# GOVERNMENT OF RAJASTHAN
# Rajasthan Urban Sector Development Program

# BIDDING DOCUMENT

for the

**Construction, Commissioning and Operation of Fecal Sludge Treatment Plant of capacity 20 m3/day at Phulera town (Rajasthan)**

## Part 1– Technical Bid –Volume 1

**Issued on:** _____, 2017

**Invitation for Bids No.:** _____

**Package No.:** _____

**Employer:** Local Self Government Department (LSGD), Government of Rajasthan

Represented by Rajasthan Urban Infrastructure Development Project (RUIDP)

**Country:** India

# Table of Contents - Summary Description

# Table of Contents

# Section 1: Instructions to Bidders

# Section 1 - Instructions to Bidders

## Table of Clauses

# Section 1 - Instructions to Bidders

## A. General

**1. Scope of Bid**

1.1 In connection with the Invitation for Bids (IFB) indicated in the Bid Data Sheet (BDS), the Employer, as indicated in the BDS, issues this Bidding Document for the procurement of the Works as specified in Section 6 (Employer's Requirements). The name, identification, and number of contracts of this bidding are provided in the BDS.

1.2 Throughout this Bidding Document,

(a) the term "in writing" means communicated in written form and delivered against receipt;

(b) except where the context requires otherwise, words indicating the singular also include the plural and words indicating the plural also include the singular; and

(c) "day" means calendar day.

**2. Source of Funds**

2.1 The Borrower or Recipient (hereinafter called "Borrower") indicated in the BDS has applied for or received financing (hereinafter called "funds") from the Asian Development Bank (hereinafter called "ADB") toward the cost of the project named in the BDS. The Borrower intends to apply a portion of the funds to eligible payments under the contract(s) for which this Bidding Document is issued.

2.2 Payments by ADB will be made only at the request of the Borrower and upon approval by ADB in accordance with the terms and conditions of the Financing Agreement between the Borrower and ADB (hereinafter called "Financing Agreement"), and will be subject in all respects to the terms and conditions of that Financing Agreement. No party other than the Borrower shall derive any rights from the Financing Agreement or have any claim to the funds.

**3. Fraud and Corruption**

3.1 ADB's Anticorruption Policy requires Borrowers (including beneficiaries of ADB-financed activity), as well as Bidders, Suppliers, and Contractors under ADB-financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, ADB

(a) defines, for the purposes of this provision, the terms set forth below as follows:

(i) "corrupt practice" means the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party;

(ii) "fraudulent practice" means any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

(iii) "coercive practice" means impairing or harming, or threatening to impair or harm, directly or indirectly, any party

or the property of the party to influence improperly the actions of a party;

(iv) "collusive practice" means an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party;

(v) "obstructive practice" means (a) deliberately destroying, falsifying, altering, or concealing of evidence material to an ADB investigation; (b) making false statements to investigators in order to materially impede an ADB investigation; (c) failing to comply with requests to provide information, documents or records in connection with an Office of Anticorruption and Integrity (OAI) investigation; (d) threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or (e) materially impeding ADB's contractual rights of audit or access to information; and

(vi) "integrity violation" is any act which violates ADB's Anticorruption Policy, including (i) to (v) above and the following: abuse, conflict of interest, violations of ADB sanctions, retaliation against whistleblowers or witnesses, and other violations of ADB's Anticorruption Policy, including failure to adhere to the highest ethical standard.

(b) will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations in competing for the Contract;

(c) will cancel the portion of the financing allocated to a contract if it determines at any time that representatives of the Borrower or of a beneficiary of ADB financing engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations during the procurement or the execution of that contract, without the Borrower having taken timely and appropriate action satisfactory to ADB to remedy the situation;

(d) will impose remedial actions on a firm or an individual, at any time, in accordance with ADB's Anticorruption Policy and Integrity Principles and Guidelines (both as amended from time to time), including declaring ineligible, either indefinitely or for a stated period of time, to participate[1] in ADB-financed, administered, or supported activities or to benefit from an ADB-financed, administered, or supported contract, financially or otherwise, if it at any time determines that the firm or individual has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations; and

(e) will have the right to require that a provision be included in bidding documents and in contracts financed by ADB, requiring Bidders,

[1] Whether as a Contractor, Nominated Subcontractor, Consultant, Manufacturer or Supplier, or Service Provider; or in any other capacity (different names are used depending on the particular Bidding Document). A Nominated Subcontractor is one that either has been: (i) included by the Bidder in its prequalification application or bid because it brings specific and critical experience and know-how that are accounted for in the evaluation of the bidder's prequalification application or the bid; or (ii) appointed by the Employer.

suppliers, and contractors to permit ADB or its representative to inspect their accounts and records and other documents relating to the bid submission and contract performance and to have them audited by auditors appointed by ADB.

3.2 Furthermore, Bidders shall be aware of the provisions of GCC 28.3 and 73.2 (i).

**4. Eligible Bidders**

4.1 A Bidder may be a natural person, private entity, or government-owned enterprise subject to ITB 4.5 – or any combination of them with a formal intent to enter into an agreement or under an existing agreement in the form of a Joint Venture. In the case of a Joint Venture:

(a) all partners shall be jointly and severally liable; and

(b) the Joint Venture shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the parties of the Joint Venture during the bidding process and, in the event the Joint Venture is awarded the Contract, during contract execution.

4.2 A Bidder, and all parties constituting the Bidder, shall have the nationality of an eligible country, in accordance with Section 5 (Eligible Countries). A Bidder shall be deemed to have the nationality of a country if the Bidder is a citizen or is constituted, or incorporated, and operates in conformity with the provisions of the laws of that country. This criterion shall also apply to the determination of the nationality of proposed subcontractors or suppliers for any part of the Contract including related services.

4.3 A Bidder shall not have a conflict of interest. All Bidders found to have a conflict of interest shall be disqualified. A Bidder may be considered to be in a conflict of interest with one or more parties in this bidding process if any of, including but not limited to, the following apply:

(a) they have controlling shareholders in common; or

(b) they receive or have received any direct or indirect subsidy from any of them; or

(c) they have the same legal representative for purposes of this bid; or

(d) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to material information about or improperly influence the Bid of another Bidder, or influence the decisions of the Employer regarding this bidding process; or

(e) a Bidder participates in more than one bid in this bidding process, either individually or as a partner in a joint venture, except for alternative offers permitted under ITB 13 of the Bidding Document. This will result in the disqualification of all Bids in which it is involved. However, subject to any finding of a conflict of interest in terms of 4.3 (a) - (d) above, this does not limit the participation of a Bidder as a Subcontractor in another Bid or of a firm as a Subcontractor in more than one Bid; or

(f) a Bidder or any affiliated entity, participated as a Consultant in the preparation of the design or technical specifications of the works that are the subject of the Bid; or

(g) a Bidder was affiliated with a firm or entity that has been hired (or is proposed to be hired) by the Employer or Borrower as Engineer for the contract.

4.4 A firm shall not be eligible to participate in any procurement activities under an ADB-financed, administered, or supported project while under temporary suspension or debarment by ADB pursuant to its Anticorruption Policy (see ITB 3), whether such debarment was directly imposed by ADB, or enforced by ADB pursuant to the Agreement for Mutual Enforcement of Debarment Decisions. A bid from a temporary suspended or debarred firm will be rejected.

4.5 Government-owned enterprises in the Employer's country shall be eligible only if they can establish that they (i) are legally and financially autonomous, (ii) operate under commercial law, and (iii) are not a dependent agency of the Employer.

4.6 Bidders shall provide such evidence of their continued eligibility satisfactory to the Employer, as the Employer shall reasonably request.

4.7 Firms shall be excluded if by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, the Borrower's country prohibits any import of goods or contracting of works or services from that country or any payments to persons or entities in that country.

4.8 In case a prequalification process has been conducted prior to the bidding process, this bidding is open only to prequalified Bidders.

**5. Eligible Materials, Equipment and Services**

5.1 The materials, equipment, and services to be supplied under the Contract shall have their origin in eligible source countries as defined in ITB 4.2 above and all expenditures under the Contract will be limited to such materials, equipment, and services. At the Employer's request, Bidders may be required to provide evidence of the origin of materials, equipment, and services.

5.2 For purposes of ITB 5.1 above, "origin" means the place where the materials and equipment are mined, grown, produced, or manufactured, and from which the services are provided. Materials and equipment are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that differs substantially in its basic characteristics or in purpose or utility from its components.

## B. Contents of Bidding Document

**6. Sections of Bidding Document**

6.1 The Bidding Document consist of Parts I, II, and III, which include all the sections indicated below, and should be read in conjunction with any addenda issued in accordance with ITB 8.

**PART I Bidding Procedures**
Section 1 - Instructions to Bidders (ITB)

Section 2 - Bid Data Sheet (BDS)
Section 3 - Evaluation and Qualification Criteria (EQC)
Section 4 - Bidding Forms (BDF)
Section 5 - Eligible Countries (ELC)

**PART II Requirements**
Section 6 – Employer's Requirements (ERQ)

**PART III Conditions of Contract and Contract Forms**
Section 7 - General Conditions of Contract (GCC)
Section 8 - Particular Conditions of Contract (PCC)
Section 9 - Contract Forms (COF)

6.2 The Invitation for Bids (IFB) issued by the Employer is not part of the Bidding Document.

6.3 The Employer is not responsible for the completeness of the Bidding Document and their Addenda, if they were not obtained directly from the source stated by the Employer in the IFB.

6.4 The Bidder is expected to examine all instructions, forms, terms, and specifications in the Bidding Document. Failure to furnish all information or documentation required by the Bidding Document may result in the rejection of the bid.

**7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting**

7.1 A prospective Bidder requiring any clarification on the Bidding Document shall contact the Employer in writing at the Employer's address indicated in the BDS or raise his inquiries during the pre-bid meeting if provided for in accordance with ITB 7.4. The Employer will respond in writing to any request for clarification, provided that such request is received prior to the deadline for submission of bids, within a period given in the BDS. The Employer shall forward copies of its response to all Bidders who have acquired the Bidding Document in accordance with ITB 6.3, including a description of the inquiry but without identifying its source. Should the Employer deem it necessary to amend the Bidding Document as a result of a request for clarification, it shall do so following the procedure under ITB 8 and ITB 22.2.

7.2 The Bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself, on its own risk and responsibility, all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.

7.3 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter its premises and lands for the purpose of such visit, but only upon the express condition that the Bidder, its personnel, and agents will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.

7.4 The Bidder's designated representative is invited to attend a pre-bid meeting, if provided for in the BDS. The purpose of the meeting will be

to clarify issues and to answer questions on any matter that may be raised at that stage.

7.5 The Bidder is requested to submit any questions in writing, to reach the Employer not later than 1 week before the meeting.

7.6 Minutes of the pre-bid meeting, including the text of the questions raised, without identifying the source, and the responses given, together with any responses prepared after the meeting, will be transmitted promptly to all Bidders who have acquired the Bidding Document in accordance with ITB 6.3. Any modification to the Bidding Document that may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an addendum pursuant to ITB 8 and not through the minutes of the pre-bid meeting.

7.7 Nonattendance at the pre-bid meeting will not be a cause for disqualification of a Bidder.

**8. Amendment of Bidding Document**

8.1 At any time prior to the deadline for submission of Bids, the Employer may amend the Bidding Document by issuing addenda.

8.2 Any addendum issued shall be part of the Bidding Document and shall be communicated in writing to all who have obtained the Bidding Document from the Employer in accordance with ITB 6.3.

