IRRIGATION AUTHORITY

BIDDING DOCUMENT FOR

Supply, Installation, Testing and Commissioning of a Filtration Plant and Associated works at Solitude II Drip Irrigation Project

Procurement Reference No: OAB/OMD/FILTRATIONPLANT/45/25

Irrigation Authority

5th Floor, Fon Sing Building
12 Edith Cavell Street
Port-Louis
Tel: 210 6596
Fax: 212 7652
Email: irrig@irrig.org

October 25

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Section 1 - Instructions to Bidders

A. GENERAL

1. Introduction

The Irrigation Authority also referred as the Employer, invites eligible local contractors to submit their bid for the works described in detail hereunder. Any resulting contract shall be subject to the terms and conditions referred to in this document.

The Works are related to the:

Supply, Installation, Testing and Commissioning of a Filtration Plant and Associated works at Solitude II Drip Irrigation Project.

Participation is limited to citizens of Mauritius or entities incorporated in Mauritius. Joint Ventures should be among entities incorporated in Mauritius.

1.1 Clarifications, if any, should be addressed to:

The Officer-in-Charge (Projects)
5th Floor, Fon Sing Building
12 Edith Cavell Street,
Port Louis
Tel: +230 210 6596
Fax: +230 212 7652
Email : irrig@irrig.org

1.2 The Employer will respond in writing to any request for clarification, provided that such request is received 14 days prior to the deadline for submission of bids. The Employer shall respond to such request at latest 7 days prior to the deadline set for submission of bids

1.3 Bidders are advised to carefully read the complete Bidding document, including the Particular Conditions of Contract in Section IV, before preparing their bids. The standard forms in this document may be retyped for completion but the Bidder is responsible for their accurate reproduction.

2. Validity of Bids

The bid validity period shall be **90 days** from the date of bid submission deadline.

3. Work Completion Period

The Intended Completion period is **150** calendar days from the start date of works.

4. Site Visit

Bidders or their designated representatives are invited to attend a pre-bid meeting scheduled for **Tuesday 14 October 2025 at 10hrs30** on site at Solitude II filtration plant, Solitude (location is accessible at the following link: Solitude 2 filtration Plant-Irrigation Authority - Google Maps).

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.

5. Sealing and Marking of Bids

Bids should be sealed in a single envelope, clearly marked with the Procurement Reference Number, addressed to the Irrigation Authority with the Bidder's name at the back of the envelope.

6. Submission of Bids

Bids should be deposited in the Bid Box located at the Office of the Irrigation Authority, 5th Floor, Fon Sing Building, 12, Edith Cavell Street, Port Louis, Tel: +230- 2106596, Fax: +230- 212 7652 not later than **15hr30 on Friday 07th November 2025.**

Bids by post or hand delivered should reach the above-mentioned address by the same date and time at latest. Late bids will be rejected. Bids received by e-mail will not be considered.

7. Bid Opening

Bids will be opened at the Office of the Irrigation Authority, 5th Floor, Fon Sing Building, 12, Edith Cavell Street, Port Louis on **Friday 07th November 2025 at 16hr00**. Bidders or their representatives may attend the Bid Opening if they choose to do so.

8. Evaluation of Bids

The Irrigation Authority shall have the right to request for clarification during evaluation. Offers that are substantially responsive shall be compared on the basis of evaluated cost to determine the lowest evaluated bid.

9. Eligibility Criteria

To be eligible to participate in this bidding exercise, Bidder should:

(a) have the legal capacity to enter into a contract to execute the works;
(b) be duly registered with the CIA under the grades that would allow him to perform the value of works for which he is submitting his bid. (Note 1)
(c) not be insolvent, in receivership, bankrupt, subject to legal proceedings for any of these circumstances or in the process of being wound up;
(d) not have had your business activities suspended;

(e) not be under a declaration of ineligibility by the Government of Mauritius in accordance with applicable laws at the date of the deadline for bid submission or appearing on the ineligibility lists of African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development, Inter-American Development Bank Group and World Bank Group;

(f) not have a conflict of interest in relation to this procurement requirement; and

(g) have a Business Registration Card.

(h) For contract above Rs 1 Million, the enterprise should have an annual turnover not less than 75% of the bid price in any one year of the last 3 years.

(i) Where applicable, be duly registered with SME Mauritius under Micro or Small Enterprise.

Note 1 Sub-contractors undertaking works are also subject to registration with CIA as applicable to Contractors.

10. Qualification and Experience Criteria

Bidders should have the following minimum qualifications and experience:

(a) valid registration certificates with the CIA under the grade that will enable the contractor to perform the works quoted for, under the following class(es): Civil Engineering Construction works or Building Construction works or Mechanical, Electrical and Plumbing Works (MEP Works).

(b) experience in one work related to the supply and installation of a Filtration plant over the last 10 years, each of value not less than ***MUR 1 Million***;

(c) Qualification and experience of Key personnel required for the Contract shall be:

(i) One Contract Manager (part time), holding at least a Degree in Mechanical or Electromechanical Engineering or Building Services Engineering works from a recognised institution. He shall have at least 5 years experiences in Mechanical or Electromechanical engineering works or Building Services Engineering works and shall be registered with the Council of Registered Professional Engineer of Mauritius

(ii) Site agent (full-time) holding at least a Diploma in Mechanical or Electromechanical engineering works or Building Services Engineering works from a recognized institution. He shall have at least 3 years experience in Mechanical or Electromechanical engineering works or Building Services Engineering works.

(iii) One foreman having at least 3 years of experience in pipe laying works, plumbing works and installation of water works.

(iv) At least one qualified plumber/pipe fitter having a minimum 3 years of experience related to installation of water works.

(d) minimum amount of liquid assets and/or credit facilities net of other contractual commitments of the Bidder of **MUR 800,000.**

11. Content of Bid

The Bid shall comprise the following:

(a) duly filled Bid Submission Form;

(b) duly filled Priced Bill of Quantities/Activity Schedule;

(c) duly filled Qualification Information Form and attachments required

(d) report on the financial standing of the Bidder for the last three years, such as certified copies of Financial Statements or Audited Accounts as filed at the Registrar of Companies before the deadline set for submission of bids

(e) Valid Registration certificates with the CIDB, as applicable

(f) Signed C.V of Contract Manager;

(g) Documentary evidence of liquid assets and/or credit facilities (Note 1);

(h) Any other documents deemed necessary as per the requirements of this bidding document

Note 1

Bidders to demonstrate access to, or availability of, financial resources such as liquid assets, lines of credit, and other financial means, other than any contractual advance payments to meet the overall cash flow requirements for the contract and its current commitments. Documentary evidence may comprise but not limited to Bank certificate, Certificate from Auditors, Certificate from a Professional Accountant registered with MIPA, Certificate from Insurance companies.

12. Joint Venture

Bids submitted by a joint venture of two or more firms as partners shall comply with the following requirements:

i. the Bid shall include all the information required as per the Qualification Information form 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.

13. Prices and Currency of Payment

Bidders should quote for the whole works. Prices for the execution of works shall be quoted and fixed in Mauritian Rupees. Items for which no rate or price is entered by Bidders, shall not be paid for by the Irrigation Authority when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities.

Bids shall cover all costs of labour, materials, equipment, overheads, profits and all associated costs for performing the works, and shall include all duties. The whole cost of performing the works shall be included in the items stated, and the cost of any incidental works shall be deemed to be included in the prices quoted.

Bidders are required to submit their bid prices **exclusive of VAT**.

14. Bid Securing Declaration

Bidders are required to subscribe to a Bid Securing Declaration in the Bid Submission Form.

15. Margin of Preference

15.1 Margin of Preference

(i) A local Small and Medium Enterprise, having an annual turnover not exceeding Rs 100M or a joint venture consisting of local Small and Medium Enterprises having an aggregate annual turnover not exceeding Rs 100M and employing a minimum of 80% or more of local manpower of the total man-days deployed for the execution of a Works contract, shall be eligible for a Margin of Preference of 20 %.

(ii) Any bidder incorporated in the Republic of Mauritius not satisfying the conditions mentioned in (i) above but employing a minimum of 80% or more of local manpower of the total man-days deployed for the execution of a Works contract, shall be eligible for a Margin of Preference of 10 %.

Note: Local manpower shall mean Mauritian nationals, who are on the payroll of the contractor as well as those of subcontractors executing works on the site.

(iii) The contractor, having benefitted from the Margin of Preference, shall from time to time, as may reasonably be requested by the public body, submit reports on the status of employment of local manpower. At the time of works completion, as defined in the bidding document, the contractor shall submit a certified audit report to the public body to substantiate the actual percentage of local manpower employed throughout the execution of the works.

15.2 Preference Security

For contracts up to Rs 100M, the public body shall, at the selected bidder's option, either retain money from progressive payments to constitute the preference security or request a security in the form of a bank guarantee.

15 A. Evaluation of Bids

If the lowest evaluated bid is seriously unbalanced or front loaded or if any item in the Bill of Quantities or Price Activity Schedule is front loaded or contains an erroneous amount in the opinion of the Employer, the Employer may require the Bidder to produce detailed price analysis for any or all items of the bid to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After analysis of the prices the Employer may reject the bid or require that the amount of the performance security be increased at the expense of the Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.

16. Award of Contract

The Employer shall award the Contract to the lowest evaluated substantially responsive bidder.

The contract may be awarded at a negotiated price following negotiation in the following circumstances:

(i) there is a tie in the lowest evaluated price by 2 or more bidders;

(ii) the lowest evaluated price substantially exceeds the estimated cost.

Invitation for negotiation, where the lowest evaluated price substantially exceeds of the estimated cost, shall be limited to bidders whose evaluated prices are not more that 25% above the estimated cost.

Where there is a tie in the lowest evaluated price by 2 or more bidders, on completion of negotiations, the bidders shall be invited to submit their best and final offer.

Prior to award, t*he selected bidder will be required to submit a Certificate of Credit Worthiness from the Mauritius Credit Information Bureau (MCIB) in case the bid amount exceeds Rs 10 Million.*

Award of contract shall be by issue of a Letter of Acceptance in accordance with terms and conditions contained in Section IV: General Conditions of Contract and Particular Conditions of Contract.

17. Performance Security and signing of contract

Within twenty-eight (28) days of the receipt of the Letter of Acceptance from the Employer, the successful Bidder shall furnish a Performance Security, in the amount equal to 10% of the Bid price (exclusive of VAT), in accordance with the conditions of contract, using for that purpose the Performance Security Form included in Section V Contract Forms.

The Contract Agreement shall be signed within 28 days after the successful bidder receives the Letter of Acceptance unless the parties agree otherwise.

Failure of the successful Bidder to submit the above-mentioned Performance Security or sign the contract within the required time may constitute sufficient grounds for the annulment of the award.

18. Notification of Award and Debriefing

Prior to the expiration of the period of bid validity, the Employer shall, for contract amount above Rs 15 million, 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. Until a formal contract is prepared and executed, the notification of award shall constitute a binding Contract.

The Irrigation Authority shall after award of contract, exceeding Rs 1 million and up to Rs 15 million, promptly inform all unsuccessful bidders in writing of the name and address of the successful bidder and the contract amount.

Furthermore, the Irrigation Authority shall attend to all requests for debriefing for contract exceeding Rs 1 million, made in writing within 30 days the unsuccessful bidders are informed of the award.

19. Advance Payment

The Irrigation Authority shall provide an Advance Payment on the Contract Price as stipulated in the General Conditions of Contract. The Advance Payment shall be guaranteed by an Advance Payment Security as per the format contained in Section V.

The Advance Payment shall be limited to **10%** percent of the Contract Price, less any provisional and contingencies sums.

20. Integrity Clause

The Irrigation Authority commits itself to take all measures necessary to prevent 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.

21. Rights of Public Body

The Irrigation Authority reserves the right to accept or reject any bid or to cancel the bidding process and reject all bids at any time prior to contract award without incurring any liability to the Irrigation Authority.

22. Challenge and Appeal

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.

(a) The address, Tel. & Fax No. & Email address to file Challenges in respect of this procurement is:

The Officer-in-Charge (Projects)
5th Floor, Fon Sing Building
12 Edith Cavell Street,
Port Louis
Tel: +230 210 6596
Fax: +230 212 7652
Email : irrig@irrig.org

(b) The address to file Application for Review is:

The Chairperson
Independent Review Panel,
5th Floor,
Belmont House
Intendence Street
Port Louis
Tel : +230 2602228
Email: irp@govmu.org

Section 2 - Bidding Forms

Note: Bidders are required to fill all the forms in this section and submit as part of their bid. Non-submission of any form may lead to rejection of the bid

Bid Submission Form

Date: _____
Bid'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;

(b) We offer to execute in conformity with the Bidding Documents the following Works: _____;

(c) The total price of our Bid excluding VAT is: _____(MUR):

(d) Our bid shall be valid for a period of 90 days from the date fixed for the bid submission deadline in accordance with the Bidding Documents or up to ……., whichever is later, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(e) 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.

(f) If our bid is accepted, we commit to obtain a Performance Security in accordance with the Bidding Document;

(g) We, including any subcontractors or suppliers for any part of the contract, do not have any conflict of interest in accordance with ITB 8;

(h) We are not participating, as a Bidder in more than one bid in this bidding process;

(i) 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;

(j) We declare that we "qualify/do not qualify" for Margin of Preference and shall upon request submit documentary evidence in this respect. [Bidder to strike out as appropriate]

(k) 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.

(l) 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;

(m) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive; and

(n) If awarded the contract, the person named below shall act as Contractor's Representative:

Name: .....

In the capacity of: .....

Signed: .....

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

Date: .....

Seal of Company .....

Bid Securing Declaration

By subscribing to the undertaking in 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 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.]

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]*

1.2 Bidder shall provide *[insert number]* of works of a nature and amount similar to the Works performed as Contractor over the last 5 years.

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 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 are duly registered with the CIDB in accordance with CIDB Act 2008.

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

2. Additional Requirements

2.1 Bidders should provide any additional information Requirements requested in the Bidding Document.

Key Financial Information Form

Key Financial Information extracted from Audited Accounts/Financial Statements

Financial data in the currency reported in the Audited Accounts / Financial Statements	Historical Information			Remarks by BEC
	Previous years	Last year	Current year	
Statement of Financial Position (Information from Balance Sheet)				
A. Current Assets				
B. Current Liabilities				
Working capital ratio or current ratio (A / B)				
Quick ratio or Acid Test ratio (Current Asset net of stock / B) (A – Closing Stock) B				
C. Total Assets				
D. Total Liabilities				
Net Asset (C-D)				
Cash in hand and at Bank				
Bank Overdrafts				
Other Liquid Assets				
Debt to Equity Ratio (Gearing / Solvency ratio) **Long Term Debt X100** **Equity**				
Information from Income statement				
Key Profitability Indicators in the currency reported in the Audited Accounts/Financial Statements	**Previous years**	**Last year**	**Current year**	
Turnover				
Profit /(Loss)Before Tax				
Taxation				
Net Profit /(Loss) After Tax				
(Net profit After tax) x 100 (Turnover)				

	Certified by Bidder that information is true extract from Audited Accounts/ Financial Statements Name of Bidder: Signature: Capacity: Date:

Financial Resources

Form FIN 3.3

Specify proposed sources of financing, such as liquid assets, unencumbered real assets, lines of credit, and other financial means, net of current commitments, available to meet the total construction cash flow demands of the subject contract or contracts as indicated in Section III (Evaluation and Qualification Criteria).

Source of financing	Amount (MUR equivalent)
1.	
2.	
3.	
4.	

BID CHECKLIST

Procurement Reference No: OAB/OMD/FILTRATIONPLANT/45/25

S.N	Description	Attached (please tick if submitted)
1	Bid Submission form	
2	Priced Bill of quantities	
3	Specifications and Compliance sheet	
4	Bid Securing declaration	
5	Qualification Information	
6	Key Financial Information Form	
7	Financial Resources	
8	Programme of Works and weekly input of labour, plant and resources	
9	Origin of goods	
10	Proposed Methodology for effecting the works	

Bill of Quantities[1]

Abbreviations:

B/F	:	brought forward
C/F	:	carried forward
Galv.	:	galvanised
c/w	:	complete with
prov.	:	provisional
PCV	:	pressure control valve
PRV	:	pressure relief valve
NRV	:	non-return valve
IA	:	Irrigation Authority
DN	:	Nominal Diameter
PN	:	Nominal Pressure
m	:	metre
mm	:	millimetre
Kg	:	kilogram
F/PE	:	flanged and plain end
D/F	:	double flanged
G. S	:	galvanised steel
E/O	:	Extra over

[1] *In lump sum contracts, the "Bill of Quantities" is prepared for information; it is not contractual. The contractual document prepared by the Bidder shall be a "Schedule of Activities."*

Preamble

1. General

1.1 The Conditions of Contract together with the Specifications and Drawings are to be read in conjunction with the Bill of Quantities and in so far as they have any bearing must be referred to for details of the description, quality, test and strength of materials to be used and the workmanship, conditions, obligations, liabilities and instructions generally which have to be complied with in carrying out the Contract.

