Control	
GCC 25.1	The Contractor shall submit a Program of Works within 3 days from the date of the Works Orders.
GCC 25.3	<p>The period between Program updates is 15 days.</p> <p>The amount to be withheld for late submission of an updated Program is NOT APPLICABLE.</p>

C. Quality Control	
GCC 33.1	The Defects Liability Period is: 365 days.
GCC 39.1	“Payment shall be made as per progress of works without payment for materials on site”. The contractor needs to submit claims for completed works on a monthly basis.
GCC 39.7	Interim Payment for Plant and Material on site is not applicable.
D. Cost Control	
GCC 41.1 (l)	<p><i>The term “exceptional adverse weather conditions” is hereby defined as any one of the following events:</i></p> <p><i>(i) Above 20 mm of rainfall recorded in day at the nearest rain station.</i></p> <p><i>(ii) An Official declaration of “Torrential Rain” by the Meteorological Department of Mauritius and</i></p> <p><i>(iii) Cyclone warning class 3 or above.</i></p>
GCC 43.1	The currency of the Employer’s country is: Mauritian Rupees.
GCC 44.1	<p>The Contract is not subject to price adjustment in accordance with GCC Clause 44, and the following information regarding coefficients does not apply.</p> <p>The coefficients for adjustment of prices are:</p> <p>(a) For currency <i>[insert name of currency]</i>:</p> <p style="padding-left: 20px;">(i) <i>[insert percentage]</i> percent non adjustable element (coefficient A).</p> <p style="padding-left: 20px;">(ii) <i>[insert percentage]</i> percent adjustable element (coefficient B).</p> <p>(b) For currency <i>[insert name of currency]</i>:</p> <p style="padding-left: 20px;">(i) <i>[insert percentage]</i> percent non adjustable element (coefficient A).</p> <p style="padding-left: 20px;">(ii) <i>[insert percentage]</i> percent adjustable element (coefficient B).</p> <p>The Index I for local currency shall be <i>[insert index]</i>.</p> <p>The Index I for the specified international currency shall be <i>[insert index]</i>.</p> <p><i>[These proxy indices shall be proposed by the Contractor, subject to acceptance by the Employer]</i></p> <p>The Index I for currencies other than the local currency and the specified international currency shall be <i>[insert index]</i>.</p> <p><i>[These proxy indices shall be proposed by the Contractor, subject to acceptance by the Employer.]</i></p>

GCC 45.1	The proportion of payments retained is: 10% which shall be retained from any payment. Half of the retention money will be released after formal taking over of the Works and the remaining shall be released after the Defects Liability Period subject to the Contractor making good all defects.
GCC 46.1	The liquidated damages for the whole of the Works are Rs 2,000 per day for each works order. The maximum amount of liquidated damages for the works is 5% of the value of the works for each works order.
GCC 47.1	Not Applicable
GCC 48.1	The Advance Payments shall Not be Applicable
GCC 49.1	The Performance Security amount is 10% of the contract price (including contingencies and VAT) in the form of a Bank Guarantee as per the format in section VIII and shall be valid until the end of the defects liability period. Where the Performance security and the insurance covers expire before the end of the date of completion of works, the contractor shall renew the insurance covers and the security to cover the period up to the completion of works and shall extend these to cover the maintenance period at no extra cost. The contractor shall inform the client in writing of the steps taken.
E. Finishing the Contract	
GCC 55.1	Not Applicable
GCC 55.2	Not Applicable
GCC 57.2 (g)	The maximum number of days is: To be determined as per the value of each works order.
GCC 59.1	The percentage to apply to the value of the work not completed, representing the Employer's additional cost for completing the Works, is 15%.

Section VIII - Contract Forms

This Section contains forms which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.