8.3 To give prospective Bidders reasonable time in which to take an addendum into account in preparing their Bids, the Employer may, at its discretion, extend the deadline for the submission of Bids, pursuant to ITB 22.2.

## C. Preparation of Bids

**9. Cost of Bidding**

9.1 The Bidder shall bear all costs associated with the preparation and submission of its Bid, and the Employer shall in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

**10. Language of Bid**

10.1 The Bid, as well as all correspondence and documents relating to the bid exchanged by the Bidder and the Employer, shall be written in the language specified in the BDS. Supporting documents and printed literature that are part of the Bid may be in another language provided they are accompanied by an accurate translation of the relevant passages in the language specified in the BDS, in which case, for purposes of interpretation of the Bid, such translation shall govern.

**11. Documents Comprising the Bid**

11.1 The Bid shall comprise two envelopes submitted simultaneously, one called the Technical Bid containing the documents listed in ITB 11.2 and the other the Price Bid containing the documents listed in ITB 11.3, both envelopes enclosed together in an outer single envelope.

11.2 The Technical Bid shall comprise the following:

(a) Letter of Technical Bid;

(b) Bid Security or Bid-Securing Declaration, in accordance with ITB 19;

(c) alternative Bids, at Bidder's option and if permissible, in accordance with ITB 13;

(d) written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 20.2;

(e) documentary evidence in accordance with ITB 17, establishing the Bidder's qualifications to perform the contract;

(f) Technical Proposal in accordance with ITB 16;

(g) Any other document required in the BDS.

11.3 The Price Bid shall comprise the following:

(a) Letter of Price Bid;

(b) completed Price Schedules, in accordance with ITB 12 and ITB 14, or as stipulated in the BDS;

(c) alternative price Bids, at Bidder's option and if permissible, in accordance with ITB 13;

(d) Any other document required in the BDS.

11.4 In addition to the requirements under ITB 11.2, Bids submitted by a Joint Venture shall include a copy of the Joint Venture Agreement entered into by all partners. 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.

**12. Letters of Bid and Schedules**

12.1 The Letters of Technical Bid and Price Bid, and the Schedules, and all documents listed under Clause 11, shall be prepared using the relevant forms furnished in Section 4 (Bidding Forms). The forms must be completed without any alterations to the text, and no substitutes shall be accepted. All blank spaces shall be filled in with the information requested and as required in the BDS.

**13. Alternative Bids**

13.1 Unless otherwise indicated in the BDS, alternative Bids shall not be considered.

13.2 When alternative times for completion are explicitly invited, a statement to that effect will be included in the BDS, as will the method of evaluating different times for completion.

13.3 When specified in the BDS pursuant to ITB 13.1, and subject to ITB 13.4 below, Bidders wishing to offer technical alternatives to the requirements of the Bidding Document must first price the Employer's design as described in the Bidding Document and shall further provide all information necessary for a complete evaluation of the alternative by the Employer, including drawings, design calculations, technical specifications, breakdown of prices, and proposed construction methodology and other relevant details. Only the technical alternatives, if any, of the lowest evaluated Bidder conforming to the basic technical requirements shall be considered by the Employer.

13.4 When specified in the BDS, Bidders are permitted to submit alternative technical solutions for specified parts of the Works. Such parts will be identified in the BDS and described in Section 6 (Employer's

Requirements). The method for their evaluation will be stipulated in Section 3 (Evaluation and Qualification Criteria).

**14. Bid Prices and Discounts**

14.1 The prices and discounts quoted by the Bidder in the Letter of Price Bid and in the Schedules shall conform to the requirements specified below.

14.2 The Bidder shall submit a bid for the whole of the works described in ITB 1.1 by filling in prices for all items of the Works, as identified in Section 4 (Bidding Forms). In case of admeasurement contracts, the Bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items against which no rate or price is entered by the Bidder will not be paid for by the Employer when executed and shall be deemed covered by the rates for other items and prices in the Bill of Quantities.

14.3 The price to be quoted in the Letter of Price Bid shall be the total price of the Bid, excluding any discounts offered. Absence of the total bid price in the Letter of Price Bid may result in the rejection of the Bid.

14.4 The Bidder shall quote any discounts and the methodology for their application in the Letter of Price Bid, in accordance with ITB 12.1.

14.5 Unless otherwise provided in the BDS and the Conditions of Contract, the prices quoted by the Bidder shall be fixed. If the prices quoted by the Bidder are subject to adjustment during the performance of the Contract in accordance with the provisions of the Conditions of Contract, the Bidder shall furnish the indexes and weightings for the price adjustment formulas in the Table(s) of Adjustment Data in Section 4 (Bidding Forms) and the Employer may require the Bidder to justify its proposed indexes and weightings.

14.6 If so indicated in ITB 1.1, bids are being invited for individual contracts or for any combination of contracts (packages). Bidders wishing to offer any price reduction for the award of more than one Contract shall specify in their bid the price reductions applicable to each package, or alternatively, to individual Contracts within the package. Price reductions or discounts shall be submitted in accordance with ITB 14.4, provided the Bids for all contracts are submitted and opened at the same time.

14.7 All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date 28 days prior to the deadline for submission of bids, shall be included in the rates and prices and the total Bid Price submitted by the Bidder.

**15. Currencies of Bid and Payment**

15.1 The currency(ies) of the Bid and payment shall be as specified in the BDS.

15.2 Bidders may be required by the Employer to justify, to the Employer's satisfaction, their local and foreign currency requirements, and to substantiate that the amounts included in the prices shown in the appropriate form(s) of Section 4, in which case a detailed breakdown of the foreign currency requirements shall be provided by Bidders.

**16. Documents Comprising the**

16.1 The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule, and any other

**Technical Proposal**

information as stipulated in Section 4 (Bidding Forms), in sufficient detail to demonstrate the adequacy of the Bidders' proposal to meet the work requirements and the completion time.

**17. Documents Establishing the Qualifications of the Bidder**

17.1 To establish its qualifications to perform the Contract in accordance with Section 3 (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding information sheets included in Section 4 (Bidding Forms).

17.2 Domestic Bidders, individually or in joint ventures, applying for eligibility for domestic preference shall supply all information required to satisfy the criteria for eligibility in accordance with ITB 35.

**18. Period of Validity of Bids**

18.1 Bids shall remain valid for the period specified in the BDS after the bid submission deadline date prescribed by the Employer. A bid valid for a shorter period shall be rejected by the Employer as nonresponsive.

18.2 In exceptional circumstances, prior to the expiration of the bid validity period, the Employer may request Bidders to extend the period of validity of their Bids. The request and the responses shall be made in writing. If a bid security is requested in accordance with ITB 19, it shall also be extended 28 days beyond the deadline of the extended validity period. A Bidder may refuse the request without forfeiting its bid security. A Bidder granting the request shall not be required or permitted to modify its Bid.

**19. Bid Security/Bid-Securing Declaration**

19.1 Unless otherwise specified in the BDS, the Bidder shall furnish as part of its Bid, in original form, either a Bid-Securing Declaration or a bid security as specified in the BDS. In the case of a bid security, the amount and currency shall be as specified in the BDS.

19.2 If a Bid-Securing Declaration is required pursuant to ITB 19.1, it shall use the form included in Section 4 (Bidding Forms). The Employer will declare a Bidder ineligible to be awarded a Contract for a specified period of time, as indicated in the BDS, if the Bid-Securing Declaration is executed.

19.3 If a bid security is specified pursuant to ITB 19.1, the bid security shall be, at the Bidder's option, in any of the following forms:

(a) an unconditional bank guarantee,

(b) an irrevocable letter of credit, or

(c) a cashier's or certified check,

all from a reputable bank from an eligible country as described in Section 5 (Eligible Countries). In the case of a bank guarantee, the bid security shall be submitted either using the Bid Security Form included in Section 4 (Bidding Forms) or another form acceptable to the Employer. The form must include the complete name of the Bidder. The bid security shall be valid for 28 days beyond the original validity period of the bid, or beyond any period of extension if requested under ITB 18.2.

19.4 Unless otherwise specified in the BDS, any Bid not accompanied by a substantially compliant bid security or Bid-Securing Declaration, if one

is required in accordance with ITB 19.1, shall be rejected by the Employer as nonresponsive.

19.5 If a bid security is specified pursuant to ITB 19.1, the bid security of unsuccessful Bidders shall be returned as promptly as possible upon the successful Bidder's furnishing of the performance security pursuant to ITB 42.

19.6 If a bid security is specified pursuant to ITB 19.1, the bid security of the successful Bidder shall be returned as promptly as possible once the successful Bidder has signed the Contract and furnished the required performance security.

19.7 The bid security may be forfeited or the Bid-Securing Declaration executed

(a) if a Bidder withdraws its bid during the period of bid validity specified by the Bidder on the Letters of Technical Bid and Price Bid, except as provided in ITB 18.2; or

(b) if the successful Bidder fails to

(i) sign the Contract in accordance with ITB 41;

(ii) furnish a performance security in accordance with ITB 42;

(iii) accept arithmetical corrections in accordance with ITB 33; or

(iv) furnish a domestic preference security, if applicable, in accordance with ITB 42.

19.8 The bid security or the Bid-Securing Declaration of a Joint Venture shall be in the name of the Joint Venture that submits the Bid. If the Joint Venture has not been legally constituted at the time of bidding, the bid security or the Bid-Securing Declaration shall be in the names of all future partners as named in the letter of intent mentioned in ITB 4.1.

**20. Format and Signing of Bid**

20.1 The Bidder shall prepare one original set of the Technical Bid and one original of the Price Bid comprising the Bid as described in ITB 11 and clearly mark it "ORIGINAL - TECHNICAL BID" and "ORIGINAL - PRICE BID." Alternative Bids, if permitted in accordance with ITB 13, shall be clearly marked "ALTERNATIVE." In addition, the Bidder shall submit copies of the Bid in the number specified in the BDS**,** and clearly mark each of them "COPY." In the event of any discrepancy between the original and the copies, the original shall prevail.

20.2 The original and all copies of the Bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder. This authorization shall consist of a written confirmation as specified in the BDS and shall be attached to the Bid. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the Bid, except for unamended printed literature, shall be signed or initialed by the person signing the bid. If a Bidder submits a deficient authorization, the Bid shall not be rejected in the first instance. The Employer shall request the Bidder to submit an acceptable authorization within the number of days as specified in the BDS. Failure to provide an acceptable authorization

within the prescribed period of receiving such a request shall cause the rejection of the Bid.

20.3 Any amendments such as interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the Bid.

## D. Submission and Opening of Bids

**21. Sealing and Marking of Bids**

21.1 Bidders may always submit their Bids by mail or by hand. When so specified in the BDS, Bidders shall have the option of submitting their Bids electronically. Procedures for submission, sealing, and marking are as follows:

(a) Bidders submitting Bids by mail or by hand shall enclose the original of the Technical Bid, the original of the Price Bid, and each copy of the Technical Bid and each copy of the Price Bid, in separate sealed envelopes, duly marking the envelopes as "ORIGINAL - TECHNICAL BID," "ORIGINAL - PRICE BID," and "COPY NO… - TECHNICAL BID," and "COPY NO…. - PRICE BID." These envelopes, the first containing the originals and the others containing copies, shall then be enclosed in one single envelope per set. If permitted in accordance with ITB 13, alternative Bids shall be similarly sealed, marked and included in the sets. The rest of the procedure shall be in accordance with ITB 21.2 and ITB 21.3.