The cost of complying with all the conditions, obligations and liabilities described in the Conditions of Contract and Specifications and carrying out the work as shown on the Drawings will be deemed to be spread over and included in the prices stated in the Bill of Quantities unless expressly the subject of a specific item.

1.2 Each item shall be priced and extended to the "Amount" column by the Contractor with the exception of the items for which a rate only is required or which already have Provisional Sums affixed thereto. Unless otherwise stated, all items shall be fully inclusive of all that is necessary to fulfil the liabilities, obligations and risks either expressly stated or implied arising out of the Contract and shall be deemed to include all of the following:

i. Labour and all associated costs.
ii. Materials, goods, plant and all associated costs.
iii. Contractor's Equipment.
iv. Temporary Works.
v. Superintendence of the Works.
vi. Establishment charges, overheads and profit.

If any item in the Bill of Quantities is not priced, the cost of the work for such item shall be deemed to be spread over and included in the rates and prices for other items of work. The Bill of Quantities has been divided into sections for convenience of measurement and pricing.

1.3 The rates and prices inserted by the Contractor are to be the full and inclusive value of the work described. They must include all plant, tools, materials, transport of men and materials, insurance and labour of every description. They must also take into account the conditions referred to in the General Conditions of Contract and other documents on which the tender is based, and include the time lost due to weather, payment of guaranteed minimum and holidays with pay. The cost of any travelling time, subsistence and incentives such as overtime, etc. must be included in the rates and prices. Where any special risks, liabilities and obligations mentioned above or otherwise, cannot be dealt with in the rates, then the price thereof is to be separately stated in an item or items provided for the purpose or added by the Contractor.

1.4 The cost of all temporary works required for the construction of the Works shall be deemed to be included in the Contractor’s rates and prices listed in the BOQ. Other than the items

provided in the BOQ, no additional payment or any claims for the cost of temporary works shall be allowed.

1.5 The rates and prices in the Bill of Quantities shall be deemed to include all obligations for the location, procurement and maintenance of adequate water and power supplies and shall be deemed to include for all costs in association therewith, unless expressly the subject of specific items.

1.6 The quantities of work and material in the Bill of Quantities are not to be considered as limiting or extending the amount of work to be done and material to be supplied by the Contractor. The quantities of the Bill of Quantities are an estimate of the amount of work, but the work will be measured on completion and the Contractor will be paid on the actual measurement of work agreed by the Engineer.

1.7 Descriptions given are brief references only and the Contractor is referred to the respective Clauses of the Conditions of Contract and the Specifications and to the Drawings for the full descriptions and instructions. The Clauses of the Conditions of Contract and of the Specifications will be equally binding as if they had been fully repeated in the Bill of Quantities and the Contractor must allow for this in his prices. Furthermore, the Clause numbers quoted herein are for reference only and are not guaranteed as comprising the whole of the relevant descriptions or instructions.

1.8 Where alternatives are proposed for materials, plant or methods of construction, the original items scheduled in the Bill of Quantities shall be priced as described and the alternatives shall be priced separately.

1.9 Where Specifications clauses or drawings are expressly stated in item descriptions, these items shall be deemed to include for all relevant items referred to in such clauses or on such drawings as well as all other relevant items specified in or reasonably implied in the Contract.

1.10 "Ditto" shall mean the whole of the preceding description except as qualified in the description in which it occurs. Where it occurs in descriptions of succeeding items it shall mean the same as in the first description of the series in which it occurs except as qualified in the description concerned. Where it occurs in brackets it shall mean the whole of the preceding description which is contained within the appropriate brackets.

1.11 The units of measurement described in the Bill of Quantities are metric units.

1.12 All rates and sums of money quoted in the Bill of Quantities shall be in Mauritian Rupees.

1.13 Arithmetic errors (if any) will be corrected by the Bid Evaluation Committee and such corrections shall be final and binding. Where a discrepancy exists between the unit rates in the "Rate" column and the extended total price in the "Amount" column, the unit rate shall be taken as correct and the amount adjusted accordingly.

1.14 The Contractor shall be deemed to have visited the Site before preparing his Tender and to have examined for himself the conditions under which the work will proceed and all other matters affecting the carrying out of the Works and the costs thereof.

1.15 "Instructed", "directed" or "approved" shall mean the instruction, direction or approval of the Engineer in writing.

1.16 The Contractor shall not be automatically entitled to receive payment for any item for work that has not been carried out or on any items that are not used. Payment will be made only on the basis of re-measurement of work actually done.

1.17 The rate for the construction of temporary access roads through and around the site shall include for all costs incurred by the Contractor for providing and maintaining such access and for reinstatement of the area to its original condition.

2. Dayworks

2.1 The rates and the valuation of works ordered by the Engineer to be executed on a daywork basis shall be made in accordance with the following: -

Plant

2.2 Rates shall be inserted against all items of plant listed and the amount extended to the 'Amount' column.

2.3 Plant Daywork hire rates shall include all operating and maintenance costs including fuel, oil, grease, spare parts, repairs, insurance and all other costs whatsoever together with operators, superintendence, any extra costs of overtime, overhead charges, P&G and profit. The rates shall also include for travelling time and costs for the plant operators, etc., to and from and about the site.

2.4 Idle time where due solely to the nature of dayworks or authorised methods of procedure will be paid for at one half of the rates entered herein.

2.5 Hire rates shall be paid only for the time during which the plant is actually working on daywork as authorised by the Engineer. Plant hire rates shall not be paid for periods of breakdown, inefficiency or unsuitability of the plant.

Labour

2.6 Rates shall be inserted against all categories of labour listed and the amount extended to the Amount' column.

2.7 The Labour Daywork rates shall include the net hourly rate paid to the worker plus special allowances to such labour in respect of subsistence, bonuses, overtime, feeding, housing, gratuity, holidays, transport to or from the Site or any cost of overhead charges in respect of recruitment, camp administration, welfare, medical treatment, supervision, insurances, profit and any other costs or allowances.

2.8 The cost of supervisors, foremen and working gangers employed in a supervisory capacity only shall be included in the daywork rates and shall not be paid for separately. The rates shall cover for the supply, transport about the Site, use, maintenance and renewal of all hand tools and equipment available on site and used on Dayworks, such as wheelbarrows, spades, picks,

crowbars, hammers, ropes, chains, hooks, blocks, pulleys, scaffolding, timber putlogs, running planks, ladders, hand operated jacks, handpumps, lamps, timber runways or platforms, tarpaulins and all other like hand tools and general equipment not specifically referred to under the listed plant hire for Dayworks.

2.9 Where the Engineer orders work to be carried out on a Daywork basis outside the Site, necessary travelling time between site and such places of work shall be allowed as hours worked.

2.10 The cost of plant operators is included in the daywork plant hire rates and are not paid separately under labour dayworks.

2.11 The total amount from the extension of all labour items is a Provisional Sum.

Materials

2.12 Rates shall be inserted against all items for materials listed and the amount extended to the 'Amount' column.

2.13 The rates inserted are to include all loading, transport, unloading, storage, double handling, insurance, superintendence, overheads and profit.

2.14 The materials shall in all instances conform to the qualities and descriptions stated in the Specifications.

3. Provisional Sums

3.1 No item for which a Provisional Sum is inserted shall be purchased by the Contractor until the Project Manager has given written instructions to this effect and it shall be the duty of the Contractor to make an application to the Project Manager sufficiently in advance of the progress of the work for instructions with regard to each such items. The Contractor shall obtain competitive quotations and samples if required and shall submit these to the Project Manager for approval.

3.2 The Contractor shall produce to the Project Manager the receipted accounts for all articles purchased under Provisional. No payment to the Contractor shall be made in respect of the items until the said receipts have been presented to the Project Manager.

3.3 The Contractor shall enter the percentage mark up of corresponding items described as Provisional Sum.

3.4 Provisional sums inserted in the Bill of Quantities in respect of materials to be specially imported for the Contract by the Contractor shall be deemed to include insurance, freight, dock and all other charges. In the case of imported materials obtained through a manufacturer's agent in Mauritius the sum shall be deemed to include the agent's fees and charges.

3.5 The Bill of Quantities include items in respect of the Provisional Sums for materials and sub-contracts given in the form of a percentage of the sums to be expended to cover the Contractor's profit and overheads, including but not limited to the costs of obtaining quotations for, and the placing of orders or awarding sub-contracts, and all expenses in connection with administering such orders or sub-contract and financing cost for payment of these sums until recovery from Interim Certificates.

3.6 Items described as Provisional Sum or Prov. Sum or Provisional in the column of Description or Unit of the Bill of Quantities shall be subject for approval from the Project Manager prior of executing the items of work. Such items may be used in whole or in part, or not at all as instructed by the Project Manager

4. Method Related Charges

4.1 In order that the Contractor may cover his costs in executing the whole of the Works in conformity with the contract documents, where those costs are not properly attributable to the quantity of permanent works to be executed, he may cover such costs in the Bills of Quantities as method related charges.

A Bidder may insert in the Bills of Quantities and in the space provided, such items for Method Related Charges as he may decide to cover items of work relating to his intended method of executing the works, the costs of which are not to be considered as proportional to the quantities, rates and prices for the other items.

Each item for a Method Related Charge inserted by the Tenderer shall be fully described so as to define precisely the extent of work covered and to identify the constructional resources (plant, equipment etc.) to be used and the particular items of permanent or temporary works to which the items relate.

Bill No. 1: General and Preliminary

Item No.	Description	Unit of Measure	Quantity	Rate (MUR)	Total Price (MUR)
1.01	***Method Related Charges*** Mobilisation and demobilisation of plant and equipment for the whole duration of the work on site.	Sum	1		
1.02	Insurance.	Sum	1		
1.03	Guarantees.	Sum	1		
1.04	Supply of as-built drawings	Sum	1		
1.05	Supply of Operation and Maintenance manual.	Sum	1		
1.06	Training on operation and maintenance of filtration plant over a period of two weeks to the Engineers, Divisional Irrigation Officer, Irrigation Officers and field supervisors.	Sum	1		
	Sub Total to be transferred to Bill No. 1 of Summary of Price				

Bill No. 2: Filtration Plant

All flanged items are to be supplied complete with bolts, nuts and gaskets as specified.

All fittings, flanges and accessories shall be drilled to PN 16.

Items mentioned in Bill No.2 refers to drawing OAB/OMD/FILTRATIONPLANT/45/25/03

All bill items shall be tested and commissioned.

Item No.	Description	Unit of Measure	Quantity	Rate (MUR)	Total Price (MUR)
2.01	Dismantle existing hydro-cyclone and Spin-klin filtration system complete with all casings, piping, fittings and accessories. All unserviceable items to be delivered to our store yard at the sub-office at Plaine des Papayes, including for costs of loading, unloading and transportation.	Sum	1		
2.02	**FILTRATION UNIT**				
	Supply, install and test one-unit automatic suction scanning screen filter for filtering a maximum flow of 100 l/s. The filtration degree of the fine screen filter shall be in the range of 200-250 micron as specified and it shall be supplied complete with control system. (Include for all the following pipes, fittings and accessories as stated below: **Pipes, Fittings and Accessories** Allow for the supply and installation of the required by-passed pipe, interconnecting pipes, valves, fittings and accessories needed to connect the new filter unit to the existing Inlet pipe (DN 150) and Outlet pipe (DN 150), as per drawing AOB/OMD/FILTRATIONPLANT/45/25/03, which shows the proposed layout of the new automatic filter unit. The Pipes and fittings shall be in hot dip galvanised steel as specified at Section 3.4.11. Exact existing dimensions of inlet and outlet pipes on site will have to be checked and confirmed by the Contractor.	Sum	1		
	Total C/F				

Item No.	Description	Unit of Measure	Quantity	Rate (MUR)	Total Price (MUR)
	Total B/F				
	The installation shall consist, among others, of the following components, based on the type of filter unit proposed by the Bidder where the sizes of all the pipes, valves and fittings shall be such that they are suitable for a maximum flow of 100 l/s: (i) Flanged galvanised steel pipes at the existing inlet and outlet pipes, for the by-passed pipe and at other interconnection points. (ii) Provision of chlorine injection point with appropriate stop valve onto the main delivery pipe after the filtration units. (iii) Butterfly valve (iv) Reducers. (v) Air valves. (vi) 90° Elbow. (vii) TEE (viii) Manometers. (ix) Controllers. (x) uPVC, PN 16 piping and fittings for the evacuation of backwashed water to the soakaway. Pipes to be painted with UV protective paint after installation. Diameter of pipes and fittings as per recommendation of the manufacturer. Bidder shall ensure that the above installation shall be done within the extent of the existing Building to house the new filtration plant.				
2.03	**ELECTRICAL WORKS**				
	Supply, fix and test all appropriate electrical wiring, breakers, switches, connection boxes, and accessories for power and control panel to the	Sum	1		
	Total C/F				

Item No.	Description	Unit of Measure	Quantity	Rate (MUR)	Total Price (MUR)
	Total B/F				
	filtration plant from the existing power supply available at the existing building. The installation shall include the supply and fixing of appropriate electric cable to be run through fully protected and insulated PVC ducting, complete with all fixing supports, clamps and accessories, as required under existing site conditions. Routing of the electrical cable to be shown on site during pre-bid site visit				
2.04	**Manometers**				
	Supply, install and test glycerine type manometer of range 0 to 10 bars at outlet	No.	1		
	Concrete Support and metal strap for Anchoring				
2.05	Supply and construct mass concrete support for anchoring the filtration unit and the interconnecting pipe networks including shuttering.	m^3	2		
2.06	Supply and fix galvanised metal strap for anchoring of filtration units and pipes on concrete supports complete with M10 rawl bolts, washers and nuts. Metal strap to be of minimum width of 40 mm and thickness 5 mm. Number of metal straps to be provided is 12 Nos. Locations to be determined by the Project Manager	Sum	1		
	Total C/F				

Item No.	Description	Unit of Measure	Quantity	Rate (MUR)	Total Price (MUR)
	Total B/F				
2.07	**RECOMMENDED SPARE PARTS**				
	Bidder to list recommended list of spare parts, as per the manufacturer's recommendation, for one unit of filter plant for a period of five years. The list of spare parts shall include the following items amongst others: (i) Backwash/hydraulic motor. (ii) Limit switches/DP switches. (iii) Flushing valves. (iv) Controller. (v) Actuator/Solenoid. (vi) Pressure transmitters, etc… (vii) (viii) (ix) (x)	Sum	1		
	Sub Total transfer to Bill No. 2 of Summary of Price				

SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF A FILTRATION PLANT AND ASSOCIATED WORKS AT SOLITUDE 11
DRIP IRRIGATION PROJECT
PROCUREMENT REFERENCE NO: OAB/OMD/FILTRATIONPLANT/45/25

SUMMARY OF PRICE

BILL NO.	DESCRIPTION	AMOUNT (MUR)
1	GENERAL AND PRELIMINARY	
2	FILTRATION PLANT	
SUB- TOTAL		
ADD 15% VAT		
ADD CONTINGENCY		200,000.00
GRAND TOTAL, MUR (INCLUDING VAT AND CONTINGENCY)		

Priced Activity Schedule Authorised By:

NAME: .....

POSITION: .....

SIGNATURE: .....

DATE: .....

NAME OF COMPANY: .....

ADDRESS OF COMPANY:
.....