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Advance Payment Security	85

Letter of Acceptance

[on letterhead paper of the Employer]

..... *[date]*

To: *[name and address of the Contractor]*

Subject: *[Notification of Award Contract No]*

This is to notify you that your Bid dated *[insert date]* for execution of the
.....*[insert name of the contract and identification number, as given in the Appendix to Bid]* .
..... for the Accepted Contract Amount of the equivalent of*[insert amount in numbers and words and name of currency]*, as corrected and modified in accordance with the Instructions to Bidders is hereby accepted by *(insert name of Public Body)*.

You are requested to furnish the Performance Security within 21 days in accordance with the General Conditions of Contract, using for that purpose of the Performance Security Form included in Section VI (Contract Forms) of the Bidding Document.

Authorized Signature:

Name and Title of Signatory:

Name of Agency:

Attachment: Contract Agreement

Contract Agreement

THIS AGREEMENT made theday of,, between [name of the Employer]. (hereinafter “the Employer”), of the one part, and [name of the Contractor]. (hereinafter “the Contractor”), of the other part:

WHEREAS the Employer desires that the Works known as [name of the Contract]. 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.
 - (a) the Letter of Acceptance
 - (b) the Bid
 - (c) the Addenda Nos [insert addenda numbers if any].
 - (d) the Appendix to the General Conditions of Contract
 - (e) the General Conditions of Contract;
 - (f) the Specification
 - (g) the Drawings; and
 - (h) the completed Schedules,
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 Mauritius on the day, month and year indicated above.

Signed by: _____
for and on behalf of the Employer

Signed by: _____
for and on behalf the Contractor

in the
presence of: _____
Witness, Name, Signature, Address, Date

in the
presence of: _____
Witness, Name, Signature, Address, Date

Performance Security

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

Beneficiary:*Name and Address of Public Body*.....

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 Contractor, we *name of Bank*hereby irrevocably undertake to pay you 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.

.....**Seal of bank and**

Signature(s).....

**Form of Preference Security
(Bank Guarantee)**

To: _____ [name of
Employer]
_____ [address of
Employer]

WHEREAS _____ [name and
addresses of the contractor] (hereinafter called "the Contractor"), has undertaken in
pursuance to Contract No. _____ to execute
_____ [name of Contract and brief Description of
Works], (hereinafter called "the Contract")

AND WHEREAS it has been stipulated by you in the said Contract that the
Contractor shall furnish you with a Bank Guarantee by a local commercial bank for the
sum specified therein as security for compliance with his obligation stated in Sub-Clause
49.2 of the Conditions of Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible
to you, on behalf of the Contractor, up to a total of _____ [amount
of Guarantee]⁹, we undertake to pay you, upon your first written demand and without
your having to substantiate such demand any sum within the limit of
_____ [amount of Guarantee].¹

We hereby waive the necessity of demanding the said debt from the Contractor
before presenting us with your demand.

We further agree that no change or addition to or other modification of the terms
of the Contract or of the Works to be performed thereunder or of any of the Contract
documents which may be made between you and the Contractor shall in anyway release
us from liability under this guarantee, and we hereby waive notice of any such change,
addition or modification.

This guarantee is valid until the date of the Completion Certificate.

Signature and Seal of the Guarantor

Name of Bank _____
Address _____

Date _____

⁹ Amount to be inserted by the Guarantor in accordance with Sub-Clause 49.2 of the General Conditions of Contract

Advance Payment Security

[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 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, an advance payment in the sum [name of the currency and amount in figures]¹. (. [amount in words].) is to be made against an advance payment guarantee.

At the request of the Contractor, we [name of the Bank]. hereby irrevocably undertake to pay you any sum or sums not exceeding a total amount of [name of the currency and amount in figures]*. (. [amount in words].) 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 [Contractor's account number]. at [name and address of the Bank].

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, whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

..... [Name of Bank and Signature(s)].

Note –

All italicized text is for guidance only to prepare this demand guarantee and shall be deleted from the final document.

1 The Guarantor shall insert the amount representing the amount of the advance payment 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.

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.