(b) Bidders submitting Bids electronically shall follow the electronic bid submission procedures specified in the BDS.

21.2 The inner and outer envelopes shall

(a) bear the name and address of the Bidder;

(b) be addressed to the Employer as provided in BDS 22.1; and

(c) bear the specific identification of this bidding process indicated in the BDS 1.1.

21.3 The outer envelopes and the inner envelopes containing the Technical Bid shall bear a warning not to open before the time and date for the opening of Technical Bid, in accordance with ITB 25.1.

21.4 The inner envelopes containing the Price Bid shall bear a warning not to open until advised by the Employer in accordance with ITB 25.7.

21.5 If all envelopes are not sealed and marked as required, the Employer will assume no responsibility for the misplacement or premature opening of the Bid.

**22. Deadline for Submission of Bids**

22.1 Bids must be received by the Employer at the address and no later than the date and time indicated in the BDS.

22.2 The Employer may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Document in accordance with ITB 8, in which case all rights and obligations of the Employer and

Bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.

**23. Late Bids**

23.1 The Employer shall not consider any Bid that arrives after the deadline for submission of bids, in accordance with ITB 22. Any Bid received by the Employer after the deadline for submission of Bids shall be declared late, rejected, and returned unopened to the Bidder.

**24. Withdrawal, Substitution, and Modification of Bids**

24.1 A Bidder may withdraw, substitute, or modify its Bid – Technical or Price – after it has been submitted by sending a written notice, duly signed by an authorized representative, and shall include a copy of the authorization in accordance with ITB 20.2, (except that withdrawal notices do not require copies). The corresponding substitution or modification of the Bid must accompany the respective written notice. All notices must be

(a) prepared and submitted in accordance with ITB 20 and ITB 21 (except that withdrawal notices do not require copies), and in addition, the respective envelopes shall be clearly marked "WITHDRAWAL," "SUBSTITUTION," "MODIFICATION;" and

(b) received by the Employer prior to the deadline prescribed for submission of Bids, in accordance with ITB 22.

24.2 Bids requested to be withdrawn in accordance with ITB 24.1 shall be returned unopened to the Bidders.

24.3 No Bid may be withdrawn, substituted, or modified in the interval between the deadline for submission of Bids and the expiration of the period of bid validity specified by the Bidder on the Letters of Technical Bid and Price Bid or any extension thereof.

**25. Bid Opening**

25.1 The Employer shall open the Technical Bids in public at the address, on the date, and time specified in the BDS in the presence of Bidders` designated representatives and anyone who choose to attend. Any specific electronic bid opening procedures required if electronic bidding is permitted in accordance with ITB 21.1, shall be as specified in the BDS. The Price Bids will remain unopened and will be held in custody of the Employer until the specified time of their opening. If the Technical Bid and Price Bid are submitted together in one envelope, the Employer may reject the entire Bid. Alternatively, the Price Bid may be immediately resealed for later evaluation.

25.2 First, envelopes marked "WITHDRAWAL" shall be opened and read out and the envelope with the corresponding Bid shall not be opened, but returned to the Bidder. No bid withdrawal shall be permitted unless the corresponding withdrawal notice contains a valid authorization to request the withdrawal and is read out at bid opening.

25.3 Second, outer envelopes marked "SUBSTITUTION" shall be opened. The inner envelopes containing the Substitution Technical Bid and/or Substitution Price Bid shall be exchanged for the corresponding envelopes being substituted, which are to be returned to the Bidder unopened. Only the Substitution Technical Bid, if any, shall be opened, read out, and recorded. Substitution Price Bid will remain unopened in

accordance with ITB 25.1. No envelope shall be substituted unless the corresponding substitution notice contains a valid authorization to request the substitution and is read out and recorded at bid opening.

25.4 Next, outer envelopes marked “MODIFICATION” shall be opened. No Technical Bid and/or Price Bid shall be modified unless the corresponding modification notice contains a valid authorization to request the modification and is read out and recorded at the opening of Technical Bids. Only the Technical Bids, both Original as well as Modification, are to be opened, read out, and recorded at the opening. Price Bids, both Original and Modification, will remain unopened in accordance with ITB 25.1.

25.5 All other envelopes holding the Technical Bids shall be opened one at a time, and the following read out and recorded:

(a) the name of the Bidder;

(b) whether there is a modification or substitution;

(c) the presence of a bid security or a Bid-Securing Declaration, if required; and

(d) any other details as the Employer may consider appropriate.

Only Technical Bids and alternative Technical Bids read out and recorded at bid opening shall be considered for evaluation. Unless otherwise specified in the BDS, all pages of the Letter of Technical Bid are to be initialed by at least three representatives of the Employer attending the bid opening. No Bid shall be rejected at the opening of Technical Bids except for late bids, in accordance with ITB 23.1.

25.6 The Employer shall prepare a record of the opening of Technical Bids that shall include, as a minimum, the name of the Bidder and whether there is a withdrawal, substitution, or modification; alternative proposals; and the presence or absence of a bid security or a Bid-Securing Declaration, if one was required. The Bidders’ representatives who are present shall be requested to sign the record. The omission of a Bidder’s signature on the record shall not invalidate the contents and effect of the record. A copy of the record shall be distributed to all Bidders who submitted Bids on time, and posted online when electronic bidding is permitted.

25.7 At the end of the evaluation of the Technical Bids, the Employer will invite bidders who have submitted substantially responsive Technical Bids and who have been determined as being qualified for award to attend the opening of the Price Bids. The date, time, and location of the opening of Price Bids will be advised in writing by the Employer. Bidders shall be given reasonable notice for the opening of Price Bids.

25.8 The Employer will notify Bidders in writing who have been rejected on the grounds of their Technical Bids being substantially nonresponsive to the requirements of the Bidding Document and return their Price Bids unopened.

25.9 The Employer shall conduct the opening of Price Bids of all Bidders who submitted substantially responsive Technical Bids, in the presence

of Bidders` representatives who choose to attend at the address, on the date, and time specified by the Employer. The Bidder's representatives who are present shall be requested to sign a register evidencing their attendance.

25.10 All envelopes containing Price Bids shall be opened one at a time and the following read out and recorded:

(a) the name of the Bidder;

(b) whether there is a modification or substitution;

(c) the Bid Prices, including any discounts and alternative offers; and

(d) any other details as the Employer may consider appropriate.

Only Price Bids, discounts, and alternative offers read out and recorded during the opening of Price Bids shall be considered for evaluation. Unless otherwise specified in the BDS, all pages of the Letter of Price Bid and Schedules are to be initialed by at least three representatives of the Employer attending the bid opening.No Bid shall be rejected at the opening of Price Bids.

25.11 The Employer shall prepare a record of the opening of Price Bids that shall include, as a minimum, the name of the Bidder, the Bid Price (per lot if applicable), any discounts, and alternative offers. The Bidders' representatives who are present shall be requested to sign the record. The omission of a Bidder's signature on the record shall not invalidate the contents and effect of the record. A copy of the record shall be distributed to all Bidders who submitted Bids on time, and posted online when electronic bidding is permitted.

## E. Evaluation and Comparison of Bids

**26. Confidentiality**

26.1 Information relating to the examination, evaluation, comparison, and post qualification of Bids and recommendation of contract award, shall not be disclosed to Bidders or any other persons not officially concerned with such process until information on Contract award is communicated to all Bidders.

26.2 Any attempt by a Bidder to influence the Employer in the evaluation of the Bids or Contract award decisions may result in the rejection of its Bid.

26.3 Notwithstanding ITB 26.2, from the time of bid opening to the time of Contract award, if any Bidder wishes to contact the Employer on any matter related to the bidding process, it may do so in writing.

**27. Clarification of Bids**

27.1 To assist in the examination, evaluation, and comparison of the Technical and Price Bids, the Employer may, at its discretion, ask any Bidder for a clarification of its Bid. Any clarification submitted by a Bidder that is not in response to a request by the Employer shall not be considered. The Employer's request for clarification and the response shall be in writing. No change in the substance of the Technical Bid or prices in the Price Bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Price Bids, in accordance with ITB 33.

27.2 If a Bidder does not provide clarifications of its Bid by the date and time set in the Employer's request for clarification, its Bid may be rejected.

**28. Deviations, Reservations, and Omissions**

28.1 During the evaluation of bids, the following definitions apply:

(a) "Deviation" is a departure from the requirements specified in the Bidding Document;

(b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document; and

(c) "Omission" is the failure to submit part or all of the information or documentation required in the Bidding Document.

**29. Examination of Technical Bids**

29.1 The Employer shall examine the Technical Bid to confirm that all documents and technical documentation requested in ITB 11.2 have been provided, and to determine the completeness of each document submitted.

29.2 The Employer shall confirm that the following documents and information have been provided in the Technical Bid. If any of these documents or information is missing, the offer shall be rejected.

(a) Letter of Technical Bid;

(b) written confirmation of authorization to commit the Bidder;

(c) Bid Security or Bid-Securing Declaration, if applicable; and

(d) Technical Proposal in accordance with ITB 16.

**30. Responsiveness of Technical Bid**

30.1 The Employer's determination of a Bid's responsiveness is to be based on the contents of the Bid itself, as defined in ITB 11.

30.2 A substantially responsive Technical Bid is one that meets the requirements of the Bidding Document without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that,

(a) if accepted, would:

(i) affect in any substantial way the scope, quality, or performance of the Works specified in the Contract; or

(ii) limit in any substantial way, inconsistent with the Bidding Document, the Employer's rights or the Bidder's obligations under the proposed Contract; or

(b) if rectified, would unfairly affect the competitive position of other Bidders presenting substantially responsive Bids.

30.3 The Employer shall examine the technical aspects of the Bid submitted in accordance with ITB 16, Technical Proposal, in particular, to confirm that all requirements of Section 6 (Employer's Requirements) have been met without any material deviation, reservation, or omission.

30.4 If a Bid is not substantially responsive to the requirements of the Bidding Document, it shall be rejected by the Employer and may not

subsequently be made responsive by correction of the material deviation, reservation, or omission.

**31. Nonmaterial Nonconformities**

31.1 Provided that a Bid is substantially responsive, the Employer may waive any nonconformities in the Bid that do not constitute a material deviation, reservation, or omission.

31.2 Provided that a Technical Bid is substantially responsive, the Employer may request that the Bidder submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities in the Technical Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any aspect of the Price Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.

31.3 Provided that a Technical Bid is substantially responsive, the Employer shall rectify quantifiable nonmaterial nonconformities related to the Bid Price. To this effect, the Bid Price shall be adjusted, for comparison purposes only, to reflect the price of a missing or non-conforming item or component. The adjustment shall be made using the method indicated in Section 3 (Evaluation and Qualification Criteria).

**32. Qualification of the Bidder**

32.1 The Employer shall determine to its satisfaction during the evaluation of Technical Bids whether Bidders meet the qualifying criteria specified in Section 3 (Evaluation and Qualification Criteria).

32.2 The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB 17.1.

32.3 An affirmative determination shall be a prerequisite for the opening and evaluation of a Bidder's Price Bid. A negative determination shall result into the disqualification of the Bid, in which event the Employer shall return the unopened Price Bid to the Bidder.