COMPANY SEAL:

Schedule of rate

Item No.	Description	Unit of Measure	Quantity	Rate (MUR)	Total Price (MUR)
1.0	**PLANT**				
1.01	Water bowser (1500 L)	hr	1		
1.02	Concrete mixer (1 m^3)	hr	1		
1.03	Poker Vibrator	hr	1		
1.04	Crane lorry (3 ton)	hr	1		
1.05	Electric/Petrol generator	hr	1		
1.06	Water pump	hr	1		
2.0	**LABOUR**				
2.01	Pipefitter	hr	1		
2.02	Welder	hr	1		
2.03	Carpenter	hr	1		
2.04	Mason	hr	1		
2.05	Labourer	hr	1		
3.0	**MATERIAL**				
3.01	Crusher run	ton	1		
3.02	High yield tensile steel reinforcement	kg	1		
3.03	Mild tensile steel reinforcement	kg	1		
3.04	Galvanised angled bar of profile 50 x 50 x 6 mm	kg	1		
3.05	Crushed basalt coarse aggregate (<20mm)	m^3	1		
3.06	Crushed basalt fine aggregate	m^3	1		

Item No.	Description	Unit of Measure	Quantity	Rate (MUR)	Total Price (MUR)
4.0	**EXCAVATION**				
	The rates for excavation shall include trimming of sides, forming steps, keeping excavation free from water or mud, stacking and carting away of materials as directed by Project Manager				
4.01	Excavation in soil to depth not exceeding 2 m.	m3	1		
4.02	Excavate in soil to depth exceeding 2m but not exceeding 4 m.		1		
4.03	Excavation in hard rock to depth not exceeding 2 m.		1		
4.04	Excavate in hard rock to depth exceeding 2m but not exceeding 4m.	m^3	1		
4.05	Excavate for unsuitable material below formation level where ordered by the Project Manager.	m^3	1		
5.0	**BACKFILLING**				
	The rate to include for supply, placing and compaction as per specifications.				
5.01	Hardcore filling consisting of sound hardstone not exceeding 150 mm size and compacting in layers not exceeding 250 mm thick	m3	1		
5.02	Soil materials free from organic matter and stones and compacted in layers not exceeding 150 mm	m3	1		
5.03	Compact Class B bedding under pipes as specified	m^3	1		
5.04	Compact Class B bedding under pipes to fill extra depth below formation after removal of unsuitable ground	m^3	1		

Section 3 - Employer's Requirements

3.1 Introduction

The Solitude II Drip Irrigation Project, managed by the Irrigation Authority (IA), is located in the region of Solitude and receives water from a delivery main pipe which itself is supplied by the La Nicoliere reservoir. The water is conveyed through a delivery main to the filtration plant, from where it is distributed to an area of around 58 ha of land under vegetable and sugar cane, via a network of submain and manifold pipes. The water is then fed to the crops through infield dripper lines.

Over time, the existing hydrocyclone and spin-klin filter have suffered from extensive wear and tear and are no longer performing as required. Since drip irrigation system requires water free of particles, so as to prevent clogging of dripper lines, the IA aims at replacing it with a new automatic suction scanning screen filters capable of filtering a flow of 100 l/s complete with control system as specified, with provision for a pipe bypass to be used in case of servicing and/or breakdown.

Photo 1 – View of the existing spin-Klin Filter Units of Solitude II Filtration Plant

3.2 Scope of Works

The scope of works is described below:

1. Dismantle the existing EBS filter station complete with all casings, piping, valves, fittings and accessories from the inlet and up to the outlet of the filter Unit.
2. Transport, loading, unloading and delivery of all the dismantled and unserviceable items to IA store at Plaine des Papayes.
3. Clean the concrete platform and compound of all debris and vegetation.
4. Supply and install one unit of automatic suction scanning screen filter, complete with all accessories, piping, fittings and associated electrical work, so as to provide a flow of 100 l/s at the outlet.
5. Supply and install a by-passed galvanized steel pipe so as to provide a flow of 100 l/s
6. Supply and install all inter-connecting galvanized steel pipe.
7. Supply of recommended spare parts.
8. Training on the operation and maintenance of the filter station to selected employees from the Irrigation Authority.
9. Testing, commissioning and maintenance of the filtration plant during the Defects liability Period including the making good of possible defects.

3.3 Operating Conditions

The filter shall operate indoors, subject to the following conditions:

Condition	Unit	Value
Ambient temperature	°C	20-30
Water temperature	°C	20-30
Minimum volume flow rate	L/s	100
Pressure	Bar	4-6
Inlet size	mm	DN 150 Bidder may propose alternative pipe diameter.
Outlet size	mm	DN 150 Bidder may propose alternative pipe diameter.
Power supply available	Single-phase	

3.4 Site and location Plan

The location plan of the project site is accessible at the following link:

Solitude 2 filtration Plant-Irrigation Authority - Google Maps

https://www.google.com/maps/place/Solitude+2+filtration+Plant-Irrigation+Authority/@-20.0768103,57.5358973,989m/data=!3m2!1e3!4b1!4m6!3m5!1s0x217c532664765c23:0x595ab3e463668822!8m2!3d-20.0768154!4d57.5384722!16s%2Fg%2F11svzs0y60?authuser=0&entry=ttu&g_ep=EgoyMDI0MDkwNC4wIKXMDSoASAFQAw%3D%3D

3.4.1 Installation

Drawing AOB/OMD/FILTRATION PLANT/45/25/03 shows the proposed schematic layout of the Filter station on the existing platform including the required components.

The installation shall consist of one-unit Automatic screen filter unit with provision for a pipe bypass.

The filter shall be installed such that the flanged inlet and outlet ports of filter units face downwards to allow draining of the filter unit.

The filters and all associated components and accessories, with the exception of the backwash piping and control system shall fit on the existing platform of size 4.2 m x 7.0 m as indicated in the layout plan.

Note that the schematic diagram is not drawn to scale but it shows all the components required in the installation. Any additional fittings and equipment as proposed by the bidder shall be such that they all fit into the platform area.

The Bidder shall draw the attention of the Employer of any missing item not mentioned in the bill of quantities and shall quote for such items in a separate memorandum.

3.4.2 Filtration Unit

The filtration unit shall be of the horizontal, self-cleaning, automatic suction scanning screen type.

The operation of the Automatic screen filter shall be as follows:

(1) The water flows through the inlet port and enters through the pre-filter to the inside of the filter element.
(2) The water then passes through the screen, and the particles are retained on the inside of the filter element (screen).
(3) The filtered water then flows out through the outlet.
(4) When the pressure differential from inlet to outlet of the filter reaches the pre-selected level, the flushing cycle starts.
(5) The hydraulic valve opens the flush port to atmosphere, which creates a vacuum in the inner nozzles, and this along with the helical movement forces captured particles through the inner nozzles into the waste flow and expels the particles out of the flush port.
(6) The duration of the flush cycle is pre-determined by the Control unit.

(7) When the cycle is complete the flush valve closes and the cycle ends.
(8) The flushing process shall use a minimal amount of water.

It shall be of lightweight, compact, cost effective, easy to service and have low flush volumes. The filtration unit shall be such that the filtration process and the flushing cycle can occur simultaneously, so that it can supply filtered water during the flushing cycles thus saving time and reducing impact on irrigation system flows.

It should be supplied fully complete with pre-filter screen, fine screen filters, flanged inlet/outlet and flush ports, inner nozzles, scanner, gate valves, air valves, manometers and casing, etc. The Filter element and internal mechanisms shall be easily removeable for periodic maintenance and cleaning.

The materials of construction shall be as follows, or from any other better alternative:

S.N	Part	Material
1	Filter casing	Carbon Steel epoxy-polyester coated
2	Filter element	Stainless Steel 316
3	Scanner	Stainless Steel 304
4	Sealing elements	Nitrile rubber

The Bidder shall supply a filter suitable for the operating conditions in section 3.3 above. Attention is drawn to the de-rating of the filter subject to the water quality.

Filtration shall be a two-stage process. The initial stage shall consist of a pre-filter (coarse) screen for the removal of oversized contaminants from the raw water which may damage the fine filter and suction nozzle.

The second stage shall be a fine screen to remove the remaining particles.

The filtration degree of the fine screen filter shall be in the range of ***200 to 250 micron***.

The coarse filter and fine filter shall both be part of each filtration unit.

The screen shall be of the 4-layer weave wire or multi-layered sintered stainless steel 316 type or other equivalent screen to be proposed by the Bidder, which is most appropriate in such application.

Pressure drop across the clean filter shall not be more than 0.8 bar.

The volume of water used for self-cleaning must be less than 2% of the total volume flow rate. The control system for self-cleaning shall allow for operation under any one of the following conditions:

1. receiving a signal from a pressure differential switch;
2. time interval parameter set at the control board; or
3. Manual Start.

However, the operator shall have the possibility to set the operation to be under any one of the above-mentioned conditions, or combination thereof, manually.

The control system shall be installed in the sub-office building if it is not an integral part of the filter unit.

The power available on site is single phase supply from the sub-office. Bidders should cater for all the electrical cabling works, including electric cables of appropriate size, PVC sleeves, connection boxes, breakers, ELCBs, switches and accessories.

3.4.3 Spare Parts

The Bidder shall supply spare parts as per the manufacturer's recommendation for a period of five years.

3.4.4 Operation and Maintenance Manual

The Bidder shall submit with the material, plant or equipment, all the manuals and drawings describing the recommended detailed procedures for their assembly, dismantling, installation, operation and maintenance. These documents shall also provide the dimensions, weight and space required for the operation and maintenance of said plant and equipment.

All the submitted drawings shall include amendments made to the original approved drawings to show the filter station as commissioned.

The Bidder shall also submit a detailed catalogue of the filter station, identifying their part numbers and any additional information required for re-ordering.

3.4.5 Training

The duration of the training shall be over a period of two weeks to the Engineers, Divisional Irrigation Officer, Irrigation Officers and Field Supervisors of the Operation and Maintenance Department. Some selected workers of the IA will also be working in collaboration with the employees of the Contractor as a form of training.

3.4.6 Butterfly Valves

Butterfly valves shall have a pressure rating of 16 bar and be either wafer type or lug type or flanged as specified in the Bill of Quantities and shall conform to BS EN 593 or equivalent standards. Valve shall also conform to BS EN 1092-1:2018 for flange dimensions and drills and to BS EN 558 for face to face (Flange to Flange) length. Also, it shall comply with BS 12266-1 for pressure test.

Butterfly valve body and disc shall be of cast iron or ductile iron or stainless steel. The disc shall be designed to achieve low head loss characteristics. The seat shall be of bronze gunmetal to BS EN 1982:2017. The valve shafts shall be of stainless- steel operating in self-lubricating bushes in the body.

The sealing ring shall be of high-quality nitrile rubber or EPDM rubber attached to the disc edge by a sectional bronze retaining ring to form a reliant and durable seal.

Valves shall be coated with a protective coating, fusion bonded epoxy having minimum thickness of 250 microns or equivalent coating, for maximum corrosion protection.

The Contractor shall submit to the Project Manager the manufacturer's certificate which shall show that the valves and their components comply with the above specified requirements.

3.4.7 Gate Valves

Unless otherwise specified by the Project Manager, gate valves shall be double flanged and manufactured in accordance with relevant clauses of BS 5163-1:2004, BS 5163- 2:2004, BS EN 1074-1:2000 and BS EN 1074-2:2000 or BS EN 1171:2002. Valves shall be specifically designed for use in raw water.

Valves shall have good quality cast grey iron bodies, high tensile brass spindles, gunmetal nuts, wedge gates with gun-metal faces and seats, bronze gland bushes and bonnets fitted with soft packing glands. Valves greater than 400 mm diameter shall have detachable bolted covers for inspection, cleaning and flushing purposes. Valves shall be provided with renewable seats and it shall be possible to remove the gates without removing the valve body from the pipework.

Valve bodies and other components of plastic or other non-metallic materials shall be compatible with the medium and of robust industrial design.

The gate face rings shall be screwed into the gate or alternatively securely pegged over the full circumference. Unless otherwise detailed on the Contract Drawings, gate valves in chambers, and other similar locations shall be provided with handwheels. Valves which are to be buried in the ground shall be provided with extension spindles, protection tubes, spindle caps, spindle supports and surface boxes.

Valves larger than 400 mm diameter and accessible for maintenance shall be fitted with a studded cast iron cover at the bottom of the valve body for inspection, cleaning and flushing purposes. Valves of 450 mm diameter and above shall be provided with a geared headstock for manual operation. Each valve shall be tested in accordance with the requirements of BS EN 1171 or BS 5163 and BS EN 1074, open-ended in each direction. Where specified Resilient seat type valves shall be provided. The wedge shall have a resilient Nitrile Rubber bonded to the cast iron wedge.

All handwheels shall be arranged to turn in a clockwise direction to close the valve and the direction of rotation for opening and closing shall be indicated on the handwheels.

Unless otherwise stated the handwheels shall be coated with plastic and incorporate facilities for padlocking in either the open or closed position.

All valve bodies shall give the following information:

(i) Manufacturer's name
(ii) Hydraulic test pressure
(iii) Size of valve

(iv) Direction of flow 'Arrow'

Unless otherwise detailed, flanges to the gate valves shall comply with BS EN 1092-2:1997 for 16 bar nominal pressure rating.

3.4.8 Progress Photograph

The Bidder shall provide progress photographs, illustrating each stage of the work being effected and to submit same to the Project Manager for onward transmission to the Operation and Maintenance Department.

3.4.9 Manometers

Manometers shall be male threaded of size 16mm and of glycerine type with the indicator graduated in 'bar' or combination of 'bar' and 'psi' with appropriate intervals and shall be have at least 0 to 20 bars reading unless otherwise specified.

3.4.10 Bolts, Nuts, Washers and Gaskets

All bolts, nuts and washer for flange connection shall be of Grade A-2 stainless steel unless otherwise specified or directed by the Project Manager. Bolts and nuts shall be hexagonal. All bolts and nuts size for connections shall be in accordance with BS EN 1092-1:2018.

The tightening of the bolts shall be carried out in the crisscross sequence and to the torque recommended by the manufacturer. A torque wrench shall always be used and in no case shall excessive tightening be exerted on any nuts or bolts.

The successful bidder shall list all bolts with respect to their grade and diameter which shall be used for the purpose of the work on each valve and fitting and same should be duly checked and endorsed by the Project Manager.

Gaskets shall be made of reinforced type EPDM rubber, in accordance with BS EN681-1 and duly certified as suitable for raw water supply (irrigation water), by one of the International regulations or as recommended by the manufacturer of particular valve and fitting

3.4.11 Steel Pipes and Fittings

Steel pipes and fittings shall be manufactured and generally tested in accordance with AWWA Manual M11 'Steel Pipe – A Guide for Design and Installation'. The physical properties of the pipes shall be as per the requirements of AWWA C200 – "Standard for steel water pipe 6 inches and larger". The methods used for testing the physical properties of the pipes shall be as described in ASTM A370.

(a) Design Criteria

A design stress of 50 percent of the specified minimum yield strength shall be used in determining the minimum wall thicknesses of the pipes. Only steel with a range of tensile stress between 290 N/mm2 and 360 N/mm2 shall be used in the manufacture.

The pipes for the delivery mains shall be manufactured to withstand an internal design pressure of 16 bars.

The manufacturer's calculations of the wall thicknesses of the pipes shall be submitted to the Employer for approval.

(b) Non-Destructive Tests

-Test on Welds

Spiral welds shall be required to be tested by ultrasonic flow detection in accordance with Clause 9.7.4 of API 5L or by Fluoroscopic Inspection in accordance with Clause 9.7.3 of API 5L.

-Hydrostatic Tests

The pipes shall be required to withstand a minimum works hydraulic proof test pressure as specified in Clause 9.4.3 of API 5L to induce a hoop stress of 90% of the minimum yield stress. All test pressures shall be held for a minimum of 10 seconds and test results recorded on a pressure recording chart.

(c) Repair of Defects

The finished pipes shall be free from unacceptable defects. Defects in the parent metal of welded pipes will be considered unacceptable when the depth of the defect is greater than 12.5 percent of the nominal wall thickness. Cracks, sweats and leaks in welds shall not be acceptable. Repair of defects will be permitted, except that the repair of defects in the parent metal will not be permitted if the depth of the defect exceeds one third of the nominal wall thickness of the pipe and if the length of that portion of the defect in which the depth exceeds 12.5 percent is greater than 25 percent of the outside diameter of the pipe. Repairs shall conform to the following requirements.

(i) The defect shall be completely removed and the cavity thoroughly cleaned.
(ii) The repair weld shall be made by automatic welding or manual welding by a welder qualified under Sec. IX, part A, of the ASME Boiler and Pressure Vessel Code, or under AWS B2.1, or under any other code acceptable to the Employer.
(ii) Each length of repaired pipe shall be tested hydrostatically in accordance with section 3.4 of AWWA C200.

(d) Jointing of Pipes

Pipes of diameter 600 mm or higher shall be provided with lap welded slip joints or sleeve couplings. Pipes of diameters lower than 600 mm shall be provided with sleeve couplings. The lap joints may be welded on the outside only with a mastic applied beforehand to the inside contact surfaces. The mastic should withstand the temperature imparted during welding without changes in its properties or elasticity. Sleeve couplings and all pipe joints shall be provided with bonding jumpers and test leads at appropriate intervals to permit the installation of a cathodic protection system. Pipelines with welded joints shall be provided with expansion joints at every 2 km intervals. All bolted and welded joints shall be protected by means of a polyethylene sleeve or bitumastic tape.