**33. Correction of Arithmetical Errors**

33.1 During the evaluation of Price Bids, the Employer shall correct arithmetical errors on the following basis:

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

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

(c) If there is a discrepancy between the bid price in the Summary of Bill of Quantities and the bid amount in item (c) of the Letter of Price Bid, the bid price in the Summary of Bill of Quantities will prevail and the bid amount in item (c) of the Letter of Price Bid will be corrected.

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

33.2 If the Bidder that submitted the lowest evaluated bid does not accept the correction of errors, its Bid shall be disqualified and its bid security may be forfeited or its Bid-Securing Declaration executed.

**34. Conversion to Single Currency**

34.1 For evaluation and comparison purposes, the currency(ies) of the Bid shall be converted into a single currency as specified in the BDS.

**35. Margin of Preference**

35.1 Unless otherwise specified in the BDS, a margin of preference shall not apply.

**36. Evaluation of Price Bids**

36.1 The Employer shall use the criteria and methodologies listed in this Clause. No other evaluation criteria or methodologies shall be permitted.

36.2 To evaluate the Price Bid, the Employer shall consider the following:

(a) the bid price, excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities for admeasurement contracts, or Schedule of Prices for lump sum contracts, but including Day work items, where priced competitively;

(b) price adjustment for correction of arithmetic errors in accordance with ITB 33.1;

(c) price adjustment due to discounts offered in accordance with ITB 14.4;

(d) converting the amount resulting from applying (a) to (c) above, if relevant, to a single currency in accordance with ITB 34;

(e) adjustment for nonconformities in accordance with ITB 31.3; and

(f) application of all the evaluation factors indicated in Section 3 (Evaluation and Qualification Criteria).

36.3 The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in bid evaluation.

36.4 If this Bidding Document allows Bidders to quote separate prices for different contracts, and to award multiple contracts to a single Bidder, the methodology to determine the lowest evaluated price of the contract combinations, including any discounts offered in the Letter of Price Bid, is specified in Section 3 (Evaluation and Qualification Criteria).

36.5 If the Bid for an admeasurement contract, which results in the lowest Evaluated Bid Price, is seriously unbalanced, front loaded or substantially below updated estimates in the opinion of the Employer, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, taking into

consideration the schedule of estimated Contract payments, the Employer may 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.

**37. Comparison of Bids**

37.1 The Employer shall compare all substantially responsive Bids to determine the lowest evaluated Bid, in accordance with ITB 36.2.

**38. Employer's Right to Accept Any Bid, and to Reject Any or All Bids**

38.1 The Employer reserves the right to accept or reject any Bid, and to annul the bidding process and reject all Bids at any time prior to contract award, without thereby incurring any liability to Bidders. In case of annulment, all Bids submitted and specifically, bid securities, shall be promptly returned to the Bidders.

## F. Award of Contract

**39. Award Criteria**

39.1 The Employer shall award the Contract to the Bidder whose offer has been determined to be the lowest evaluated Bid and is substantially responsive to the Bidding Document, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.

**40. Notification of Award**

40.1 Prior to the expiration of the period of bid validity, the Employer shall notify the successful Bidder, in writing, that its Bid has been accepted.

40.2 At the same time, the Employer shall also notify all other Bidders of the results of the bidding. The Employer will publish in an English language newspaper or well-known freely accessible website the results identifying the bid and lot numbers and the following information: (i) name of each Bidder who submitted a Bid; (ii) bid prices as read out at bid opening; (iii) name and evaluated prices of each Bid that was evaluated; (iv) name of bidders whose bids were rejected and the reasons for their rejection; and (v) name of the winning Bidder, and the price it offered, as well as the duration and summary scope of the contract awarded. After publication of the award, unsuccessful Bidders may request in writing to the Employer for a debriefing seeking explanations on the grounds on which their Bids were not selected. The Employer shall promptly respond in writing to any unsuccessful Bidder who, after publication of contract award, requests a debriefing.

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

**41. Signing of Contract**

41.1 Promptly after notification, the Employer shall send the successful Bidder the Contract Agreement.

41.2 Within 28 days of receipt of the Contract Agreement, the successful Bidder shall sign, date, and return it to the Employer.

**42. Performance Security**

42.1 Within 28 days of the receipt of notification of award from the Employer, the successful Bidder shall furnish the performance security in accordance with the Conditions of Contract, subject to ITB 36.5, using

for that purpose the Performance Security Form included in Section 9 (Contract Forms), or another form acceptable to the Employer.

42.2 Failure of the successful Bidder to submit the above-mentioned Performance Security or to sign the Contract Agreement shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security or execution of the Bid-Securing Declaration. In that event the Employer may award the Contract to the next lowest evaluated Bidder whose offer is substantially responsive and is determined by the Employer to be qualified to perform the Contract satisfactorily.

42.3 The above provision shall also apply to the furnishing of a domestic preference security, if so required.

# Section 2: Bid Data Sheet

# Section 2 - Bid Data Sheet

## A. General

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| **ITB 1.1** | The number of the Invitation for Bids (IFB) is: BMGF/NCB/03 |
| **ITB 1.1** | **The Employer is**: Executing Agency, the Local Self Government Department of the State of Rajasthan. The authorized representative of the Employer is Project Director, Rajasthan Urban Infrastructure Development Project or its successor agency. |
| **ITB 1.1** | **The name of the bidding process is**: Construction, Commissioning and Operation of Fecal Sludge treatment plant of capacity 20 m3/day at Phulera<br>The identification number of the NCB bidding process is: BMGF/Phulera/01<br>The number and identification of lots comprising this NCB bidding process is: 1 |
| **ITB 2.1** | Financing for the proposed sub project is from the Bill and Melinda Gates Foundation (BMGF). The Grant Recipient is: Government of Rajasthan, India. |
| **ITB 2.1** | The name of the Project is: Rajasthan Urban Sector Development Program (RUSDP) |

## B. Contents of Bidding Documents

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| **ITB 6.1** | The Bidding Document is in Two Parts. Part 1 is for Technical bid. Part 1 is in two Volumes. Volume 1 includes Sections 1 to 9. Volume 2 includes Drawings.<br><br>Part 2 is for Price Bid which includes Price Bid form, Preamble to Bill of Quantities and Bill of Quantities. |
| **ITB 6.3** | The Bidding Document, its addenda and other documents and information arising out of or related to the requirements of the Bidding Document will be posted on e-procurement website (eproc.rajasthan.gov.in). |
| **ITB 6.5** | **Standard Publications of RUIDP**<br>The soft copy of publications of RUIDP on (i) Standard Specification and (ii) Quality Assurance and Quality Control (QAQC) are available on RUIDP website (www.ruidp.rajasthan.gov.in) and will form part of the contract. |
| **ITB 7.1** | For clarifications, bidder will submit the written queries to RUIDP through email, fax, courier or deliver personally. Written response to queries will be published on e-proc website<br><br>For **clarification purposes** only, the Employer's address is:<br>Addl. Project Director,<br>Rajasthan Urban Infrastructure Development Project, |

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| | AVS Building, 1st Floor, Jawahar Circle,<br>JLN Marg, Malviya Nagar,<br>JAIPUR – 302017, India.<br>Telephone: +91 141 2548404.<br>Facsimile: +91 141 2721919<br><br>Requests for clarification should be received by the Employer no later than 14 Days from deadline for receipt of ids. |
| **ITB 7.4** | A pre-bid meeting shall take place at the following date, time, and location:<br>**Date : ……., 2017**<br>**Time:** ……hrs<br>**Place:** Conference hall,<br>Office of Project Director,<br>Rajasthan Urban Infrastructure Development Project,<br>AVS Building, 1st Floor, Jawahar Circle,<br>JLN Marg, Malviya Nagar,<br>JAIPUR – 302017, India.<br><br>Telephone: 91141 2721966. |
| **ITB 7.4** | *Bidders are advised to either attend the pre-bid meeting, or to submit their queries by fax letter to Project Director or by e-mail to*. mail.ruidp@rajasthan.gov.in. There will be no online pre-bid meeting.<br><br>A site visit shall be organized by the Employer at the following date, time:<br>**Date : ……., 2017**<br>**Time:** …….hrs<br><br>Meeting point in the town will be informed to the bidders. |
| **ITB 8.2** | Addendum to the bid document will be notified on web sites www.eproc.rajasthan.gov.in in e-bidding process, it is not possible to have correspondence in writing with the bidders who have downloaded the bid documents; Bidders are informed to check the portal at regular intervals for any such amendments to the Bid document. Employer will not be held responsible, if bidder did not download the addendum from the website. |

## C. Preparation of Bids

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| **ITB 10.1** | The language of the Bid is: **English** |
| **ITB 11.2** | Technical bid shall be submitted in two Envelopes. **Envelope – "A"** and **Envelope – "B"** and shall comprise the following:<br><br>**Envelope "A" - Bidder shall upload scanned copies of the following:**<br>• Letter of Technical Bid<br>• Power of Attorney in original duly attested by Notary. In case of |

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| | partnership firm / limited company / group of companies, a power of attorney for the person authorised to sign shall be issued by all the partners.<br>• Cost of Bid document in form of Demand Draft (DD) for INR 5500/- issued in favor of Project Director, RUIDP, payable at Jaipur and RISL Fee in form of DD for Rs.1100/- in favor of MD, RISL, payable at Jaipur.<br>• Bid Security - Documentary proof of Bid Security as per ITB 19 of ITB.<br>• If applicable, a valid Joint Venture (JV) agreement legally notarized or attested by an appropriate authority, specifying the work responsibility and financial stakes of each of Joint venture partners under the contract.<br><br>**Documents submitted in envelope 'A' of eproc website must be submitted in original in office of the Project Director, Rajasthan Urban Infrastructure Development Project, AVS Building, 1st Floor, JawaharCircle, JLN Marg, Malviya Nagar, Jaipur - 302 017 (Rajasthan) Tel: 0141-2721966 by the deadline indicated in IFB (upto …… hours on ….., 2017)**<br><br>**Except for the RISL fee and cost of the bidding document, failure to submit original copy of the above specified documents in Envelope "A" on or before the deadline may result to rejection of the bidder's bid by the Employer.**<br><br>**Envelope – "B" will contain following:**<br>• Documentary evidence in accordance with ITB 17 establishing the Bidder's qualifications to perform the contract;<br>• Technical Proposal in accordance with ITB 16;<br><br>*The Technical bid shall be uploaded in envelope marked Envelope – A & B on eproc website.* |
| **11.3** | Price bid comprising scanned copies of letter of price bid and completed price schedule and others as applicable shall be submitted on line at the website www.eproc.rajasthan.gov in and shall be digitally signed.<br><br>**Eproc** is the short name of www.eproc.rajasthan.gov.in**,** a website established by Government of Rajasthan for e tendering purposes.<br><br>*The Technical bid, shall be uploaded in envelope marked Envelope – 2* |
| **ITB 13** | Alternative bids shall not be permitted. |
| **ITB 14.5** | The prices quoted by the Bidder shall be fixed during the performance of the Contract. No price adjustment will be paid. |
| **ITB 15.1** | The prices shall be quoted by the bidder and shall be paid in: Indian Rupees (INR). |
| **ITB 18.1** | The bid validity period shall be 120 (One Hundred Twenty) days. |
| **ITB 19.1** | The Bidder shall furnish a bid security in the amount of INR 6,00,000/- (Rupees |

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| | Six lacs). |
| **ITB 19.2** | Clause Not Applicable as bid security has been demanded and not a declaration. |
| **ITB 19.3** | Replace ITB 19.3 with the following: -<br>The bid security shall be, at the Bidder's option, in any of the following forms:<br>a. an unconditional bank guarantee in the name of Project Director, RUIDP, Jaipur; or<br>b. fixed deposit receipt pledged in favour of Project Director, RUIDP, Jaipur.<br>c. Demand draft or Banker's cheque<br>It shall be from a reputable source from an eligible country as described in Section 5 (Eligible Countries)<br>In the case of a bank guarantee, the bid security shall be submitted using the Bid Security Form included in Section 4 (Bidding Forms). The form must include the complete name of the Bidder. The bid security shall be valid for a period of twenty eight (28) days beyond the original validity period of the bid, or beyond any period of extension if requested under ITB 18.2.<br>The bank guarantee shall be issued by a reputable bank located in the Employer's country, which may include scheduled banks or nationalized banks, or by a foreign reputable bank outside the Employer's country, through a correspondent bank located in the Employer's country, which may include banks in Jaipur, to make it enforceable. |
| **ITB 19.4** | Any bid not accompanied by an irrevocable and callable bid security shall be rejected by the Employer as nonresponsive. However, if a bidder submits a bid security that deviates in form, amount, and/or period of validity, the Employer shall request the Bidder to submit a compliant bid security within 15 days of receiving such a request. Failure to provide a compliant bid security within the prescribed period of receiving such a request shall cause the rejection of the Bid. |
| **ITB 20.1** | In addition to the original Bid, the number of copies is: Not Applicable |
| **ITB 20.2** | The written confirmation of authorization to sign on behalf of the Bidder shall consist of: **Power of Attorney** |

## D. Submission and Opening of Bids

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| **ITB 21.1** | Replace the paragraph with following:<br>Bidders will submit their bids electronically only. |
| **ITB 21.1 (b)** | "E-Tendering" means submission of a digitally signed bid (by a valid digital certificate which has been issued by a licensed Certifying Agency, as approved by Controller of Certifying Agency) which is stored in Time Stamped electronic sealed tender box. |

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| | Bidders, who wish to participate in the bidding process, shall have to procure Digital Certificate as per Information Technology Act 2000 using which they can sign their electronic bids. Bidders can procure the same from any CCA approved certifying agency. Online bids will have to be digitally signed and submitted in a Time stamped electronic sealed tender box on www.eproc.rajasthan.gov.in.<br><br>On the e-Procurement portal, a bidder is given an option to specify his areas of interest under maximum 10 different categories of activities (product category) and these are stored. When IFB is published, based on the selection by the bidders, the mails are automatically sent to the bidders by the system at the end of day. Thus the bidder gets information on opportunities, IFBs, for the product category selected by the bidder. In case, a bidder selects and keeps any tender as his favourite tender, All clarifications, corrigendum, Addendums etc are informed by mail and /or SMS to the bidder automatically.<br><br>The e-procurement system will scan the uploaded documents for virus and if a document uploaded by the bidder is found to have virus, the system shall reject the uploaded file. Bidders shall take due care to ensure that the documents uploaded by them in e-procurements system are virus free. Employer shall not be liable for such rejections.<br><br>The downloaded Bid forms shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder<br><br>The bidders are required to download the biding forms (section 4), print the forms, fill them, scan them and upload in envelope - A at the portal. The information on eligibility and qualification provided in the bidding forms only will be considered. Bidder will also provide reference of supporting documents provided in its support in the bidding forms.<br><br>Employer shall not accept any responsibility for failures or breakdowns for systems other than in those systems strictly within the control of Employer and its e-Procurement service provider. However a helpline center is provided to help the bidders by the e-Procurement service provider.<br><br>Bidders shall take due care to ensure purchase of Digital Signature Certificates requisite for tender submission in the e-Procurement portal, availability of internet connectivity and requisite client software.<br><br>Bidders are informed to get acquainted with the bid submission process in e-Procurement system of the State Government of Rajasthan by contacting RajComp Info Services Limited (RISL). RISL conducts training sessions for prospective bidders at regular intervals. Refer to http://www.eproc.rajasthan.gov.in for further details.<br><br>Online submissions shall be received into an electronic bid box and maintained to high standards of security for long-term record keeping and audit. |
| | The bidders will be provided two slots in the portal for uploading their technical forms. Bidders are advised to upload the documents in pdf form, If size exceeds 25 MB, they can zip and upload it. The technical bid submissions including the technical forms (Section 4), financial statements, documents related to |

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| | qualification requirements shall be submitted in pdf format only. Bidders are informed to upload sensitive documents under the "Non-statutory" documents category. Along this, the bidder shall submit the scanned copies of the RISL fee, cost of Bid Document fee, copy of Bid Security etc.<br><br>Bidders shall submit their response to this bid electronically vide the e-Procurement system of the State Government of Rajasthan: http://www.eproc.rajasthan.gov.in.<br><br>The price bids are to be submitted electronically. The bidders are advised to download the excel sheets from the portal and fill their rates in excel sheet. Bidder shall not modify the BOQ like Item Description, quantity, etc and should not rename the excel sheet. Bidder can download excel sheet on their computer and fill it and then upload it or can directly fill online the price bid. The bidder shall submit the Price Bids on line on e-procurement web site.<br><br>Bidders have the provision of submitting, modifying or withdrawing bids electronically before the bid submission deadline. Electronic acknowledgement of any of these actions with a time stamp is provided to the Bidder by the system.<br><br>Bidders are solely responsible for safe keeping of their Digital Signature Certificate (DSC). If the Digital Signature Certificate is lost, bidders may choose to send a mail from their registered login e-mail address in the company's letter head to RUIDP and RajCOMP Info Services Ltd (RISL). The application administrator may at his discretion choose to inactivate the lost (old) DSC, thereby allowing the bidder to register a new DSC**.**<br><br>After bid opening, participating bidders can view technical bid submitted by other bidder by clicking on *"Bid Opening (Live)"* link on the left side.<br><br>Bidders can view the technical bid of other bidder online from their respective logins under the link "Bid Opening (Live)". Documents uploaded by bidders during bid submission under the non-statutory link cannot be viewed by the other bidders. Bidders are herewith informed to load sensitive documents there may be under the non-statutory link.<br><br>"Accept" status of a bidder's document as shown to the bidder implies that RUIDP has downloaded the document and shall not be construed as "Acceptance" of contents of the document.<br><br>During evaluation, RUIDP reserves the right to verify original copies of scanned documents uploaded by bidders. RUIDP may seek additional documentary evidence on their technical proposals, which the bidders shall provide either online using the e-Procurement or in manual form. |
| **ITB 22.1** | **Bids shall be submitted electronically on e-Procurement site http://www.eproc.rajasthan.gov.in, not later than …….hours on ……, 2017**<br><br>Bid submission timelines will be defined as per the e-Procurement server clock only. |
| **ITB 25** | Delete ITB 25.1, 25.2, 25.3, 25.4 and 25.5 and replace with the following:<br><br>1. The Employer shall open the technical bids online in public in the presence of Bidders or designated representative of the Bidders, who chose to attend |

| | |
|---|---|
| | at:-<br>Date : ……..,2017<br>Time:……..<br>Location: Office of the Project Director, RUIDP, AVS Building, 1st Floor, Jawahar Circle, JLN Marg, Malviya Nagar, JAIPUR – 302017, India<br>Telephone: +91 0141 2721966<br><br>Bid opening timelines will be defined as per the e-Procurement server clock only.<br><br>2. Bids are electronically opened in the presence of at least two authorized Bid Openers. In first stage, Envelope '1A' of the tenders, will be opened. The bidders' names, the presence (or absence) of Bid Security, Tender Fee and RISL Fee, will be announced by the Tender Opening Committee at the opening. Then the Envelope '1B' of technical proposals will be opened and evaluated.<br><br>3. The technical bids recorded and opened at the time of opening shall be considered for evaluation.<br><br>4. The Price Bids will remain unopened in the eproc website and will remain encrypted, until the specified time of its opening.<br><br>5. The letter of technical bid shall be initialed by two representatives of the employer attending the bid opening.<br><br>6. Bid opening date specified in the e-Procurement site shall be taken as the final date. Employer reserves the right to open bids on or after the announced bid opening date and time specified in the e-Procurement site: http://www.eproc.rajasthan.gov.in |
| **ITB 25.10** | The Letter of Price Bid and Bill of Quantifies shall be initialed by at least 2 representative of the Employer attending Bid opening. |

## E. Evaluation and Comparison of Bids

| | |
|---|---|
| **ITB 27.1** | Communication during bid evaluation for the purpose of clarification will be done electronically with the normal restrictions against modification of the substance and price of the bid. There is a separate heading of Clarifications on the portal and mode will be only through the e-procurement site. The Provision is available in the software and can be enabled, if required. If enabled, the clarifications can be obtained online and all logs of such online communications through the application are stored in the system. |
| **ITB 34.1** | Not Applicable. |

| | |
|---|---|
| **ITB 35.1** | A margin of preference shall not apply. |

# Section 3 - Evaluation and Qualification Criteria

# Section 3 - Evaluation and Qualification Criteria

## Table of Criteria

# 1. Evaluation

In addition to the criteria listed in ITB 36.2 (a) – (e), other relevant factors are as follows:

## 1.1 Adequacy of Technical Proposal

Evaluation of the Bidder's Technical Proposal will include an assessment of the Bidder's technical capacity to mobilize key equipment and personnel for the contract consistent with its proposal regarding work methods, scheduling, and material sourcing in sufficient detail and fully in accordance with the requirements stipulated in Section 6 (Employer's Requirements).

Non-compliance with equipment and personnel requirements described in Section 6 (Employer's Requirements) shall not normally be a ground for bid rejection, and such noncompliance will be subject to clarification during bid evaluation and rectification prior to contract award.

## 1.2 Completion Time

An alternative Completion Time, if permitted under ITB 13.2, will be evaluated as follows:

Not Permitted

## 1.3 Technical Alternatives

Technical alternatives, if permitted under ITB 13.4, will be evaluated as follows:

Not Permitted

## 1.4 Quantifiable Nonconformities and Omissions

Subject to ITB 14.2 and ITB 36.2, the evaluated cost of quantifiable nonconformities including omissions, is determined as follows:

Pursuant to ITB 31.3, the cost of all quantifiable nonmaterial nonconformities shall be evaluated, including omissions in Daywork where competitively priced but excluding omission of prices in the Bill of Quantities. The Employer will make its own assessment of the cost of any nonmaterial nonconformities and omissions for the purpose of ensuring fair comparison of bids.

## 1.5 Margin of Preference

If a margin of preference shall apply under ITB 35.1, the procedure will be as follows:

Not Applicable.

## 1.6 Multiple Contracts

Not Applicable.

# 2. Qualification

It is the legal entity or entities comprising the Bidder, and not the Bidder's parent companies, subsidiaries, or affiliates, that must satisfy the qualification criteria described below.