(e) Protective Coatings

External protective coating to the pipes and fittings shall be by fusion bonded epoxy to AWWA C213 and shall have a minimum thickness of 350 microns.

The pipes and fittings shall be lined internally either with cement mortar conforming to AWWA C205 and incorporating sulphate resisting Portland cement to BS 4027 or with an approved polyurethane coating. The thickness of the cement mortar lining shall be as specified in AWWA C205 but shall not be less than those given hereunder.

Normal Pipe Diameter (mm)	**Internal Lining Nominal Thickness (mm)**	**Tolerance (mm)**
D ≤ 400	5	-1
400 < D ≤ 600	6	-1.5

Coatings shall be required to be spark tested and checked for thickness.

Steel fittings shall be manufactured to mount on the pipe ends through welding or sleeve couplings. The ends of pipes or fittings to valves shall be finished as flanges to the same pressure rating as the valves.

(f) Field Welding

Joints shall be welded on site using welding methods in accordance with ISO 9956. The competence of the welder should be certified according to ISO 9606. Preparation for the welding and details of the welds shall be in accordance with API 1104 or BS EN 1708 part 1. Each welded joint shall be inspected visually according to EN 970 and subsequently tested ultrasonically according to BS EN

1712 and 1713.

An air test shall be carried out after each joint has been completed in order to localise any defect in any particular joint.

All the steel pipework including adaptor pipe, spacer pipe, riser pipe and among others shall be hot-dipped galvanised for internal and external protection. The galvanisation shall be in accordance with BS 729 or other recognized standards. Steel used for pipework shall be as specified above.

(a) Adaptor pipe

Adaptor pipes shall be galvanised steel pipe as specified. It shall be welded on one side with flange in accordance with BS EN 1092-1:2018, PN 16 provided they are each compatible with the joining control valve and the other end chamfered accordingly. The edge of the spigot end shall be clean, true and square. Adaptor pipe shall be painted externally with bitumen paint prior to installation.

(*b) Spacer pipe*

Spacer pipe shall be double flanged and shall be of galvanised steel pipe as specified. The flange dimensions and drills shall be in accordance with BS EN 1092-1:2018, PN 16. It shall also have provision for fixing a male threaded manometer 16mm. Spacer pipe shall be painted externally with bitumen paint prior to installation.

(c) Riser pipe/By-passed pipes

Riser pipe shall be double flanged and shall be of galvanised steel pipe as specified. The flange dimensions and drills shall be in accordance with BS EN 1092-1:2018, PN 16. Riser pipe shall be painted externally with bitumen paint prior to installation.

3.4.11.1 Jointing of Pipes and Equipment

Unless otherwise specified, all joints used for connecting steel pipeworks shall be flanged. However, flexible or dismantling joints shall be used as alternative, in the assemblies to enable easy dismantling. All flanges shall be to BS EN 1092-1:2018 or other recognized standards. Threaded connections on fittings shall be to BS 21 or ISO 7/1 or other recognized standards.

3.4.11.2 Flanges & Bolting for Pipes, Valves and Fittings

Flanges and bolting for pipes, valves and fittings shall all be to BS EN 1092-1:2018 or alternatively to AFNOR NF E 29-201 or ISO 2084 or to other standard to the approval of the Project Manager, provided that they are each compatible with the other for the purposes of jointing like-sized components and are such that corrosion by galvanic action shall be avoided. The rating and test pressure of the flanges shall not be less than the rating and test pressure of the pipeline specified.

3.4.11.3 Cutting Pipes

All pipes shall be cut with an approved mechanical pipe cutter and in conformity with the pipe manufacturer's recommendations. The edges of the cut shall be clean, true and square. The use of an oxyacetylene flame cutter will not be permitted in any circumstances. The edges of the cut together with those parts of the pipes from which the coating has been removed shall be given two coats of bituminous paint and the internal lining repaired, if damaged, to the approval of the Project Manager. When the cut pipe is to be inserted in a "Tyton" type joint it shall be bevelled for 10mm at 30° to pipe axis to remove sharp or rough edges

3.4.11.4 Proprietary Joints and Couplings

Proprietary joints and couplings shall be assembled in accordance with the manufacturer's instructions. The Contractor shall be responsible for obtaining such copies of the manufacturer's instructions as he requires, at his own expense. The Contractor shall be responsible for obtaining all the necessary special tools, lubricants and appliances necessary for making the joints. Where pipes are laid above ground and jointed with bolted flexible couplings the nuts bolts and gaskets shall be protected against vandalism by sheathing with an approved heat-shrink moulding as manufactured by Raychem of Swindon UK or similar approved.

3.4.11.5 Flanged Joints

Flanged joints shall be made with the gaskets and nuts, washers and bolts provided by the materials supplier. Two washers shall be used per bolt, one under the bolt head and the other under the nut. The tightening of the bolts shall be carried out in the sequence and to the torque recommended by the manufacturer. A torque wrench should always be used and in no case shall excessive tightening be exerted on any nut or bolt.

3.4.11.6 Protection of Joints

All buried flange joints shall be protected externally by painting with an approved bitumen paint and then the joint shall be wrapped using 'Denso' paste, mastic, tape and outerwrap, or similar approved materials all in accordance with the manufacturer's instructions. All flanged adaptors and mechanical couplings shall have a RILSAN nylon coating applied by the manufacturer and no further external protection is required. Where flanged adaptors and couplings have been damaged in shipping, transport, handling or laying such damage shall be made good in accordance with the manufacturer's instructions. The Contractor shall supply all tools and materials necessary for compliance with this clause.

3.4.11.7 Grouting in ironwork and pipes

All brackets, anchor bolts and other ironwork for which holes have been boxed out or left in the concrete of a structure shall be carefully grouted into their correct positions in all particulars. The grouting in shall be carried out with cement and sand grout in such a manner that there shall be no apparent difference in the texture or colour throughout the face or seepage of water either between the iron work and set grout or between the set grout and the surrounding structures. The above instructions shall apply also to the building in of pipes except that the class of concrete used for that part of the structure shall be used in lieu of cement grout

3.4.12 Concrete

3.4.12.1 Code of Practice for Concrete Work

All workmanship, materials, and tests and performance in connection with the concrete work are to be in conformity with the British Standard BS 8110: Part I, 1985 for Design, Materials and Workmanship for "The Structural Use of Concrete" and BS 8007 1987 "Design of Concrete Structures for Retaining Aqueous Liquids".

3.4.12.2 Testing

3.4.12.3 Laboratory Testing

Notwithstanding other tests required under this Specification and stated elsewhere, the following laboratory tests shall be carried out by the Contractor

Description of Test	Method of Test No.
Concrete & Concrete Aggregates	B.S 812 para 11
Aggregate Crushing Value	B.S 812 para 31
Flakiness	B.S 812 para 15
Testing of Sand	B.S 882
Sampling Fresh Concrete	B.S 1881
Slump Test of Concrete	B.S 1881
Concrete Cubes	B.S 1881

3.4.12.4 Testing by Project Manager and access to staff of OMD

The Project Manager and his staff shall at all times have free and unfettered access to the Contractor's laboratory in order to watch and supervise all tests. Engineer, DIOO and IOOs shall have free access to site of work during implementation of the contract.

3.4.12.5 Grading of Aggregates

Grading aggregates at each stockpile extraction point shall be determined at least once daily. The Contractor shall allow in his rates for the cost of testing of materials and workmanship described above.

3.4.12.6 Concrete Mixes

Concrete mixes shall be "designed mixes" in accordance with the requirements of BS 5328 having the characteristics specified in Table 6.2 of this Specification. Concrete for water retaining or water excluding structure shall comply with the requirements of BS 8007.

3.4.12.7 Workability

The workability of the fresh concrete should be such that the concrete is suitable for the conditions of handling and placing so that after compaction it surrounds all reinforcement, tendons and ducts and completely fills the formwork.

Workability should be assessed by means of the slump test, compacting factor test or VB consistometer test as appropriate.

3.4.12.8 Requirements for Designed Mixes

3.4.12.9 Target mean strength

The concrete mix should be designed to have at least the required minimum cement content and to have a mean strength greater than the required characteristic strength by at least the current margin. The current margin for each particular type of concrete mix should be determined; it may be taken as having the smaller of the values given by (1) or (2).

1) 1.64 times the standard deviation of cube tests on at least 100 separate batches of concrete of nominally similar proportions of similar materials and produced over a period not exceeding 12 months by the same plant under similar supervision, but not less than 1/6 of the characteristic strength for concrete of Grade 10 or 15, or 3.75 N/mm2 for concrete Grade 20 or above.
2) 1.64 times the standard deviation of cube tests on at least 40 separate batches of concrete of nominally similar proportions of similar materials and produced over a period exceeding 5 days but not exceeding 6 months by the same plant under similar supervision but not less than 1/3 of the characteristic strength for concrete of Grade 10 or 15, or 7.5 N/mm2 for concrete Grade 20 or above.

If there is insufficient data to satisfy (1) or (2) above, the margin for the initial mixdesign should be taken as two-thirds of the characteristic strength for concrete of Grade 10 or 15, or 15 N/mm2 for concrete of Grade 20 or above. This margin should be used as the current margin only until sufficient data are available to satisfy (1) or (2) above.

3.4.12.10 Evidence of suitability of proposed mix proportions

Evidence should be submitted to the Engineer for each grade of concrete showing that at the intended workability, the proposed mix proportions and manufacturing method will produce concrete of the required quality. If adequate data for 'target mean strength' is not available, trial mixes should be prepared. The following information should be provided before any designed mix is supplied. Subsequently the Contractor should declare any change in sources of materials and any change in cement content which results in a difference greater than 20kg/m3 from the cement content last declared.

1) Nature and source of each material.
2) Either
    a) appropriate existing data as evidence of satisfactory previous performance for target mean strength, and current margin and if required workability and water/cement ratio, or
    b) full details of tests on trial mixes.
    c) for ordinary structural concrete a statement that for initial production the appropriate mix proportions given in the Table 6.2 will be used.
3) Proposed quantities of each ingredient per cubic metre of full compacted concrete.

3.4.12.11 Trial Mixes

At least six weeks before commencing the placing of any concrete in the Works, trial mixes shall be prepared for each class of concrete to be used on the Works.

Three separate batches of concrete should be made using materials likely to be typical of the proposed supply and under full scale production conditions. Sampling and testing should be in accordance with BS 1881.

The workability of each of the trial batches should be determined and three cubes made from each batch for test at 28 days. A further three cubes made from each batch for test at an earlier age if required. The trial mix proportions should be approved if the average strength of the nine cubes tested at 28 days exceeds the specified characteristic strength by the current margin minus 3.5 N/mm2 or if nine tests at an earlier age indicate that it is unlikely to be exceeded by this amount.

To demonstrate that the maximum free water/cement ratio is not exceeded, two batches of concrete shall be made in a laboratory with cement and surface dry aggregate known from past records of the suppliers of the material to be typical.

3.4.12.12 Additional Trial Mixes

During production the Engineer may require trial mixes to be made before a substantial change is made in the materials or in the proportions of the materials to be used.

3.4.12.13 Concrete Additives

The Contractor shall provide all details of concrete additives including plasticisers for incorporation into the concrete mixes. The use of "PENETRON" or similar approved waterproofing concrete additives shall be incorporated into the mix design for manhole construction in high watertable areas along the trunk sewer.

3.4.12.14 Production of Concrete

The Engineer shall be afforded all reasonable opportunity and facility to inspect the materials and the manufacture of concrete and to take any samples or to make any tests.

The quantity of cement, the quantity of fine aggregate and the quantities of the various sizes of coarse aggregate shall be measured by weight.

A separate weighing device shall be provided for weighing the cement. Alternatively, the cement may be measured by using a whole number of bags in each batch.

The amount of water shall be measured, by volume or by weight. Any solid admixtures to be added shall be measured by weight but liquid or paste admixtures may be measured by volume or weight.

The batch weights of aggregate shall be adjusted to allow for a moisture content typical of the aggregates being used.

The accuracy of the measuring equipment shall be within ±3% of the quantity of cement, water or total aggregates being measured and within ±5% of the quantity of any admixture being used. All measuring equipment shall be maintained in a clean, serviceable condition.

The mixer should comply with the requirements of BS 1305 or BS 4251 where applicable. The mixing time shall be not less than that used by the manufacturer in assessing the mixer performance.

The water content of each batch of concrete shall be adjusted so as to produce a concrete of the workability required by the trial mixes.

Mixers shall be completely emptied before receiving the materials for the succeeding batch and shall be kept clean and shall be washed out after stopping work for more than 30 minutes and at the end of each shift. On commencing work with a clean mixer, the first batch shall contain only one half of the normal quantity of coarse aggregate for the batch so as to compensate for the fine material and cement which is left adhering to the drum. This batch shall also be mixed for at least one minute longer than the normal time.

The Contractor shall provide standard test weights at least equivalent to the maximum working load used on the most heavily loaded scale and other auxiliary equipment required for checking the satisfactory operation of each scale or other measuring device. Tests shall be made by the Contractor at intervals to be determined by the Engineer but not less than weekly and shall be carried out in his presence and to his approval.
The Contractor shall furnish the Engineer with copies of the complete results of all check tests and shall make such adjustments, repairs or replacements as the Engineer may consider necessary to ensure satisfactory performance before mixing recommences.
Neither volume batching of materials nor hand mixing of concrete shall be allowed. They may, however, be permitted at the Engineer's discretion, at isolated points where the total volume of concrete is small. Hand mixing of concrete shall be done on a clean close boarded platform. The material shall be turned over no less than three times dry, water shall then be sprayed on through a rose and the materials turned over in a wet condition and worked together until a mixture of uniform consistency is obtained.

For hand mixing concrete the specified quantities of cement shall be increased by 10 per cent and not more than one half of one cubic metre shall be mixed at one time. Any concrete mixed by hand will be paid for at the appropriate rates for the class of concrete inserted in the Bill of Quantities and no claim will be considered in respect of any extra cost of hand mixing by reason of the additional cement or otherwise.
Where volume batching has been approved, gauging of materials shall be done by means of properly designed rectangular gauging boxes with smooth clean edges on top. The boxes shall be properly filled and struck off level by means of a straight edge.
During windy weather, sufficient precautions shall be taken to prevent cement from being blown away during the process of apportioning and mixing in both machine and hand mixed concrete. Precautions shall also be taken to protect the cement and concrete during wet weather.
The Contractor shall be required to submit to the Engineer, a daily return of the number of packets of cement and the quantities of fine and coarse aggregate used, the grade of concrete poured and the location thereof, for each concreting operation, in order that a check may be kept on the ingredients used per cubic metre of each grade of finished concrete.

3.4.12.15 Consistency

The consistency of all concrete shall be determined by means of the slump test in accordance with British Standard Specification B.S 1881 "Methods of Testing Concrete". The Contractor shall provide the necessary number of slump cones and rods as required by the Engineer. The slump cones shall be designed to lift off in a truly vertical plane, this being controlled by guides set on a steel base, the guides being also used to determine the exact amount of slump.

Slump tests shall be made at frequent intervals when concreting is in progress and as ordered by the Engineer. The first consistency tests shall be made immediately concreting is commenced on any section. For the purposes of any test two slump tests shall be taken at a time and the average adopted.

The slump required shall be determined by the Engineer and shall be varied to suit the purpose for which the concrete is required. All concrete shall be mechanically vibrated after deposition within the shuttering. No concrete shall be used with a slump exceeding 100mm without the approval of the Engineer.

The cost of providing slump apparatus and labour and materials required for taking slump tests shall be included in the rates for concrete in the Bill of Quantities.

3.4.12.16 Control of Strength of Designed Mixes

3.4.12.17 Adjustment to Mix Proportions

During production adjustments of mix proportions may be made in order to minimize the variability of strength and to approach more closely the target mean strength, but the specified limits of minimum cement content and maximum water/cement ratio shall be maintained. Changes in cement content shall not be made without the written approval of the Engineer. Adjustments to mix proportions shall not be taken to imply any change to the current margin.

3.4.12.18 Change of Current Margin

A change in the current margin used for judging compliance with the specified characteristic strength becomes appropriate when the results of a sufficiently large number of tests show that the previously established margin is significantly too large or too small, recalculation of the margin should be carried out in accordance with sub-clause 4.5.1 but, although a recalculated margin is almost certain to differ numerically from the previous value, the adoption of the recalculated value will not be authorised if the two values differ by

more than 18% when based on tests on 40 separate batches;

or more than 11% when based on tests on 140 separate batches;

or more than 5% when based on tests on 500 separate batches.

On the adoption of a recalculated margin it becomes the current margin for the judgement of compliance with the specified characteristic strength of concrete produced subsequently to the change.