## 2.1 Eligibility

| Criteria | Compliance Requirements | | | | Documents |
|---|---|---|---|---|---|
| Requirement | Single Entity | Joint Venture | | | Submission Requirements |
| | | All Partners Combined | Each Partner | One Partner | |

### 2.1.1 Nationality

| | | | | | |
|---|---|---|---|---|---|
| Nationality in accordance with ITB Sub-clause 4.2. | must meet requirement | must meet requirement | must meet requirement | not applicable | Forms ELI –1; ELI –2 with attachments |

### 2.1.2 Conflict of Interest

| | | | | | |
|---|---|---|---|---|---|
| No conflicts of interest in accordance with ITB Sub-clause 4.3. | must meet requirement | must meet requirement | must meet requirement | not applicable | Letter of Technical Bid |

### 2.1.3 ADB Eligibility

| | | | | | |
|---|---|---|---|---|---|
| Not having been declared ineligible by ADB, as described in ITB Sub-clause 4.4. | must meet requirement | must meet requirement | must meet requirement | not applicable | Letter of Technical Bid |

### 2.1.4 Government-Owned Enterprise

| | | | | | |
|---|---|---|---|---|---|
| Bidder required to meet conditions of ITB Sub-clause 4.5. | must meet requirement | must meet requirement | must meet requirement | not applicable | Forms ELI -1, ELI - 2 with attachments |

### 2.1.5 United Nations Eligibility

| | | | | | |
|---|---|---|---|---|---|
| Not having been excluded by an act of compliance with a UN Security Council resolution in accordance with ITB Sub-clause 4.7. | must meet requirement | must meet requirement | must meet requirement | not applicable | Letter of Technical Bid |

## 2.2 Pending Litigation

Pending litigation and arbitration criterion shall apply.

### 2.2.1 Pending Litigation and Arbitration

| Criteria | Compliance Requirements | | | | Documents |
|---|---|---|---|---|---|
| Requirement | Single Entity | Joint Venture | | | Submission Requirements |
| | | All Partners Combined | Each Partner | One Partner | |
| All pending litigation and arbitration, if any, shall be treated as resolved against the Bidder and so shall in total not represent more than 50 percent of the Bidder's net worth calculated as the difference between total assets and total liabilities. | must meet requirement by itself or as partner to past or existing Joint Venture | not applicable | must meet requirement by itself or as partner to past or existing Joint Venture | not applicable | Form LIT - 1 |

## 2.3 Financial Situation

### 2.3.1 Historical Financial Performance

| Criteria | Compliance Requirements | | | | Documents |
|---|---|---|---|---|---|
| Requirement | Single Entity | Joint Venture | | | Submission Requirements |
| | | All Partners Combined | Each Partner | One Partner | |
| Submission of audited financial statements or, if not required by the law of the Bidder's country, other financial statements acceptable to the Employer, for the last 3 (three) years to demonstrate the current soundness of the Bidder's financial position. As a minimum, the Bidder's net worth for the last year, calculated as the difference between total assets and total liabilities should be positive. | must meet requirement | not applicable | must meet requirement | not applicable | Form FIN - 1 with attachments |
| Return on investment (ratio of annual profit before taxes and net worth) should be positive for at least 3 years in the last 5 years (FY 2012-13 to 2016-17). | must meet requirement | not applicable | must meet requirement | not applicable | Form FIN - 1 with attachments |

### 2.3.2 Average Annual Construction Turnover

| Criteria | Compliance Requirements | | | | Documents |
|---|---|---|---|---|---|
| Requirement | Single Entity | Joint Venture | | | Submission Requirements |
| | | All Partners Combined | Each Partner | One Partner | |
| Minimum average annual construction turnover of INR 45 million or its equivalent calculated as total certified payments received for contracts in progress or completed, within the last 3 (three) years. (Financial years 2017-16, 2016-15, 2015-14) | must meet requirement | must meet requirement | must meet 25% of the requirement | must meet 50% of the requirement | Form FIN - 2 |

Note: The present price level for turnover of the previous years' value shall be given weightage of 10% per year as follows:

| S. No | Financial Year | Weightage |
|---|---|---|
| (i) | 2015-16 | 1.00 |
| (ii) | 2014-15 | 1.10 |
| (iii) | 2013-14 | 1.21 |

### 2.3.3 Financial Resources

If the bid evaluation process and the decision for the award of the Contract takes more than one (1) year from the date of bid submission, Bidders shall be asked to resubmit their current contract commitments and latest information on financial resources supported by latest audited accounts/audited financial statements, or if not required by the law of the Bidder's country, other financial statements acceptable to the Employer, and the Bidders' financial capacity shall be reassessed on this basis.

| Criteria | Compliance Requirements | | | | Documents |
|---|---|---|---|---|---|
| Requirement | Single Entity | Joint Venture | | | Submission Requirements |
| | | All Partners Combined | Each Partner | One Partner | |
| The Bidder must demonstrate that it has the financial resources to meet | | | | | |
| (a) its current contract commitments, as defined in FIN-4 (Total Financial Requirements for Current Contract Commitments), plus | must meet requirement | not applicable | must meet requirement for its own contractual commitments | not applicable | Form FIN - 4 |
| (b) the requirements for the Subject Contract of INR 7 Million or its equivalent. | must meet requirement | must meet requirement | must meet[1]<br>25% (A) | must meet[2]<br>50% (B) | Form FIN – 3 and Form FIN - 4 |

Note:
1. Value (A) is to be carry forward and inserted in Form Fin-5B.
2. Value (B) is to be carry forward and inserted in Form Fin-5B.

## 2.4 Construction Experience

### 2.4.1 Contracts of Similar Size and Nature

| Criteria | Compliance Requirements | | | | Documents |
|---|---|---|---|---|---|
| Requirement | Single Entity | Joint Venture | | | Submission Requirements |
| | | All Partners Combined | Each Partner | One Partner | |
| Participation in at least two works which have been successfully or substantially completed* within the last 10 (ten) years (from 1st July 2007 to Bid submission date), where the value of the Bidder's participation in each successfully or substantially completed* work exceeds INR 24 Million or its equivalent. | must meet requirement | must meet requirement as follows:<br>Either one partner must meet requirement<br>Or<br>any two partners must each demonstrate one (1) successfully or substantially completed contract | not applicable | not applicable | Form EXP -1 |

*Substantially completed means (i) the contractor has completed the works but could not commission the same because of hindrances beyond the control of contractor; or (ii) the contractor has completed and commissioned the works at least for the amount required for qualification out of a large size contract.

### 2.4.2 Construction Experience in Key Activities

(May be complied with by Specialist Subcontractors. Employer shall require evidence of subcontracting agreement from the Bidder. Specialist Subcontractor is a specialist enterprise engaged for highly specialized processes which cannot be provided by the main Contractor.)

| Criteria | Compliance Requirements | | | | Documents |
|---|---|---|---|---|---|
| Requirement | Single Entity | Joint Venture | | | Submission Requirements |
| | | All Partners Combined | Each Partner | One Partner | |
| For the above or other contracts executed during the period stipulated in 2.4.1 above, a minimum construction experience in the following key activities: | must meet requirements | must meet requirements | not applicable | not applicable | Form EXP-2 |
| NA | | | | | |
| | | | | | |
| | | | | | |

# Section 4 - Bidding Forms

# Section 4 - Bidding Forms

## Table of Forms

# Letter of Technical Bid

---- on letterhead paper of the bidder ----

Date: .....

NCB No.: .....

Invitation for Bid No.: .....

To:

**The Project Director,**
Rajasthan Urban Infrastructure Development Project (RUIDP)
First Floor, AVS Building, Jawahar Circle,
JLN Marg, Malviya Nagar, Jaipur, Rajasthan

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB) 8.

(b) We offer to execute in conformity with the Bidding Documents the following Works: Construction, Commissioning and Operation of Fecal Sludge Treatment Plant of capacity 20 m3/day at Phulera.

(c) Our Bid consisting of the Technical Bid and the Price Bid shall be valid for a period of . . . . . days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

(d) Our firm, including any Subcontractors or Suppliers for any part of the Contract, have nationalities from eligible countries in accordance with ITB 4.2.

(e) We, including any Subcontractors or Suppliers for any part of the contract, do not have any conflict of interest in accordance with ITB 4.3.

(f) We are not participating, as a Bidder in more than one Bid in this bidding process in accordance with ITB 4.3(e), other than alternative offers submitted in accordance with ITB 13.

(g) Our firm, its affiliates or subsidiaries, including any Subcontractors or Suppliers for any part of the contract, has not been declared ineligible by ADB, under the Employer's country laws or official regulations or by an act of compliance with a decision of the United Nations Security Council.

(h) We are not a government-owned enterprise.

(i) We agree to permit ADB or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by ADB.

(j) If our Bid is accepted, we commit to mobilizing key equipment and personnel in accordance with the requirements set forth in Section 6 (Employer's Requirements) and our technical proposal, or as otherwise agreed with the Employer.

Name .....

In the capacity of .....

Signed .....

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

Date .....

# Letter of Price Bid

**(Price Bid form is available in Part 2 and to be submitted in Price Bid – Part 2)**

# Bid Security

## Bank Guarantee

*Bank's name, and address of issuing branch or office*[1]

**Beneficiary: Project Director, RUIDP, JLN Marg, Jaipur, Rajasthan**

**Date:**.....

**Bid Security No.:**.....

We have been informed that . . . . . *name of the bidder.* . . . . (hereinafter called "the Bidder") has submitted to you its bid dated . . . . . (hereinafter called "the Bid") for the execution of . . . . . *name of contract* . . . . . under Invitation for Bids No. . . . . (“the IFB”).

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

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

(a) has withdrawn its Bid during the period of bid validity specified by the Bidder in the Letter of Technical Bid and Letter of Price Bid; or

(b) does not accept the correction of errors in accordance with the Instructions to Bidders (hereinafter “the ITB”); or

(c) having been notified of the acceptance of its Bid by the Employer during the period of bid validity, (i) fails or refuses to execute the Contract Agreement, or (ii) fails or refuses to furnish the Performance Security, in accordance with the ITB, or (iii) fails or refuses to furnish the domestic preference security, if required.

This guarantee will expire (a) if the Bidder is the successful Bidder, upon our receipt of copies of the Contract Agreement signed by the Bidder and the Performance Security issued to you upon the instruction of the Bidder; and (b) if the Bidder is not the successful Bidder, upon the earlier of (i) our receipt of a copy your notification to the Bidder of the name of the successful Bidder, or (ii) 28 days after the expiration of the Bidder’s bid.

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

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458.[2]

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

**-- Note --**

*In case of a joint venture, the bid security must be in the name of all partners to the joint venture that submits the bid.*

[1] All italicized text is for use in preparing this form and shall be deleted from the final document.

[2] Or 758 as applicable.

# Technical Proposal

## Personnel

**Form PER – 1: Proposed Personnel**
Bidder should provide the details of the proposed personnel and their experience record in the relevant Information Forms below for each candidate:

| | |
|---|---|
| **1.** | **Title of position*** |
| | **Name** |
| **2.** | **Title of position*** |
| | **Name** |
| **3.** | **Title of position*** |
| | **Name** |
| **4.** | **Title of position*** |
| | **Name** |
| **etc.** | **Title of position*** |
| | **Name** |

**-- Note --**

**As listed in Section 6 (Employer's Requirements).*

**Form PER – 2: Resume of Proposed Personnel**

The Bidder shall provide all the information requested below. Use one form for each position.

| | | |
|---|---|---|
| **Position** | | |
| **Personnel information** | **Name** | **Date of birth** |
| | **Professional qualifications** | |
| **Present employment** | **Name of employer** | |
| | **Address of employer** | |
| | **Telephone** | **Contact (manager / personnel officer)** |
| | **Fax** | **E-mail** |
| | **Job title** | **Years with present employer** |

Summarize professional experience in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

| From | To | Company / Project / Position / Relevant Technical and Management Experience |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

## Equipment

### Form EQU: Equipment

The Bidder shall provide adequate information and details to demonstrate clearly that it has the capability to meet the equipment requirements indicated in Section 6 (Employer's Requirements), using the Forms below. A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder.

| **Item of Equipment** | | |
|---|---|---|
| **Equipment Information** | **Name of manufacturer** | **Model and power rating** |
| | **Capacity** | **Year of manufacture** |
| **Current Status** | **Current location** | |
| | **Details of current commitments** | |
| **Source** | **Indicate source of the equipment**<br>☐ **Owned** ☐ **Rented** ☐ **Leased** ☐ **Specially manufactured** | |

Omit the following information for equipment owned by the Bidder.

| **Owner** | **Name of owner** | |
|---|---|---|
| | **Address of owner** | |
| | **Telephone** | **Contact name and title** |
| | **Fax** | **Telex** |
| **Agreements** | **Details of rental / lease / manufacture agreements specific to the project** | |
| | | |
| | | |

## Site Organization

## Method Statement

## Work plan:

## Mobilization Schedule

## Construction Schedule

# Bidders Qualification

To establish its qualifications to perform the contract in accordance with Section 3 (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding Information Sheets included hereunder.

**Form ELI - 1: Bidder's Information Sheet**

| Bidder's Information | |
|---|---|
| **Bidder's legal name** | |
| **In case of Joint Venture, legal name of each partner** | |
| **Bidder's country of constitution** | |
| **Bidder's year of constitution** | |
| **Bidder's legal address in country of constitution** | |
| **Bidder's authorized representative** (name, address, telephone numbers, fax numbers, e-mail address) | |

**Attached are copies of the following documents.**

- ❑ 1. In case of single entity, articles of incorporation or constitution of the legal entity named above, in accordance with ITB 4.1 and ITB 4.2.
- ❑ 2. Authorization to represent the firm or Joint Venture named above, in accordance with ITB 20.2.
- ❑ 3. In case of Joint Venture, letter of intent to form Joint Venture or Joint Venture agreement, in accordance with ITB 4.1.
- ❑ 4. In case of a government-owned enterprise, any additional documents not covered under 1 above required to comply with ITB 4.5.

**Form ELI - 2: Joint Venture Information Sheet**

Each member of the Joint Venture and Specialist Subcontractor must fill out this form separately.

| Joint Venture / Specialist Subcontractor Information | |
|---|---|
| **Bidder's legal name** | |
| **Joint Venture Partner's or Specialist Subcontractor's legal name** | |
| **Joint Venture Partner's or Specialist Subcontractor's country of constitution** | |
| **Joint Venture Partner's or Specialist Subcontractor's year of constitution** | |
| **Joint Venture Partner's or Specialist Subcontractor's legal address in country of constitution** | |
| **Joint Venture Partner's or Specialist Subcontractor's authorized representative information**<br>(name, address, telephone numbers, fax numbers, e-mail address) | |
| **Attached are copies of the following documents.**<br>❑ 1. Articles of incorporation or constitution of the legal entity named above, in accordance with ITB 4.1 and ITB 4.2.<br>❑ 2. Authorization to represent the firm named above, in accordance with ITB 20.2.<br>❑ 3. In the case of government-owned enterprise, documents establishing legal and financial autonomy and compliance with commercial law, in accordance with ITB 4.5. | |

Specialist Subcontractor is a specialist enterprise engaged for highly specialized processes that cannot be provided by the main Contractor.

**Form LIT – 1:Pending Litigation and Arbitration**

Each Bidder must fill out this form if so required under Criterion 2.2 of Section 3 (Evaluation and Qualification Criteria) to describe any pending litigation or arbitration formally commenced against it.

In case of joint ventures, each Joint Venture Partner must fill out this form separately, and provide the Joint Venture Partner name below:

Joint Venture Partner: _____

**Pending Litigation and Arbitration**

**Choose one of the following:**

❑ No pending litigation and arbitration.

❑ Below is a description of all pending litigation and arbitration involving the Bidder (or each Joint Venture member if Bidder is a Joint Venture).

| Year | Matter in Dispute | Value of Pending Claim in INR Equivalent | Value of Pending Claim as a Percentage of Net Worth |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

**Form FIN - 1: Historical Financial Performance**

Each Bidder must fill out this form.

In case of joint ventures, each Joint Venture Partner must fill out this form separately, and provide the Joint Venture Partner name below:

Joint Venture Partner: _____

| Financial Data for Previous 3 Years [INREquivalent] | | |
|---|---|---|
| **Year 1:** | **Year 2:** | **Year 3:** |

**Information from Balance Sheet**

| | | | |
|---|---|---|---|
| **Total Assets (TA)** | | | |
| **Total Liabilities (TL)** | | | |
| **Net Worth = TA – TL** | | | |
| **Current Assets (CA)** | | | |
| **Current Liabilities (CL)** | | | |
| **Working Capital = CA - CL** | | | |

| | | |
|---|---|---|
| **Most Recent Working Capital** | | To be obtained for most recent year and carried forward to FIN-3 Line 1; in case of Joint Ventures, to the corresponding Joint Venture Partner's FIN-3. |

**Information from Income Statement**

| | | | |
|---|---|---|---|
| **Total Revenues** | | | |
| **Profits Before Taxes** | | | |
| **Profits After Taxes** | | | |
| **Return on Investment (ratio of Annual Profit Before Taxes and the Net Worth)** | | | |

❑ Attached are copies of financial statements (balance sheets including all related notes, and income statements) for the last 3 years, as indicated above, complying with the following conditions.

- Unless otherwise required by Section 3 of the Bidding Document, all such documents reflect the financial situation of legal entity or entities comprising the Bidder and not the Bidder's parent companies, subsidiaries, or affiliates.
- Historical financial statements must be audited by a certified accountant.
- Historical financial statements must be complete, including all notes to the financial statements.
- Historical financial statements must correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).

**Form FIN - 2: Average Annual Construction Turnover**

Each Bidder must fill out this form.

The information supplied should be the Annual Turnover of the Bidder or each member of a Joint Venture in terms of the amounts billed to clients for each year for work in progress or completed, converted to INR at the exchange rate at the end of the year reported. The exchange rate will be the reference exchange rate, published by the Reserved Bank of India at the end of the year for each year.

In case of joint ventures, each Joint Venture Partner must fill out this form separately, and provide the Joint Venture Partner name below:

Joint Venture Partner: _____

| Annual Turnover Data for the Last 3Years (Construction only) | | | |
|---|---|---|---|
| **Year** | **Amount Currency** | **Exchange Rate** | **INR Equivalent** |
| | | | |
| | | | |
| | | | |
| | **Average Annual Construction Turnover** | | |

**Form FIN – 3: Availability of Financial Resources**

Bidder must demonstrate sufficient financial resources, usually comprising of Working Capital supplemented by credit line statements or overdraft facilities and others to meet the Bidder's financial requirements for

(a) its current contract commitments, and

(b) the subject contract.

In case of joint ventures, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner name below:

Joint Venture Partner: _____

| Financial Resources | | |
|---|---|---|
| **No.** | **Source of financing** | **Amount (INR equivalent)** |
| 1 | Working Capital (to be taken from FIN-1) | |
| 2 | Credit Line (unutilized on 28 days prior to bid submission)[a] | |
| 3 | Revolving line of credit facility | |
| | **Total Available Financial Resources** | |

[a] To be substantiated by a letter from the bank issuing the line of credit.

**Form FIN- 4: Financial Resources Requirement**

Bidders (or each Joint Venture partner) should provide information on their current commitments on all contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued.

In case of joint ventures, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner name below:

Joint Venture Partner: _____

| Current Contract Commitments | | | | | | |
|---|---|---|---|---|---|---|
| **No.** | **Name of Contract** | **Employer's Contact (Address, Tel, Fax)** | **Contract Completion Date** | **Outstanding Contract Value (X)[a]** | **Remaining Contract Period in months (Y)[b]** | **Monthly Financial Resources Requirement (X / Y)** |
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| **Total Monthly Financial Requirements for Current Contract Commitments** | | | | | | **INR…….** |

a) Remaining outstanding contract values to be calculated from 28 days prior to the bid submission deadline (INR equivalent based on the foreign exchange rate as of the same date, published by the Reserved Bank of India).

b) Remaining contract period to be calculated from 28 days prior to bid submission deadline.

## Form FIN - 5: Compliance Check of Financial Resources (Criterion 2.3.3 of Section 3)

### Form FIN-5A: For Single Entities

| For Single Entities: | Total Available Financial Resources from FIN-3 (C) | Total Monthly Financial Requirement for Current Contract Commitments (CCC) from FIN-4 (D) | Available Financial Resources net of CCC (C-D) | ≥ | Requirement[a] |
|---|---|---|---|---|---|
| _____ (Name of Bidder) | _____ | _____ | _____ | ≥ | 100% of Requirementfrom Section 3 - 2.3.3(b) _____ |

### Form FIN-5B: For Joint Ventures

| For Joint Ventures: | Total Available Financial Resources from FIN-3 (C) | Total Monthly Financial Requirement for Current Contract Commitments (CCC) from FIN-4 (D) | Available Financial Resources net of CCC (C-D) | ≥ | Requirement[a] |
|---|---|---|---|---|---|
| One Partner: | | | | | |
| _____ (Name of Partner) | _____ | _____ | _____ | ≥ | B(%) of Requirement _____ |
| Each (Other) Partner: | | | | | |
| _____ (Name of Partner 1) | _____ | _____ | _____ | ≥ | A(%) of Requirement _____ |
| _____ (Name of Partner 2) | _____ | _____ | _____ | ≥ | A(%) of Requirement _____ |
| _____ (Name of Partner 3) | _____ | _____ | _____ | ≥ | A(%) of Requirement _____ |
| **All partners combined** | | | **∑ (C-D)[b] =** _____ | ≥ | 100% of Requirementfrom Section 3 - 2.3.3(b _____ |

*Form FIN – 5 is made available for use by the bidder as a self-assessment tool, and by the employer as evaluation work sheet, to determine compliance with financial resources.*

[a] *Requirement for the subject contract is defined in Criterion 2.3.3(b) of Section 3. Value A is the required percentage of the subject contract, which each partner must meet; and value B is the required percentage of the subject contract, which one partner must meet. A and B values are defined in Criterion 2.3.3 of Section 3 (Evaluation and Qualification Criteria).*

[b] *Σ (C – D) = sum of available financial resources net of current contract commitments (CCC) for all partners.*

**Form EXP – 1: Contracts of Similar Size and Nature**

Fill up one (1) form per contract.

| **Contract of Similar Size and Nature** | | |
|---|---|---|
| **Contract No**. . . . . **of** . . .. . | **Contract Identification** | |
| **Award Date** | | **Completion Date** |
| **Total Contract Amount** | | **INR** |
| **If partner in a Joint Venture or subcontractor, specify participation of total contract amount** | **Percent of Total** | **Amount** |
| **Employer's Name**<br>**Address**<br>**Telephone/Fax Number**<br>**E-mail** | | |
| **Description of the similarity in accordance with Criterion 2.4.1 of Section 3** | | |
| Participation in at least two works which have been successfully or substantially completed* within the last 10 (ten) years (from 1st July 2007 to Bid submission date), where the value of the Bidder's participation in each successfully or substantially completed* work exceeds INR 24 Million or its equivalent. | | |
| **Reference page No. of copy of work order completion certificate in support of above experience:** | | |

*Substantially completed means (i) the contractor has completed the works but could not commission the same because of hindrances beyond the control of contractor or (ii) the contractor has completed and commissioned the works at least for the amount required for qualification out of a large size contract.