3.4.12.19 Compliance with Specified Requirements

Provided that the Engineer is satisfied that the materials used are in accordance with the Specification and that correct methods of manufacture and practices of handling raw material and manufactured concrete have been used, the compliance of a designed mix for ordinary structural concrete will be judged by the strength of the hardened concrete in comparison with the specified characteristic strength together with the cement content, in comparison with the specified minimum cement content.

All sampling and testing of constituent materials shall be carried out in accordance with the provisions of the appropriate British Standard and all sampling and testing of fresh and of hardened concrete shall be carried out in accordance with the provisions of B.S 1881.

The characteristic strength of concrete is that 28 days cube strength below which no more than 5% of the test results fail.

Compliance with the specified characteristic strength will be judged by tests made on cubes at an age of 28 days.

Each cube shall be made from a single sample taken from a randomly selected batch of concrete. The rate of sampling shall be one sample per 10 concrete batches or $10m^3$ whichever is the lesser volume with a minimum of 4 samples (i.e. 4 cubes) from each major concrete pour or important section of concrete. These cubes shall be crushed at 28 days. Additional cubes shall be made and tested at 7 days or earlier as directed by the Engineer. These cubes shall not be used in the statistical analysis for control of concrete.

The samples should normally be taken at the point of discharge from the mixer, or, in the case of ready-mixed concrete, at the point of discharge from the delivery vehicle. If concrete is pumped or transported for more than 500m sampling should be taken at the point of deposition into the formwork.

The Contractor shall supply to the Engineer within 3 days of manufacture of test cubes, copies of certificate showing reference numbers of the cubes, classes of concrete, types of cement used, the date of manufacture and the locations in the Works in which the relevant concrete was placed.

Compliance with the specified characteristic strength may be assumed if

1) the average strength determined from any group of four consecutive test cubes exceeds the specified characteristic strength by not less than 0.5 times the current margin, and
2) each individual test result is greater than 85% of the specified characteristic strength.

The current margin should be taken to be two-thirds of the specified characteristic strength for concrete of grade 10 or 15, or 15 N/mm2 for concrete of grade 20 or above, unless a smaller margin has been established to the satisfaction of the Engineer.

If only one cube result fails to meet the second requirement then that result may be considered to represent only the particular batch of concrete from which that cube was taken provided the average strength of the group satisfies the first requirement.

If more than one cube in a group fails to meet the second requirement or if the average strength of any group of four consecutive test cubes fails to meet the first requirement then all the concrete in all the batches represented by all such cubes shall be deemed not to comply with the strength requirements.

For the purposes of this sub-clause the batches of concrete represented by a group of four consecutive 28 days test cubes shall include the batches from which samples were taken to make the first and the last cubes in the group of four, together with all the intervening batches.

3.4.12.20 Cement Content

The cement content of any batch of concrete shall be not less than the specified minimum value minus 5% of that value, nor more than the specified maximum value plus 5% of that value.

3.4.12.21 Workability Limits

The workability of concrete shall be within the following limits:

Slump	±25mm or ± one third of the required value, whichever is the greater.
Compacting Factor	±0.03 where the required value is 0.90 or more; ±0.04 where the required value is less than 0.90 but more than 0.80; ±0.05 where the required value is 0.80 or less.
VB	±3 seconds or ±one fifth of the required value, whichever is the greater

The water/cement ratio of a batch of concrete should not exceed the specified maximum value by more than 5% of that value. If a maximum water/cement ratio has been specified the ability to comply with that requirement, at a suitable level of workability, will have been determined by means of trial mixes. Provided that the constituent materials and mix proportions are not substantially different from those used in the trial mixes, a maximum water/cement ratio will be judged from workability tests.

3.4.12.22 Non-Compliance with Specified Requirements

If the specified requirements for concrete have not been fulfilled, the Contractor shall take such remedial action as the Engineer may order and the Contractor shall before proceeding with the placement of further concrete submit in good time to the Engineer his proposals to ensure that the new concrete will comply with the specified requirements.

Where in the opinion of the Engineer the remedial action is unacceptable, the batches of concrete represented by the tests shall be classified as defective work and removed forthwith from the Works and replaced as directed by the Engineer, all at the Contractor's expense.

3.4.12.23 Records

Records in a form approved by the Engineer shall be kept by the Contractor of the details of every pour of concrete placed in the Works. These records shall include class of concrete, location of pour, date of pour, temperature, slump, moisture content of aggregates, weights of aggregates, number of batches,

tests undertaken and cement parcel number. The Contractor shall supply to the Engineer four copies of these records each week covering the concrete work carried out in the preceding week.

3.4.12.24 Preparation of Rock Surfaces to Receive Concrete

Immediately before concrete is placed on or against a rock surface, the rock shall be given a final cleaning with the aid of high-pressure air. The foundation shall be properly drained and dewatered so that no water runs over or stands on a surface on which concrete is being placed. If required by the Engineer, drains provided through or beneath concrete for the temporary conveyance of water shall afterwards be completed sealed to the Engineer's approval.

3.4.12.25 Authority to Commence Placing of Concrete

The Contractor shall give the Engineer at least 24 hours' notice of his intention to place concrete in a particular section of the Works. Before concrete is placed, the Contractor shall apply to the Engineer for approval of the cleaning of rock and/or the fixing of shuttering, reinforcement, embedded parts and the like, and he shall obtain written permission from the Engineer to proceed with concreting.

3.4.12.26 Deposition of Concrete

All concrete work shall as far as practicable be carried out continuously. The concrete immediately after being mixed and before the initial set has taken place shall be carefully deposited within the formwork so as not to displace the formwork or reinforcement. It shall be carefully transported in watertight containers and deposited into position in regular layers approved by the Engineer, and compacted into place within the formwork and around the reinforcement by means of pokers and other mechanical vibrators.

Every care must be taken to prevent the separation of the coarse material from the finer materials in the concrete, during transit to place of deposit and if, in the opinion of the Engineer, any segregation of materials has taken place, the concrete shall be again turned over and mixed before it is deposited in position. The concrete shall be a plastic mixture capable of being solidly filled within the formwork and between and around the reinforcement, consolidated, thoroughly worked around embedded fixtures and into the corners of the formwork and compacted until it assumes a jelly-like consistency with water just appearing on the surface. Excess of mixing water shall be avoided. The receptacles or chutes used for transport shall be kept clean and washed out after each operation.

The operation of depositing concrete is to be continuous in so far as is practicable until the section authorised by the Engineer is completed to the height shown or required. Where this is impracticable, the required height shall be obtained by depositing concrete in regular layers of an approved thickness well compacted as specified above.

All work shall be completed on the concrete before the initial set commences and care shall be taken not to disturb the concrete before it has set hard. No concrete that has partially hardened or that has been mixed for more than twenty minutes shall be used in the work.

When the deposition of concrete requires to be interrupted, suitable precautions shall be taken to ensure satisfactory joints with concrete deposited earlier. Where delays of longer than one hour occur during concreting operations, work shall be suspended until, in the opinion of the Engineer, the concrete has had sufficient time to harden before fresh concrete is deposited thereon.

Concrete generally shall not be deposited from a greater height than 1 metre. Should certain sections of the work require the concrete to be deposited from a greater height, it shall be deposited in such a way to avoid segregation of the materials and ensure an unbroken stream of concrete, all to the approval of the Engineer.

3.4.12.27 Consolidation of Concrete

The Contractor shall use mechanical vibration for consolidating all concrete.

The number and type of vibrators to be used shall be to the approval of the Engineer. In the case of thin vertical faces, vibrators fastened to the formwork may be required on both faces so as to cover the lift of concrete being deposited. Apart from this immersion vibrators of approved design to cover each 1.5 metre length of concrete shall be available so as to enable the whole layer to be vibrated.

Before vibrating is commenced the concrete of an approved thickness of layer shall be spread to an approximate level surface.

Special care must be taken to ensure that all formwork is sufficiently substantial to permit this extent of vibrating equipment to be in operation without disturbing the formwork and cause it to bulge or move out of alignment. Special care shall also be taken to prevent leakage of mortar through joints in the forms during vibration.

Generally, the vibration of the concrete shall be continued until the period when the appearance of air bubbles on the surface of the lift of concrete ceases. Care shall be taken not to continue vibration to a point where segregation of the materials may commence and the whole of the operation shall be subject to the approval of the Engineer. Means for the rapid switching off of each or all vibrators shall be provided to prevent an undue amount of vibration.

No vibrators shall be fastened to the reinforcement and care shall be taken that no tubes attached to the immersion vibrators are allowed to come into contact with the reinforcing rods or the internal surface of the shuttering.

The particular purpose of the vibration of concrete is to ensure a densely compacted mass.

All concrete must be worked up against existing faces of concrete as well as against the faces and into the corners of formwork so as to produce a thoroughly consolidated mass by spading and ramming and internal and external vibrating so as to ensure its complete contact and incorporation into the adjacent concrete.

Generally, the method of obtaining the most efficient results for the placing, compacting and vibrating of all concrete as well as the number of and disposal of rammers, shovellers and vibrating equipment to be carried out on any particular section of the work and the slump value and water/cement ratio shall be subject to the approval of the Engineer.

After final compacting of any section up to the authorised vertical or horizontal construction joint, care shall be taken that no disturbance to the concrete is caused until the section is completely set.

Any charges which the Contractor considers necessary to cover the cost of mechanically vibrating the concrete shall be included in the rate for the respective items in the Bill of Quantities.

3.4.12.28 Construction Joints

Whenever concrete is to be bonded to other concrete which has hardened, the surface of contact between the sections shall be deemed a construction joint.

Where construction joints are shown on the Drawings, the Contractor shall form such joints in those positions. The location of joints which the Contractor requires to make for the purpose of construction shall be subject to the agreement of the Engineer and details shall be submitted with the Programme of Works required by the Conditions of Contract. Construction joints shall be in vertical or horizontal planes except in sloping slabs where they shall be normal to the exposed surfaces or elsewhere where the Drawings require a different arrangement.

Construction joints shall be so arranged as to reduce to a minimum the effects of shrinkage in the concrete after placing, and shall be placed in the most advantageous positions with regard to stresses in the structures and the desirability of staggering joints.

Feather edges of concrete at joints shall be avoided and any feather edges which may have formed where reinforcing bars project through a joint shall be cut back until sound concrete has been reached.

The intersections of horizontal or near horizontal joints and exposed faces of concrete shall appear as straight lines produced by use of a guide strip fixed to the formwork at the top of the concrete lift, or by other means acceptable to the Engineer.

Construction joints formed as free surfaces shall not exceed a slope of 20 per cent from the horizontal.

The surface of the fresh concrete in horizontal or near horizontal joints shall be thoroughly cleaned and roughened by means of high-pressure water and air jets when the concrete is hard enough to withstand the treatment without the leaching of cement. The surface of vertical or near vertical joints shall be similarly treated if circumstances permit the removal of formwork at a suitable time.

Where concrete has become too hard for the above treatment to be successful, the surface whether formed or free is to be thoroughly scabbled by mechanical means or wet sand blasted and then washed with clean water. The indentations produced by scabbling shall be not less than 10mm deep and shall not extend closer than 40mm to a finished face.

If instructed by the Engineer the surface of the concrete shall be thoroughly brushed with a thin layer of mortar composed of 1 part of cement to 2 parts of sand by weight immediately prior to the deposition of fresh concrete. The mortar shall be kept just ahead of the fresh concrete being placed and the fresh layer of concrete shall be thoroughly and systematically vibrated to full depth to ensure complete bond with the adjacent layer.

No mortar or concrete may be placed in position on or against a construction joint until the joint has been inspected and passed by the Engineer.

Constructions joints in water-retaining structures shall be made as shown on the Drawings and shall be sealed on the water face with an approved sealant. All costs involved in complying with this Clause shall be deemed to be included in the concrete rates for joints not expressly required by the Engineer.

Kickers shall be formed at the junctions of walls and slabs and shall be not less than 150 mm upstand, cast monolithically with the slab.

3.4.12.29 Expansion and Contraction Joints

Expansion and contraction joints are discontinuities in concrete designed to allow for thermal or other movements in the concrete.

Expansion joints are formed with a gap between the concrete faces to permit subsequent expansion of the concrete. Contraction joints are formed to permit initial contraction of the concrete and may include provision for subsequent filling.

Expansion and contraction joints shall be formed in the position and in accordance with the details shown on the Drawings or elsewhere in the Specification.

3.4.12.30 Waterstops

All references to waterstops include groutstops.

Waterstops shall be of the material and form shown on the Drawings. No waterstops or alternative materials shall be brought onto site until the Contractor has submitted full details of the materials he proposes to use, including samples, and these have been approved by the Engineer. All samples shall be of adequate length for testing.

Waterstops or alternatives proposed by the Contractor shall be supplied in lengths as long as possible consistent with ease of handling and construction requirements.

In rubber or plastic materials joints other than butt joints shall be supplied ready-made by the manufacturer. Butt joints shall be made on site in accordance with the manufacturer's instructions and with equipment supplied for the purpose by the manufacturer.

Waterstop materials shall be stored carefully on site to avoid damage and contamination with oil, grease, or other pollutants. Rubber and plastic waterstops shall be stored in cool well-ventilated places away from direct sunlight.

Rubber and plastic waterstops which are embedded in one side of a joint more than one month before the scheduled date of placing concrete on the other side, shall be protected from the sun.

Waterstops shall be firmly fixed in the formwork so that they cannot be displaced during concrete placing and shall be completely free of all dirt, grease, oil, etc., before placing concrete.

Concrete shall be placed carefully round waterstops so as to avoid distortion or displacement and shall be fully compacted. Where waterstops lie in a horizontal or nearly horizontal plane the Contractor shall ensure that no voids are left on the underside of the waterstop.

Formwork round waterstops shall be carefully removed to avoid damage. If waterstops suffer any damage which cannot be properly repaired insitu the Engineer may require a section of concrete to be removed and the waterstop replaced.

3.4.12.31 Curing of Concrete Work

Concrete shall be protected during the first stage of hardening from the harmful effects of sunshine, drying winds, rain and running water. The protection shall be applied as soon as practicable after completion of placing by one or more of the following methods:-

a) Concrete with the exception of concrete in walls of water-retaining or water-excluding structures shall be covered with a layer of sacking, canvas, hessian, straw mats or similar absorbent material which shall be securely fixed so as to avoid exposure of the concrete surface. This layer shall be kept constantly wet for 7 days.

b) Concrete shall be covered immediately on removal of shutters with a layer of approved waterproof paper or plastic membrane kept in contact with the concrete for 7 days.

c) Except in the case of surfaces to which concrete has subsequently to be bonded, the Engineer may approve curing by application of an approved liquid curing membrane suitable for use in tropical climates.

   Application shall be made by low pressure spray at a rate of not less than 0.33 litres/m2 or according to the manufacturer's instructions. On horizontal surfaces, the curing membrane shall be applied immediately after placing the concrete and on vertical surfaces, immediately after removing the formwork.

d) Formed surfaces may be cured by retaining the formwork in place for the required curing period.

   On no account shall concrete in water-retaining or water-excluding structures be sprayed with cold water on removal of shuttering, as steep temperature gradients may be set up in the concrete leading to a tendency to crack.

3.4.12.32 Weather Conditions

Any concrete produced and/or placed during adverse weather conditions shall be at the Contractor's own risk. The Engineer shall have the power to order the suspension of concrete production and/or placing whenever he considers such conditions prevail. The Contractor shall be deemed to have allowed in his rates in the Bill of Quantities for any delays that may occur due to adverse weather conditions. Any wasted or damaged concrete resulting from the continuation of work in adverse weather conditions shall be classified as defective work.

In hot weather suitable means shall be provided to ensure that the temperature of the concrete when deposited shall not exceed 32°C. No concreting shall be allowed when the shade temperature exceeds 38°C.

In hot dry weather, suitable means shall be provided to avoid premature stiffening of concrete placed in contact with hot dry surfaces. Where necessary, the surfaces including reinforcement against which

concrete is to be placed shall be shielded from the direct rays of the sun and shall be sprayed with water to prevent excessive absorption by the surfaces of water from the fresh concrete.

3.4.12.33 Treatment and Protection of Cast Concrete

No treatment or making good, other than that required for curing shall be applied to the concrete faces until they have been inspected by the Engineer. The Contractor shall submit to the Engineer his method of making good any defects and shall only proceed if the Engineer's approval is received.

The Contractor shall ensure that the completed concrete work is adequately protected from damage and discoloration at all times during construction.

As soon as concrete has set sufficiently to prevent surface damage and before it is dry, the top surface of the concrete shall be covered with PVC sheeting on which is placed a 75mm layer of dry sand. This protective layer will prevent loss of heat and moisture and shall be maintained for ten days.

3.4.12.34 Formwork for Concrete

All formwork with supporting falsework, struts and staging, etc. shall be of suitable quality, and of substantial strength with ample scantlings as will ensure that the formwork remains rigid without any springing or distortion throughout the placing, ramming, compacting and setting of the concrete, and the design of the formwork shall be such as will permit its being struck and removed for re-use without injury to the concrete, all to the Engineer's approval. No formwork fixings or supports, etc. will be allowed to be incorporated in the finished concrete without the approval of the Engineer.

Form clamps, tie bolts and anchors shall be used to fasten forms. The use of wire ties to hold forms in position during placing of concrete will not be permitted. Tie bolts and clamps shall be positive in action and of sufficient strength and number to prevent spreading or springing of the forms. They shall be of such a type that no metal part shall be left within the specified concrete cover. For water retaining sections, methods of fixing the forms which result in holes through the concrete section when the formwork is removed shall not be used and wall ties shall be fitted with water baffles.

The cavities shall be filled with grout or mortar and the surface left sound, smooth, even and uniform in colour. All forms for outside surfaces shall be constructed with stiff wales at right angles to the studs and all form clamps shall extend through and fasten such wales.

All joints in formwork shall be of such a design as to ensure there is no loss of fine materials or cement during the placing or consolidation of the concrete.

Where reinforcement passes through the end frames of formwork, care shall be taken to ensure close fitting joints against the steel rods so as to avoid loss of cement during consolidation of the concrete.

All formwork shall unless otherwise shown on the Drawings be provided with 25 x 25 mm angle fillets so as to form splays on external angles.

The formwork shall be cleaned out prior to concreting and the bottoms thoroughly freed from sawdust, shavings, rust, dirt, mud or other debris, all to the Engineer's approval.

After concreting the exposed surfaces of the formwork shall be cleaned of all adhering concrete before depositing fresh concrete.

To prevent concrete adhering to the formwork the surface against which the concrete is to be deposited shall receive a thin coat of an approved formwork oil. Care shall be taken to keep the steel reinforcement free from any such coating material. The prices for formwork shall include for this coating.

Formwork must be used for all slopes exceeding 15° to the horizontal, to enable the concrete to be properly rammed.

3.4.12.35 Blinding for Foundations

Blinding concrete Grade C15/20/C, 75mm thick shall be laid on all excavated surfaces prior to the placing of any structural concrete. Prior to blinding, these surfaces shall be compacted in accordance with Specification Clause 3.4 and no blinding shall be placed before the ground has been approved by the Project Manager. Vertical surfaces of foundations, etc., shall be formed with formwork.

3.4.12.36 Finishes on Free Surfaces

Horizontal or nearly horizontal surfaces which are not cast against formwork shall be finished to the class shown on the Drawings and defined hereunder.

U1 Finish

All surfaces on which no higher class of finish is called for on the Drawings or instructed by the Project Manager shall be given a U1 finish.

The concrete shall be levelled and screeded to produce a uniform plain or ridged surface, surplus concrete being struck off by a straight edge immediately after compaction.

U2 Finish

This is a floated finish for roof or floor slabs and other surfaces where a hard trowelled surface is not required.

The surface shall first be treated as a Class U1 finish and after the concrete has hardened sufficiently, it shall be floated by hand or machine sufficient only to produce a uniform surface free from screed marks.

U3 Finish

This is a hard trowelled surface for use where weather resistance or appearance is important, or which is subject to high velocity water flow.

The surface shall be floated as for a U2 finish but to the tolerance stated below. When the moisture film has disappeared and the concrete has hardened sufficiently to prevent laitance from being worked to the surface, it shall be steel-trowelled under firm pressure to produce a dense, smooth uniform surface free from trowel marks.

Table 1 Surface tolerances

Class of Finish	Tolerance in mm (see notes)		
	A	B	C
U1	Not applicable	10	+20 or -10
U2	Nil	10	+20 or -10
U3	Nil	5	+12.5 or -7.5

Notes:

1) Col. A is the maximum allowable value of any sudden change of level in the surface.
2) Col. B is the maximum allowable value of any gradual irregularity of the surface, as indicated by the gap between the surface and a 3m long straight edge or correctly shaped template placed on the surface.
3) Col. C is the maximum allowable value of the difference in level or position between a straight edge or correctly shaped template placed on the surface and the specified level or position of that surface

3.4.12.37

3.4.12.38 Surface Finishes

3.4.12.39 Classes of Finish

The surface finish to be achieved on formed concrete surfaces shall be as shown on the Drawings and defined hereunder.

Class F1 Finish

This finish is for surfaces against which backfill or further concrete will be placed. Formwork may be sawn boards, sheet metal or any other suitable material which will prevent the loss of the material from the concrete being placed.

Class F2 Finish

This finish is for surfaces which are permanently exposed to view but where the highest standard of finish is not required. Forms to provide a Class F2 finish shall be faced with a minimum 20mm thick marine ply or steel.

Joints between boards or panels shall be horizontal and vertical unless otherwise directed. This finish shall be smooth and such that no general filling or surface pitting is evident, but fins, surface discoloration and other minor defects shall be remedied by methods agreed by the Engineer.

3.4.12.40 Curved Surfaces

For curved surfaces where a F2 finish is called for, the formwork face shall be built up of splines cut to make a tight surface which shall then be dressed to produce the required finish.

Alternatively, single curvature surfaces may be faced with plastic or plywood linings attached to the backing with adhesive or with escutcheon pins driven flush. Linings shall not bulge, wrinkle or otherwise deform when subjected to temperature and moisture changes.

3.4.12.41 Tolerances

All parts of formed concrete surfaces shall be in the position shown on the Drawings within the tolerances set out in Table 1.

In cases where the Drawings call for tolerances other than those given in Table 1 the Drawings shall rule.

Where precast units have been set to a specified tolerance, further adjustments shall be made as necessary to produce a satisfactory straight or curved line. When the Engineer has approved the alignment, the Contractor shall fix the units so that there is no possibility of further movement.

Table 2: Tolerances

Class of Finish	Tolerance in mm (see notes)		
	A	B	C
F1	10	10	+25 or -10
F2	5	10	+ or -15

Notes: The tolerances A, B and C given in the table are defined as follows: -

A is an abrupt irregularity in the surface due to misaligned formwork or defects in the face of the formwork.

B is a gradual deviation from a plane surface as indicated by a straightedge 3m long. In the case of curved surfaces, the straightedge shall be replaced by a correctly shaped template.

C is the amount by which the whole or part of a concrete face is displaced from the correct position shown on the Drawings.

3.4.12.42 Remedial Work to Defective Surfaces

If on stripping any formwork the concrete surface is found to be defective in any way, the Contractor shall make no attempt to remedy such defects prior to the Engineer's inspection and the receipt of any instructions which the Engineer may give.
Defective surface shall not be made good by plastering.
Areas of honeycombing which the Engineer agrees may be repaired shall be cut back to sound concrete or to 75mm whichever is the greater distance. The cavity shall have sides at right angles to the face of the concrete. After cleaning out with water and compressed air, a thin layer of cement grout shall be brushed

onto the concrete surfaces in the cavity and it shall then be filled immediately with concrete of the same class as the main body but with aggregate larger than 20mm nominal size removed. A form shall be used against the cavity, provided with a lip to enable concrete to be placed. The form shall be filled to a point above the top edge of the cavity.
After seven days the lip of concrete shall be broken off and the surface ground smooth.
Surface irregularities which are outside the limits of tolerances shall be ground down in the manner and to the extent instructed by the Engineer. Defects other than those mentioned above shall be dealt with as instructed by the Engineer.

3.4.12.43 Removal of Formwork

The removal of formwork after the concrete has set shall be carefully effected without shock or disturbance and in such a manner as will not injure the concrete. No formwork shall be removed before the concrete has set sufficiently to withstand safely any stresses to which the structure may then be subject.
The minimum periods which shall elapse unless otherwise approved by the Engineer between the completion of the concreting operations and the striking of the formwork for various parts of the structures are given in the following list based on normal cement, but this shall not relieve the Contractor from his obligation to delay removal of the formwork until the concrete has set sufficiently hard and the Contractor shall be held responsible for and make good at his own cost all injury and damage arising from premature striking of the formwork. A small portion of the formwork shall be removed to ensure that the concrete has set sufficiently hard before the whole area of the formwork is removed.

Type of Formwork	**Minimum Period before Striking** (assuming min. surface temperature of concrete 16°C)
Vertical formwork to columns, walls and large beams	3 days
Soffit formwork to slabs	4 days
Props to slabs	11 days
Soffit to formwork to beams	8 days
Props to beams	15 days

3.4.12.44 Special Methods of Working

Should the Contractor propose to use special methods of working not included in this Specification, such as pumping concrete or using vacuum moulds, he shall obtain the Engineer's approval before commencing work and comply with any subsequent specification made by the Engineer for this special method of working.

3.4.12.45 Loading Concrete Structures

No concrete structure shall be loaded until the concrete is at least 21 days old, and only then with the approval of the Engineer, and subject to such conditions as he may lay down.

3.4.12.46 Measurement of Formwork and Concrete

Formwork, where measured separately from the concrete items, will only be measured when it is used and the Engineer considers it necessary to use it and the measurement will be strictly limited to the superficial area of formwork actually in contact with the finished faces of concrete. No measurement will be allowed for formwork to construction joints, either vertical or horizontal, or to such other temporary joints as may be necessary.

The Contractor shall include in the rates for formwork, the cost of all timber, steel plates and sections, bolts, nails, straps, clamps and all other fixings, all cutting and waste and the cost of all labour and materials in making, erecting and removing the formwork and for all preliminary and other work required to construct the concrete to the forms and dimensions shown on the Drawings or as directed by the Engineer. In the case of precast work where the items for concrete include cost of formwork then the rates for such items shall include all the above costs.

In the case of formwork for suspended beams, and slabs, etc., the price to be entered by the Contractor in the Bill of Quantities shall include the cost of any special steel or timber centering that may be necessary to support the load of "green" concrete across the full span.

The measurement for all concrete shall, unless otherwise specified, be taken as the net cubical contents of the concrete actually used in the work completed in accordance with the Contract. No deduction shall be taken for the concrete displaced by steel reinforcing rods.

The rates for concrete shall include for forming perfect facework of whatever shape or size and for construction of all temporary joints and preparation of temporarily exposed faces, as well as for provision and consolidation of the concrete, building in of all objects and every other expense or labour that may be specified or be necessary to complete the work in accordance with the Contract.

3.4.12.47 Steel Reinforcement

Steel reinforcement for concrete shall consist of high yield deformed bars complying with the requirements of the British Standard BS 4449 for "Hot rolled Steel Bars for the Reinforcement of Concrete" or BS 4461 for "Cold Worked Steel Bars for the Reinforcement of Concrete".

All reinforcement shall be cut to exact lengths and made truly straight or bent to the exact shape indicated on the Drawings and bar bending schedules before it is fixed in the work. Bar bending shall be done by the application of a slow steady pressure using appropriate bending equipment.

The Contractor shall prepare and submit in duplicate to the Engineer, bar bending schedules showing cutting and bending details of the reinforcement shown on the drawings. Schedules shall be prepared in

accordance with BS8666:2000 – Specifications for Scheduling, Dimensioning, Bending and Cutting of Steel Reinforcement for Concrete. The Contractor will be deemed to have allowed for this in his rates.

Prior to being placed in the Works, all reinforcement shall be well cleaned and made perfectly free from dirt, scale, loose rust, paint, oil, limewash or any other coatings.

Steel reinforcement shall be fabricated to the forms and dimensions and fixed in the positions shown on the Drawings. Special care shall be taken that the overall length of bars with multiple bends is accurate and that after bending and fixing in position the bars remain in place without any warps or twists.

Bars shall be firmly bound together with No. 16 gauge soft annealed wire at intersection of bars to ensure that the meshwork or bars will retain its designed form, and the meshwork shall be so temporarily supported as to retain its correct position in the moulds during the process of depositing and consolidating the concrete. The ends of all such tying wire shall be turned into the body of the concrete and not allowed to project towards the surface of the concrete.

During concreting a competent steelfixer shall be in attendance on the work to adjust and correct the position of the reinforcement immediately prior to the placing of the concrete. Welding of high yield reinforcement shall not be permitted.

Spacer blocks shall be used to maintain cover to steel and shall be made from dense cement mortar (1 part cement: 2 parts sand) unless other materials are approved by the Engineer. The size of spacer blocks shall be kept to a minimum. Concrete spacers shall not be used on water retaining faces.

Where steel fabric reinforcement is used for concrete work the fabric shall comply with the requirements of the British Standard BS 4483 unless otherwise directed by the Engineer.

Before concreting, all reinforcement shall be carefully cleaned of all set or partially set concrete which may have been deposited thereon during the placing of a previous lift of concrete

3.4.12.48 Jointing Materials

1) Resin Bonded Cork as filler in gaps shall be as manufactured by Expandite or similar approved. It shall not extrude when compressed and shall return to not less than 80 per cent of its original thickness after compression.
2) Waterproof Building Paper shall be polythene sheeting similar to Visqueen 500 (375 micron thickness).
3) Contraction and expansion joints shall be sealed with an approved make of joint sealer of type and dimensions as shown on the Drawings.

   Bitumen-rubber joint sealing compounds shall be pourable conforming to type A as specified in BS 2499: 1966 "Hot applied joint sealants for concrete pavements for horizontal joints" and shall be an approved solvent type gun grade applied by suitable gun for vertical joints.

   Polysulphide joint sealing compounds shall be two part conforming to BS 4254: 1976.

3.4.12.49 Cleansing and Disinfection

(a) General

Before being tested or put into service all buildings, tanks and other units, constructed under this Contract, shall be thoroughly cleansed so as to remove all dirt, grit and other rubbish. Any tanks, etc., that will contain treated potable water shall be disinfected.

(b) Disinfection

The inside faces of tanks, etc., shall be washed with clean water and when completely clean, the tank shall be filled to a depth of 300mm with clear water having a chlorine residual of not less than 20mg/litre. All inside faces shall then be scrubbed with this water using stiff brushes. Workmen carrying out this operation shall wear clean rubber boots which have been disinfected. Strict precautions shall be enforced to ensure that hygienic conditions prevail throughout the disinfection operations. After disinfection has been completed no person shall enter the disinfected area without the prior permission of the Engineer. Particular attention shall be paid to the provision of adequate safety precautions for personnel involved throughout the disinfection operations.

3.4.12.50 Testing Water Retaining Structures

All concrete structures designed to retain water shall be tested by the Contractor after completion for watertightness. Such testing will not be allowed to begin until the structure has been fully completed and all concrete has reached its specified strength. The Contractor shall make preparations to begin testing as soon as possible after each main structure has been completed.

After cleaning to the satisfaction of the Engineer, the structure shall be filled at an approximately uniform rate of increase of water level of not more than 1 m in 24 hours to the intended top water level. The water shall be allowed to stand in the structure for a period of 7 days after which time the level shall be recorded and further measurements made at intervals of 24 hours for 7 days. The structure may be deemed to be watertight if the total drop in surface level does not exceed 12mm in 7 days, considering the losses due to evaporation.

If the total loss is greater than 12mm the Contractor shall at once investigate the cause, and shall determine the points of leakage, the water level being lowered in stages as required. The Contractor shall carry out any further remedial work necessary to stop such leakage in a manner directed by the Engineer, the structure shall subsequently be re-cleaned and testing repeated.

If the structure does not satisfy the conditions of the test, and the daily drop in water level is decreasing, the period of test may be extended for a further 7 days and if the specified limit is then not exceeded the structure may be considered as satisfactory.

The structures will not be accepted by the Employer until they have been ascertained to be in a perfectly useable and water tight condition to the complete satisfaction of the Engineer.

No claim for extra payment to the Contractor shall be allowed if for any reason the Engineer is unable to allow filling or emptying to be carried out at the time requested by the Contractor.

The Contractor shall provide all water, pumps, measuring instruments and all necessary labour, tools and materials for the testing of structures. The cost of carrying out all testing is the responsibility of the Contractor and this cost will be deemed to have been included by the Contractor in his prices for the structure.

3.4.12.51 Blockwork

3.4.12.52 Concrete Blocks – General

The hollow and/or solid concrete blocks shall comply with BS 6073 Parts 1 and 2 and BS 5628.

3.4.12.53 Sizes of Concrete Blocks

The blocks shall be to the thicknesses shown on the Drawings and have the specified strength in the following approximate size: 460x200mm. Blocks shall be hollow, unless shown otherwise on the Drawings.

3.4.12.54 Strength of Concrete Blocks

The average compressive strength of blocks shall be in accordance with BS 6073 Parts 1 and 2.

The minimum allowable compressive strength of blocks shall be as specified below.

Minimum allowable compressive strength of concrete blocks:

Structural blockwork units: 3.5 N/mm²

Blockwork for partitions: 2.8 N/mm²

3.4.12.55 Materials for Concrete Blocks

a) Cement

   Cement generally shall conform to the requirements of Section 2 of the Specification.

b) Aggregates

   Coarse aggregate shall conform to the requirements of Section 2 of the Specification, with maximum 10 mm nominal size.

   Sand shall conform to the requirements of Section 2 of the Specification.

c) Water

   Water shall conform to the requirements of Section 2 of the Specification

3.4.12.56 Manufacture of Concrete Blocks

Blocks shall be manufactured by the use of vibration machinery and shall be cast on removable pallets. They shall be left on the pallets to cure for ten days during which time they shall be kept damp and shall be protected from direct sunlight, drying winds and heavy rain.

No blocks shall be used in the permanent works until they have attained an age of twenty-eight days.

Table 3: Concrete classes

Class of Concrete	Minimum Cement Content kg/m^3	Maximum Water /Cement Ratios		150mm cubes Required Minimum Average 28 day strength (M.A.S) N/mm^2
		A	B	
C15	180	0.70		15
C20	180	0.61		20
C25	200	0.59		25
C30	230	0.57		30
C35A	325	0.53	0.5	35
C40	350	0.49	0.46	40

M.A.S = Required Minimum Average 28 days Strength

Concrete for water retaining structures shall have a minimum cement content of 400kg/m3 and maximum water/cement ratios as column B or as shown on the Drawings. Concrete for other structures shall have a minimum water/cement ratio as column A above or as shown on the Drawings.

3.4.12.57 Thrust blocks

Concrete thrust blocks shall be formed at bends, tees and valves in accordance with the typical sections shown in the Drawings or otherwise as directed by the Project Manager. The additional excavation shall be made after the bends, etc have been jointed and the concrete shall then be placed with all possible speed. The back of supports and blocks shall abut on to solid ground with all loose material being removed before concreting. The concrete used for thrust shall be Grade C20 or as shown on the Drawings and after placing shall be kept in view for not less than six hours. No pressure shall be applied in any section of main until the concrete has had at least three day's curing. Flexible joints shall not normally be cast into thrust blocks. Where the size of thrust block does not make this possible, additional flexible joint shall be provided no greater than half the pipe diameter beyond each face of the block.

3.4.12.58 Support blocks

Where control valves are placed on support block, the concrete used for support blocks shall be of Grade C20 or as shown on the Drawings. After placing of fresh concrete shall be kept in view for not less than six hours. Where new concrete is to be cast and place on existing support block, Contractor shall use an

approved high-grade bonding agent prior of placing new concrete. The method of application of the bonding agent shall be applied as per manufacturer's guideline. 155 Existing concrete surfaces shall be clean from wax, grease, oil, dust, loose concrete, etc. prior to apply bonding agent.

3.4.12.59 Anchor blocks

Anchor blocks to prevent side slips shall be constructed where directed in BoQ, and in accordance with details provided by the Project Manager. The concrete used for anchor blocks shall be of Grade C20 or as shown on the Drawings. After placing shall be kept in view for not less than six hours. Anchor blocks to prevent longitudinal slip shall be constructed where the slope of the pipe is greater than 1 in 10 or as otherwise directed by the Project Manager.

3.4.13 Earthworks

3.4.13.1 Location of existing services

The location of existing services shown on the Drawings is approximate only. Before carrying out any demolition or excavation for construction purposes the Contractor shall, at his own cost, accurately locate in both line and level all existing services within the Site of the Works whether indicated on the Drawings or not, and furnish the Project Manager with 3 copies of the relevant information in the form of AutoCad drawings.

3.4.13.2 Trial pits

The Contractor shall, at his own cost, excavate refill and restore in advance of his programme such trial pits as he may require for the location of existing underground services and obstructions.

3.4.13.3 Excavation generally

Excavation shall be made in open cutting unless tunnelling or heading is specified or approved by the Project Manager and shall be taken out as nearly as possible to exact dimensions and levels so that the minimum of infilling will afterwards be necessary. It shall be the Contractor's responsibility at all times to ensure the stability and safety of excavations and the Contractor shall take all measures necessary to ensure that no collapse erosion or subsidence occurs. The sides of all excavations shall be kept true and shall where necessary be adequately supported by means of timber, steel or other type struts, walling, poling boards, sheeting, bracing and the like. All supports shall be of sound design and construction and shall be sufficiently watertight to permit excavation, concreting and other work to be completed satisfactorily. Excavations shall be kept free from water and it shall be the Contractor's responsibility to construct and maintain temporary diversion and drainage works and to carry out pumping and to take all measures necessary to comply with this requirement. If the Contractor encounters any unsound material in the formation, he shall immediately inform the Project Manager who will instruct the Contractor in writing as to whether or not the said material shall be treated as unsound. Unsound material shall be

removed and disposed of to the satisfaction of the Project Manager. Unless otherwise specified or ordered by the Project Manager, the voids so formed shall be filled with concrete Grade 10 in the formations to structures, with the same material as that which comprises the fill in the formation to embankments, with compacted granular material in the formation of pipelines and with concrete Grade 10 filling approved by the Project Manager in the formation to roads. If, in the opinion of the Project Manager, the unsoundness is due to failure of the Contractor to comply with the Specification including keeping the excavation free from water, the cost of dealing with the unsound material shall be borne by the Contractor. The Contractor shall not deposit excavated materials on public or private land except where directed by the Project Manager in writing or with the consent in writing of the relevant authority or of the owner or responsible representative of the owner of such land and only then in those places and under such conditions as the relevant authority, owner or responsible representative may prescribe.

3.4.13.4 Excavation for foundations of structures

The Contractor shall give sufficient notice to the Project Manager to enable him to examine foundations well in advance of concrete being placed and no placement shall occur until such inspection shall have been carried out and the formation approved. If the formation has become weathered prior to the placing of concrete the Contractor shall remove the weathered material and replace it with Grade C15P concrete at his own cost as directed by the Project Manager. If the Project Manager so directs, a bottom layer of excavation of not less than 75mm thickness shall be left undisturbed and subsequently taken out by hand immediately before concrete or other work is placed. Similarly, where concrete or other materials is to be placed in contact with the side face of an excavation the Contractor shall, if the Project Manager so directs, leave undisturbed the last 75mm thickness of the excavation to that face until it is taken out neatly to profile by hand immediately before the concrete is placed. Areas of excavation which are to receive a layer of concrete blinding or drainage layer under structural concrete shall be covered with such blinding or layer immediately the excavation has been completed and inspected and approved by the Project Manager. All surfaces shall be free of oil, water, mud or any material which in the opinion of the Project Manager is not desirable. Excavations for foundations and for thrust and anchor blocks shall be to such depth as shown on the Drawings or as the Project Manager may direct and no concrete or other materials shall be placed until the formation has been examined and approved. Due notice shall be given to the Project Manager to enable him to examine the formation well in advance.

3.5 Drawings

The following drawings are annexed:

Drawing No.	Title
SOL II - 01	Filtration Plant Site Layout
SOL II - 02	Line Diagram for Inlet and Outlet of Filter Plant
AOB/OMD/FILTRATIONPLANT/45/25/03	Proposed layout of new automatic suction scanning screen filter to be installed inside existing filtration room (4.2 m x 7m)

Section 4 - General Conditions of Contract and Particular Conditions Of Contract

Any resulting contract shall be placed by means of a Letter of Acceptance and shall be subject to the General Conditions of Contract (GCC), **(Ref:W/GCC10/04-24**), for the Procurement of Works (available on website *ppo.govmu*.org) except where modified by the Particular Conditions of Contract below.

Procurement Reference No: OAB/OMD/FILTRATIONPLANT/45/25

The clause numbers given in the first column correspond to the relevant clause number of the General Conditions of Contract.

Particular Conditions of Contract

PROCUREMENT REFERENCE NO: OAB/OMD/FILTRATIONPLANT/41/24

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

A. General	
GCC 1.1 (o)	The Defects Liability Period is 6 months from successful commissioning of the whole project.
GCC 1.1 (r)	The Employer is the Irrigation Authority The authorised representative is the General Manager.
GCC 1.1 (v)	The Intended Completion Period for the whole of the Works shall be one hundred and fifty (150) calendar days calculated from start date.
GCC 1.1 (y)	The Project Manager is to be appointed by the Employer.
GCC 1.1 (aa)	The Site is located at solitude.
GCC 1.1 (dd)	The Start Date shall be seven (7) days from the date of the Order to Commence works to be issued by the Project Manager.
GCC 1.1 (hh)	Refer to Section 3.2 - Scope of Works.
GCC 2.2	Sectional Completions are not allowed.
GCC 2.3(i)	The following documents also form part of the Contract: 1) Pre-award correspondences 2) Letter of Acceptance 3) Specifications 4) Bill of Quantities 5) Drawings 6) Post-award Submissions a) Performance Security b) Insurance Policies c) Joint Venture Agreement (if any) d) Programme of Works 7) Technical Proposal submitted by the Bidder including all catalogues and brochures 8) Any other document submitted by the Bidder which the Employer considered to be necessary for inclusion in the Contract.
GCC 3.1	The language of the contract is English The law that applies to the Contract is the law of the Republic of Mauritius.

GCC 4.1	The Project Manager shall obtain specific approval from the Employer before carrying out any of his duties under the Contract which in the Project Manager's opinion will cause the amount finally due under the Contract to exceed the Contract Price or will give entitlement to extension of time. This requirement shall be waived in an emergency affecting safety of personnel or the Works or adjacent property.
GCC 5.1	The Project Manager is not allowed to delegate any of his duties and responsibilities without the approval of the Employer.
GCC 6	Any notice shall be sent to the following addresses: The General Manager, **Irrigation Authority**, 5th Floor Fon Sing Building, 12 Edith Cavell Street Port Louis. For the Contractor, the address shall be as given on the first page of the Letter of Acceptance and the contact name shall be: _____.
GCC 8.1	Schedule of other contractors: Not applicable
GCC 9.1	To add under Key Personnel: (i) One Contract Manager (part time), holding at least a Degree in Mechanical or Electromechanical Engineering or Building Services Engineering works from a recognised institution. He shall have at least 5 years experiences in Mechanical or Electromechanical engineering works or Building Services Engineering works and shall be registered with the Council of Registered Professional Engineer of Mauritius (ii) Site agent (full-time) holding at least a Diploma in Mechanical or Electromechanical engineering works or Building Services Engineering works from a recognized institution. He shall have at least 3 years experience in Mechanical or Electromechanical engineering works or Building Services Engineering works. (iii) One foreman having at least 3 years of experience in pipe laying works, plumbing works and installation of water works. (iv) At least one qualified plumber/pipe fitter having a minimum 3 years of experience related to installation of water works.

GCC 13.1	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: a) for the Works, Plant and Materials: Contact Price + 15% **b)** for loss or damage to Equipment: **Cost of equipment plus** **15% of its value** c) for loss or damage to property (except the Works, Plant, Materials, and Equipment) in connection with Contract: Rs 3 million d) for personal injury or death: i. of the Contractor's employees: As per laws of Mauritius ii. of other people: Rs 10 million - This cover shall be in the joint name of the two parties covering any third party and extended to the site representatives of the Irrigation Authority**.** e) for loss or damage to materials on-site and for which payment have been included in the Interim Payment Certificate, where applicable. 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. All insurance covers shall be valid from the commencement of works until the end of the defects liability period and shall be approved by the Project Manager.
GCC 14.1	Site Data are: There are no site data available for consultation. Available information concerning the site are described in the specifications, bill of quantities and drawings. Bidders are however advised to visit and examine the site of works and surrounding prior to submission of bid. They should acquaint themselves with the nature of site, extent of work, limits of site, sizes and accessibility to existing chambers, means of access, general nature of the soil and all other matters which may influence preparation and execution of their bid. All costs incidental thereof shall be at the Bidder's own expense. No claim due to ignorance of these factors as mentioned in the preceding paragraph shall be entertained from the contractor. The costs of visiting the site shall be at the Bidder's own expense.
GCC 16.1	The intended completion date shall be **One hundred and Twenty (150)** calendar days from the Start Date
GCC 20.1	The Site Possession Date shall be stated by the Project Manager in the Letter of Order to Commence and shall be based on the Program of works to be approved by the Project Manager as stated in GCC 25.1.
GCC 23.1 & GCC 23.2	Appointing Authority for the Adjudicator: **No Adjudicator shall be appointed for this Contract.**

GCC 24.	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. 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 Irrigation Authority or the Contractor may give notice to the other party of its intention to refer the matter to the competent courts of Mauritius
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 for approval a Program for the Works within s*even (7)* calendar days from the date of the Letter of Acceptance.
GCC 25.3	Program update shall be required and the period between Program updates is ten *(*10*)* calendar days. The amount to be withheld for late submission of an updated Program is MUR 2,000.00 per day delayed.
C. Quality Control	
GCC 33.1	The Defects Liability Period is: 365 days calculated from the date of completion of the works to be certified by the Project Manager.
GCC 34.1	Delete sub-clause 34.1 and replace by the following: Should any defect arise during the contractual period and up to the end of the Defects Liability Period and the Contractor fails to correct the Defect within the time specified in the Project Manager's notice, this shall constitute a breach of the Contractor's obligations under the contract. The Project Manager shall assess the cost of having the defect corrected and recover the money from the Performance Security.
GCC 37.1	To add: Prior to issue of any Variation Order (VO) involving cost implication, the Project Manager shall assess the variation and seek the approval of the Employer.
GCC 37.2	To add: The Project Manager shall assess all quotations and submit recommendation to Employer for approval prior to issue of the VO.
GCC 39.7	Interim Payment for Plant and Material on site is not applicable.

D. Cost Control	
GCC 40.1	The Employer shall pay the Contractor the amounts certified by the Project Manager within 14 days of the date of each certificate but not later than 56 days after the Project Manager has received a statement with supporting documents from the Contractor. Minimum amount of Interim Payment shall be **MUR 500,000**
GCC 41.1 (l)	The term "exceptionally adverse weather conditions" is hereby defined as any one of the following events: (i) 100 mm rainfall or above recorded in one day of the nearest rain station; (ii) An official declaration of 'Torrential Rain' by meteorological Department of Mauritius; and (iii) Cyclone warning Class II or above.
GCC 43.1	The currency of the Employer's country is: **Mauritian Rupees**.
GCC 44.1	The Contract is not subject to price adjustment. It shall be a fixed price which shall not be revised or adjusted for any fluctuations in the cost of inputs.
GCC 45.1	10% of the amount shall be retained from any payment in respect of the value of work certified. Half of the retention money will be released after formal taking over of the Works and the remaining shall be released after the Defect Liability Period subject to the Contractor making good all defects. **The limit of Retention Money shall be 5% of Contract Price.**
GCC 46.1	The liquidated damages for the whole of the Works are MUR 5,000.00 per day. The maximum amount of liquidated damages for the whole of the Works is **10%** of the awarded contract value.
GCC 47.1	Not applicable.
GCC 48.1	The Advance Payments shall be: **10 %** of the Contract Price excluding VAT, less any provisional and contingencies sums and shall be paid to the Contractor within 14 days after signature of the Contract and submission of the Advance Payment security by the contractor no later than 7 days from the signature of the Contract.
GCC 49.1	The Performance Security amount is **10 %** of the awarded Contract Price excluding VAT, inclusive of Provisional Sum and Contingencies Sum and shall be in the form of an unconditional Bank Guarantee as per the format provided at section 5, and shall be valid until the issue of the Defects Liability Certificate

E. Finishing the Contract	
GCC 56	The date by which operating and maintenance manuals are required is two weeks before the intended completion date. The date by which "as-built" drawings are required is two weeks before the intended completion date. "As built" drawings shall be worked out by the Contractor and submitted for approval by the Project Manager in case of changes to drawings of the bidding document, failing which these drawings shall be drawn by the Employer at the cost of Rs 1000 per drawing which will be deducted from the final payment to the contractor.
GCC 56.2	The amount to be withheld for failing to produce "as-built" drawings and/or operating and maintenance manuals by the date required in GCC 56.1 is **MUR 20,000.00**.
GCC 57.2 (g)	The maximum number of days shall be computed based on the maximum amount of liquidated damages for the whole of the Works.
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 25%.

Section 5 - 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.

Performance Security

.....Bank/Insurance Company'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/Insurance Company]* .....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 and returned to us not later than twenty- one days from the date of issuance of the Defects Liability 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/Insurance Guarantee and

Signature(s).....

Advance Payment Security

[Bank's/ Insurance Company'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/Insurance Company]*** . . . . . hereby irrevocably undertake to pay you any sum or sums not exceeding in total an 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/Insurance Company]*** . . . . . .

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.

. . . . . ***[Seal of Bank/Insurance Company and Signature(s)]*** . . . . . .

Note –

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

1 The Guarantor shall insert an 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.

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 .Rs . . . . . ***.[insert amount in numbers and words and name of currency]***, exclusive of VAT, 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 in accordance with the General Conditions of Contract, using for that purpose of the Performance Security Form included in Section V (Contract Forms) of the Bidding Document.

Authorized Signature:

Name and Title of Signatory:

Name of Agency:

Attachment: Contract Agreement

Contract Agreement

THIS AGREEMENT made the . . . . . .day 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:	Signed by: .....
for and on behalf of the Employer	for and on behalf the Contractor
In the presence of:	in the presence of: .....
Witness, Name, Signature, Address, Date	Witness, Name, Signature, Address, Date

Format for Bank Certificate

(Bank's Official Letterhead)

Bank Certificate

Procurement Reference No: ……..

Name of Project: .

For: …….. (Name of public body)

THE UNDERSIGNED

(Bank Name):

(Address): ……

Certifies that the firm:

…… (Name of firm and address)

for the purposes of submitting a bid for the above-mentioned project has, at the present time,

the financial means and resources for the proper execution of the Contract (if awarded) with a minimum of liquid assets and/or credit facilities of (MUR …….) net of other contractual commitments.

Drawn at…….

Date:……..

For: ……(Bank Name)

Represented by: ……(Name of Officer)

Status:…….

Signature:……..

[Bank Seal]

[Note: The bidder should ensure that the Bank Certificate submitted by a Bank shall be

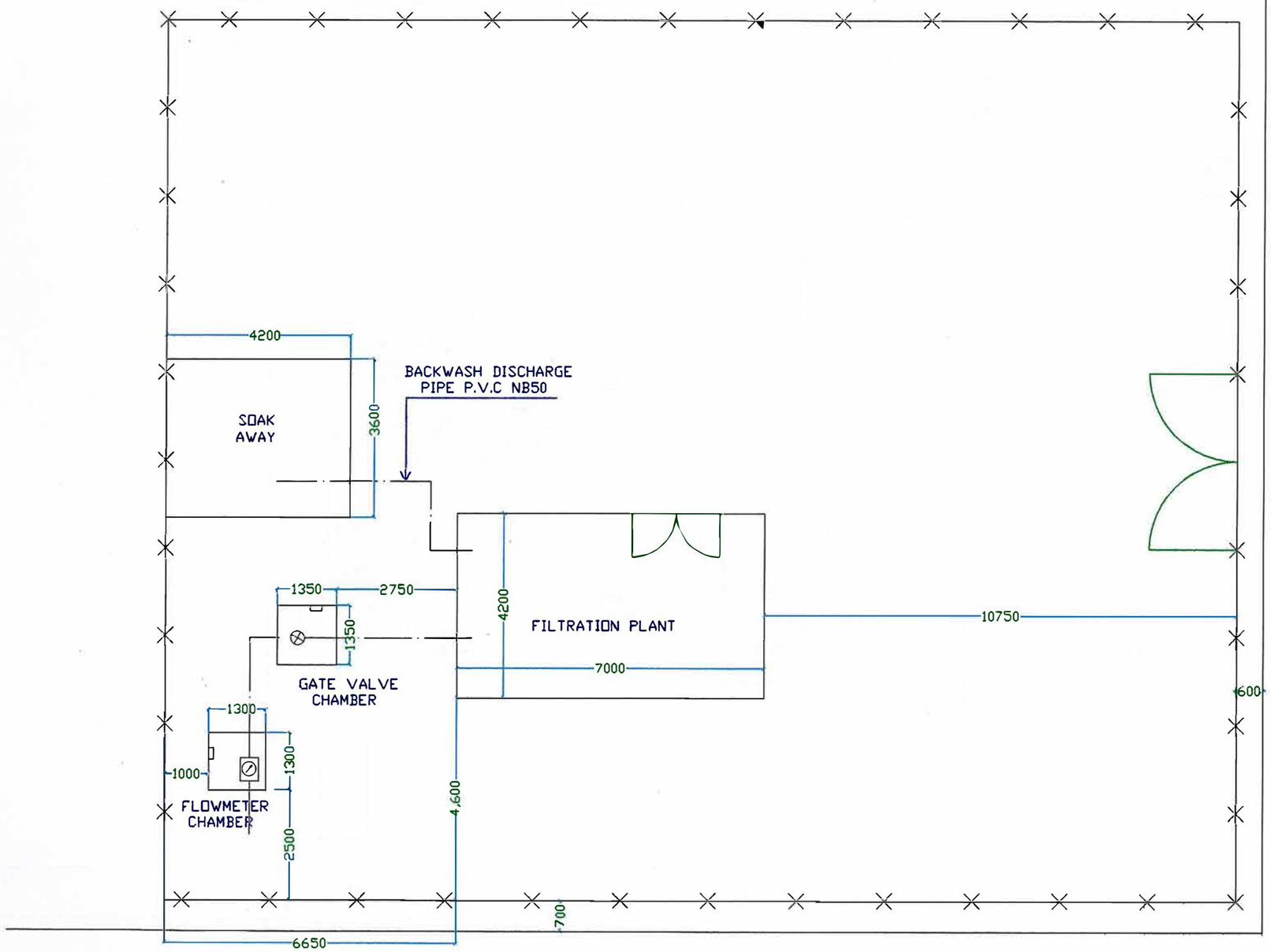
substantially similar to the above format]

Annexure- Drawings

1. FILTRATION PLANT SITE LAYOUT – Drwg No: SOL II - 01

2. LINE DIAGRAM FOR INLET AND OUTLET OF FILTER PLANT – Drwg No: SOL 11 - 02

3. Proposed layout of new Automatic Suction Scanning Screen - Drwg No. AOB/OMD/FILTRATIONPLANT/45/25/03



EXISTING TRACK ROAD

NOTES

REV	DATE	DESCRIPTION	BY

CLIENT

IRRIGATION AUTHORITY

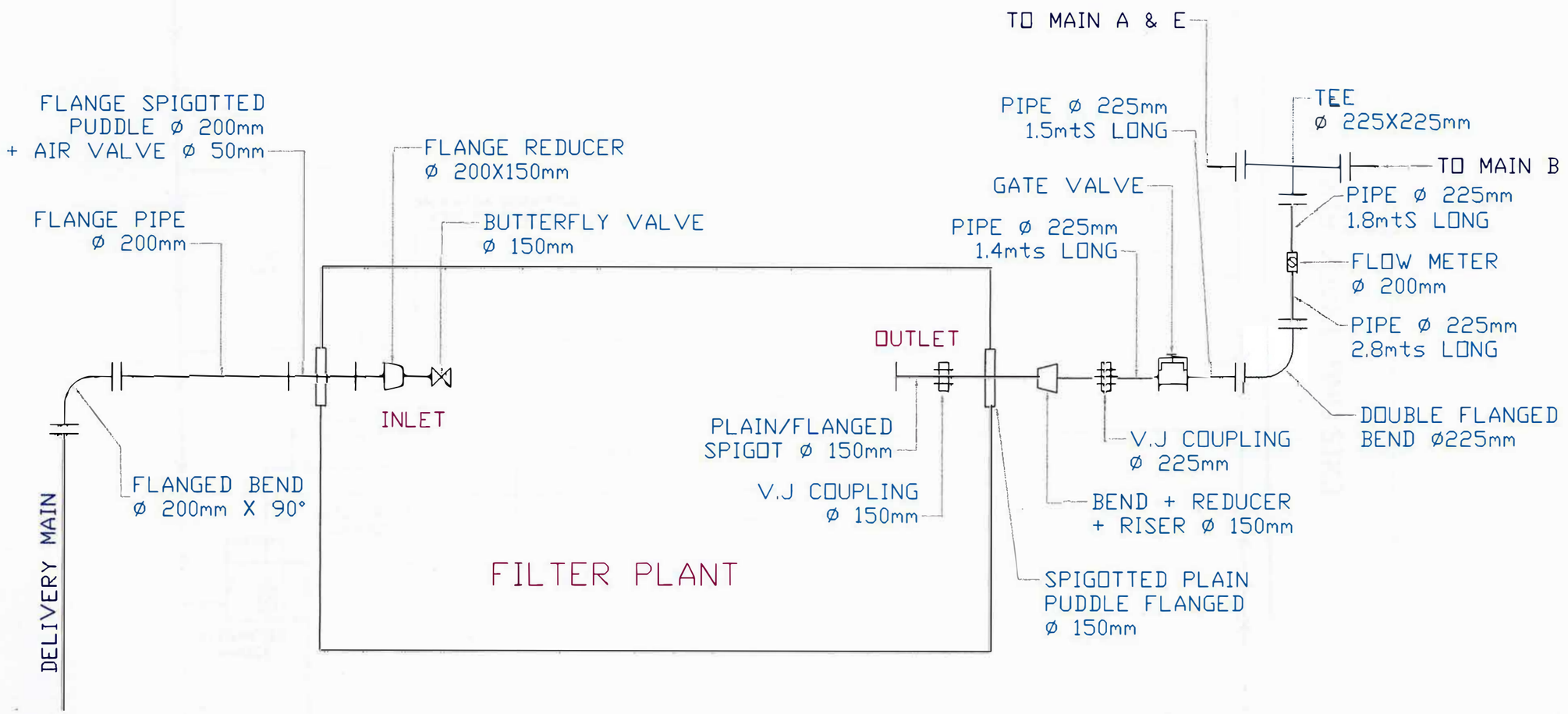
PROJECT

Supply, Installation,Testing and Commissioining of a Filtration Plant for Solitude II Drip Irrigation Project

TITLE

FILTRATION PLANT SITE LAYOUT

DWG No. SOL II - 01	DATE SEPT 2024
SCALE N.T.S	
DRAWN	CHECKED B. S
APPROVED	
REV	



NOTES

REV	DATE	DESCRIPTION	BY

CLIENT

IRRIGATION AUTHORITY

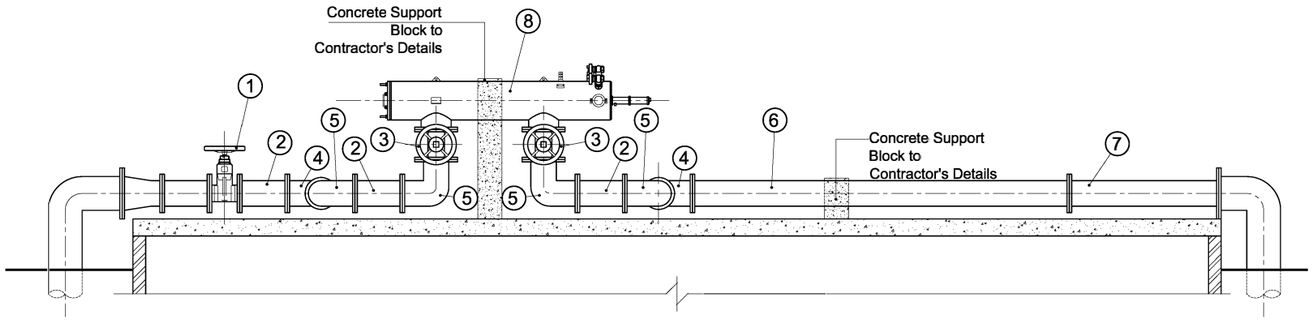
PROJECT

Supply, Installation, Testing and Commissioining of a Filtration Plant for Solitude II Drip Irrigation Project

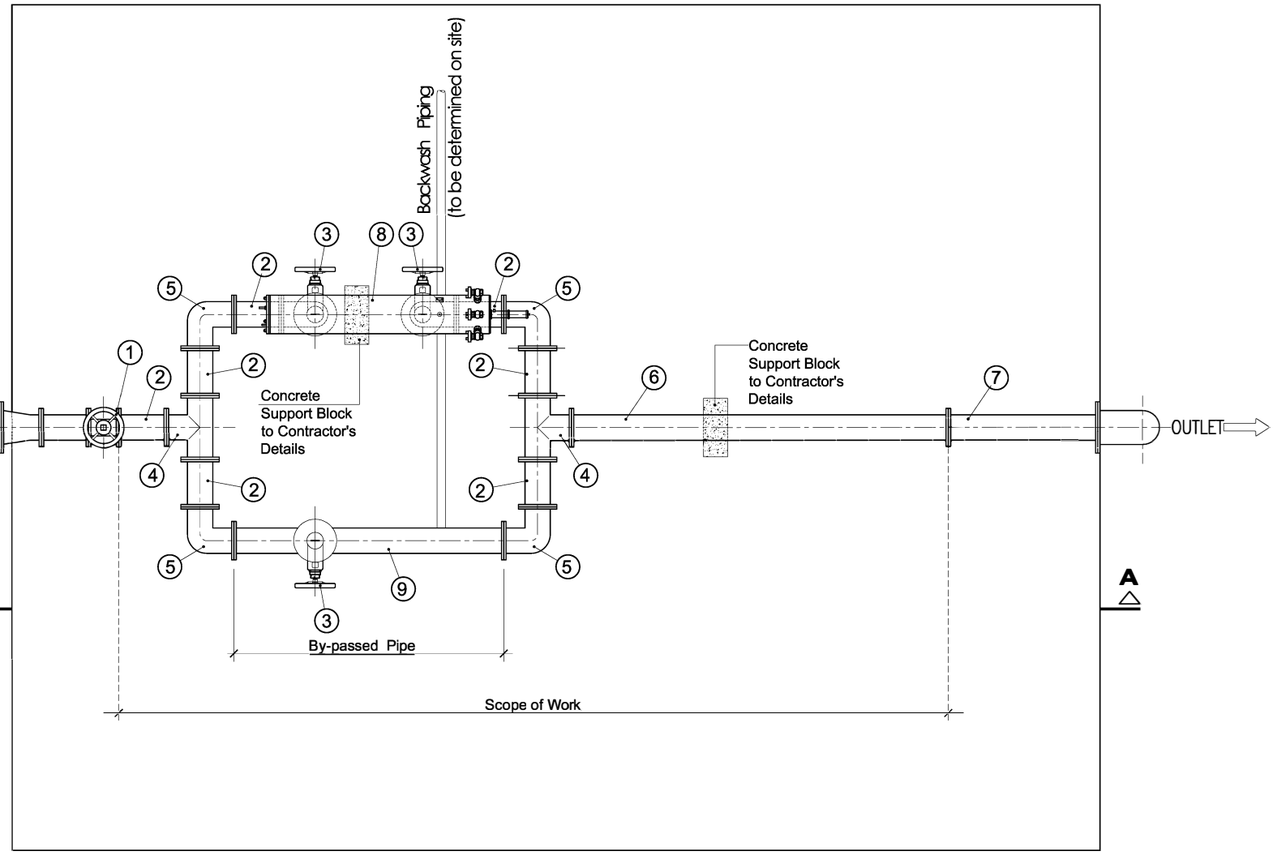
TITLE

LINE DIAGRAM FOR INLET AND OUTLET OF FILTER PLANT

DWG No.	DATE
SOL II - 02	SEPT 2024
SCALE N.T.S.	
DRAWN	CHECKED B. S.
APPROVED	
REV	



Sectional Elevation A-A



Plan

Item No.	Item Description
①	Existing Butterfly valve DN 150
②	Flanged Pipe ø150 (Length to be Determined by Bidder)
③	DN 1500 Butterfly valve
④	DN 1500 Tee
⑤	DN 150 90° Bend
⑥	Flanged pipe ø150 (Length to be Determined by Bidder)
⑦	Existing Flanged Pipe Outlet DN 150
⑧	Filter Unit
⑨	By-passed Pipe ø150

MARK	REVISION	DATE

DRAWN : STDO (W.Rioux)	DESIGNED : B.S
SCALE : N.T.S	SURVEYED :
DATE : OCT 2024	CHECKED :
FILE NAME : Rehab	APPROVED :

PROJECT

IRRIGATION AUTHORITY

Supply, Installation, Testing and Commissioning of a Filtration Plant for SOLITUDE II Drip Irrigation Project.

TITLE PROPOSED LAYOUT OF NEW AUTOMATIC SUCTION SCANNING SCREEN FILTER TO BE INSIDE EXISTING FILTRATION ROOM (7.00 m x 4.20 m)

DRG No. **OAB/OMD/FILTRATION PLANT/45/25/03** ISSUE