### Form EXP - 2: Construction Experience in Key Activities

| Fill up one (1) form per contract. **Contract with Similar Key Activities** | | |
|---|---|---|
| **Contract No** . . . . . **of** . . . . . | **Contract Identification** | |
| **Award Date** | | **Completion Date** |
| **Total Contract Amount** | | **INR** |
| **If partner in a Joint Venture or subcontractor, specify participation of total contract amount** | **Percent of Total** | **Amount** |
| **Employer's Name**<br>**Address**<br>**Telephone Number**<br>**Fax Number**<br>**E-mail** | | |
| **Description of the key activities in accordance with Criterion 2.4.2 of Section 3** | | |
| | | |
| | | |
| | | |
| Bidder will provide reference page number of work order completion certificate in support of above experience: | | |

# Preamble to Bill of Quantities

**(Preamble to Bill of Quantities is available in Part 2 -Price Bid)**

# Bill of Quantities

**(Bill of Quantities is available in Part 2 and to be submitted in Price Bid – Part 2)**

# Section 5 – Eligible Countries

# Section 5 - Eligible Countries

| | | |
|---|---|---|
| 1. | AFG | Afghanistan |
| 2. | ARM | Armenia |
| 3. | AUS | Australia |
| 4. | AUT | Austria |
| 5. | AZE | Azerbaijan |
| 6. | BAN | Bangladesh |
| 7. | BEL | Belgium |
| 8. | BHU | Bhutan |
| 9. | BRU | Brunei Darussalam |
| 10. | CAM | Cambodia |
| 11. | CAN | Canada |
| 12. | PRC | China, People's Republic of |
| 13. | COO | Cook Islands |
| 14. | DEN | Denmark |
| 15. | FIJ | Fiji |
| 16. | FIN | Finland |
| 17. | FRA | France |
| 18. | GEO | Georgia |
| 19. | GER | Germany |
| 20. | HKG | Hong Kong, China |
| 21. | IND | India |
| 22. | INO | Indonesia |
| 23. | IRE | Ireland |
| 24. | ITA | Italy |
| 25. | JPN | Japan |
| 26. | KAZ | Kazakhstan |
| 27. | KIR | Kiribati |
| 28. | KOR | Korea, Republic of |
| 29. | KGZ | Kyrgyz Republic |
| 30. | LAO | Lao PDR |
| 31. | LUX | Luxembourg |
| 32. | MAL | Malaysia |
| 33. | MLD | Maldives |
| 34. | RMI | Marshall Islands |
| 35. | FSM | Micronesia, Federated States of |
| 36. | MON | Mongolia |
| 37. | MYA | Myanmar |
| 38. | NAU | Nauru |
| 39. | NEP | Nepal |
| 40. | NET | The Netherlands |
| 41. | NZL | New Zealand |
| 42. | NOR | Norway |
| 43. | PAK | Pakistan |
| 44. | PAL | Palau |
| 45. | PNG | Papua New Guinea |
| 46. | PHI | Philippines |
| 47. | POR | Portugal |
| 48. | SAM | Samoa |
| 49. | SIN | Singapore |
| 50. | SOL | Solomon Islands |
| 51. | SPA | Spain |
| 52. | SRI | Sri Lanka |
| 53. | SWE | Sweden |
| 54. | SWI | Switzerland |
| 55. | TAJ | Tajikistan |
| 56. | TAP | Taipei,China |
| 57. | THA | Thailand |
| 58. | TIM | Timor-Leste |
| 59. | TON | Tonga |
| 60. | TUR | Turkey |
| 61. | TKM | Turkmenistan |
| 62. | TUV | Tuvalu |
| 63. | UKG | United Kingdom |
| 64. | USA | United States |
| 65. | UZB | Uzbekistan |
| 66. | VAN | Vanuatu |
| 67. | VIE | Viet Nam |

# Section 6 - Employer's Requirements

# Section 6 - Employer's Requirements

This Section contains the Specification, the Drawings, Supplementary Information that describe the Works to be procured, the Personnel Requirements, and the Equipment Requirements.

**Table of Contents**

# 6.1 SCOPE OF SERVICES

# 1. SCOPE OF SERVICES

## 1.1 Introduction

Rajasthan is the largest state in India, accounting for 10% of total geographical area of the country. It is located in the north-western part of India and its capital city is Jaipur. With the current urbanization rate around 25% in the state, municipal bodies (which number 190 at present) are rapidly urbanizing at a high growth rate of 2.9% per annum. The GoR has successfully implemented two multi- sector urban investment projects (Rajasthan Urban Infrastructure Development Project Phases 1 and 2) in the past decade, covering six major cities under the first project and 15 secondary cities under the second project. While the investments have made substantial improvements in the living standards of the residents of these cities, the service delivery in the remaining cities of the state remains poor.

## 1.2 Project Background

One of the important lessons learned by the GoR, is that the investments have to be coupled with sustainable and vibrant institutions and effective governance systems to sustain and maximize their impacts. The institutions in water and wastewater sectors in Rajasthan are weak and the responsibilities are fragmented. Accordingly, the GoR has committed to developing a long-term urban development policy that stimulates investments in urban infrastructure and simultaneously addresses institutional deficiencies and targets major reforms in urban governance. Therefore, GoR has undertaken a sector development program (SDP) with the loan assistance of ADB.

Bill and Melinda Gate Foundation (BMGF) through ADB has provided grant funds for implementing fecal sludge management works in selected towns of the State.

The Local Self Government Department (LSGD), will be the executing agency for the grant money fund. Rajasthan Urban Infrastructure Development Project (RUIDP) through its city based Project implementation Unit will be the implementing agency.

Rajasthan Urban Infrastructure Development Project (RUIDP) has proposed to implement non-sewer solution to some selected towns in Rajasthan through Faecal Sludge and Septage Management.

The Activity, under the subproject, is to specifically provide faecal sludge management solutions for Phulera and Sambhar towns in Rajasthan. At the initial level Phulera and Sambhar towns in Rajasthan have been selected, where a common Faecal Sludge Treatment Plant (FSTP) for both towns shall be constructed as a part of the fecal sludge management in Phulera and Sambhar towns.

This will be considered as a pilot project for non-sewered areas/ towns, which would to be implemented throughout the state on success to Rajasthan environment.

## 1.3 Project Objective

- Bill and Melinda Gate Foundation has provided grant fund to provide pilot initiatives for low costs sanitation, decentralized treatment plants and faecal sludge manaement works in towns of Rajasthan. Under this grant fund, GoR has identified to design and implement faecal sludge management solutions for Phulera and Sambhar towns in Rajasthan. A common Faecal Sludge Treatment Plant (FSTP) for both towns shall be constructed as a part of the fecal sludge management in Phulera and Sambhar towns.
- The pilot testing is aimed at demonstrating the feasibility of septage management options in respect to its treatment and effluent management, which is low cost and environment-friendly. The results are intended to facilitate demand for sanitation solutions for non-sewered areas, thus allowing replication in other project towns.

- A Faecal Sludge and Septage Management (FSSM) Plan has been prepared for both the towns. Urban Local bodies of Phulera and Sambhar towns have passed the resolutions to accept the proposal, accept FSTP and operate and maintain the works after completion of works. They have also passed resolution to make impose and recover user charges and making regular O&M payments to the operator.
- FSTP has been designed by the experienced personnel of the consultant. Contractor will be responsible to construct the plant as per designs and drawings provided by the consultant. Works will be supervised by RUIDP with the support of consultant.
- Contractor/ Operator will also be responsible for Operation and maintenance of plant for a period of 5 years.
- Successful experience from the pilot cities will be replicated to other project towns.

## 1.4 Physical Setting of Project Town

**Phulera Town**

Phulera lies in the North Western part of the Jaipur District. It is well connected via the railways to Jaipur, Ajmer, Ahmedabad, Jodhpur, Bikaner, Delhi etc. Phulera is 62Kms away from Jaipur.

The population of Phulera in the year 1951 was 7117, which increased to 19106 in the year 1991 and 21643 in the year 2001. According to the Census 2011, Phulera has recorded a population of 26091 and based on the latest service level benchmark data the population is 23989 which clearly indicates that the population has reduced in the last 7 years. Phulera lies in the proposed Malbhara Corridor and the Delhi Mumbai Industrial Corridor and is expected to undergo industrial and commercial developments.

Phulera lies approximately 380 m above the mean sea level. There rae no major rivers or freash water rivulets flowing across the town. The town slopes towards the north west. The maximum summer temperature is approximately 44.3°C while during winters the temperature reaches a minimum of 2.1°C. Rianfall is approximately 673.0 mm annually.

**Sambar Town**

Sambhar is approximately 10 Kms away from Phulera and is famous for the Salt Lake and salt production. Sambhar also lies in the western part of the Jaipur District. This town is located on the banks of the Sambhar Lake. The total area of the Sambhar lake is spread across 2190 square kilometer. Salt production is the primary source of occupation for the people in this town. It is located 380 m above the mean sea level.

The population of Sambhar in the year 2011 was 22327 according to the Census 2011. Not much is being currently done in regards to wastewater generated at household level and for sludge collected from on-site systems. Faecal sludge management hence becomes imperative in the given context, especially when resources are constricted for sewerage based approach to sanitation. Faecal sludge management intends to cut out leakages and intends to find solutions for the leakages proposed in the sanitation value chain from on-site sanitation systems. It uses systems approach in integrating various actors and components of the value chain and aligning their objectives towards a safe and healthier environment.

## 1.5 General Scope

Generally the following activities shall be carried out by the Contractor. The scope of work is broadly listed below and shall include, but not be limited to:

- Establishing field office, for the Contractor's staff and the Engineer at the start of the Contract.
- Establishing testing laboratories at work site.

- Establishing suitable labor camps with all electrical, water and sanitation facilities required under the relevant Labor laws.
- Submittal of an initial work program and schedule and updating the same every month for approval by the Engineer.
- Verification of spot levels with reference to the bench marks as required to facilitate the construction work is to be carried out by the Contractor
- Site clearance and leveling of the work sites.
- Performing tests on materials received and for the finished works and maintaining complete records and registers required on site as per the Quality Manual.
- Carrying out construction works as per the designs and drawings etc
- Participating in weekly progress meetings with the Employer and Engineer to review the schedule and other pertinent issues.
- Factory and field testing, pre-dispatch inspections, packaging, transportation to the Project Site, providing transit insurance, storage, handling at the sites, installation, trial runs and commissioning of all components/elements of the system.
- Site clearance and restoration of the premises after completion of the work.
- Submission of 'As Built' drawings and Operation and Maintenance Manuals.
- Operation and maintenance of plant for a period of 5 years
- Any other items, as described elsewhere in the document.

## 1.6 Specific Scope

Specific scope of this project is given below.

| | |
|---|---|
| 1 | **Construction and Commissioning of Fecal Sludge treatment plant of capacity 20 m3/day :** Construction and Commissioning of Fecal Sludge treatment plant(FSTP)with all appurtenant structures( as mentioned in the design and bill of quantities) and allied works |
| 2 | **Operation & maintenance of the complete works of FSTP and allied works for a period of 5 years** |

## 1.7 Outcome And Benefit s From Project

The project aimed at improvising a sanitation solution to the areas where conventional sewerage system is not feasible and improve sanitation condition of the area. This contract package area is defined within area of the town. The implementation of this contract package is expected to demonstrate the feasibility of adopting a faecal sludge treatment plant, including providing operations and maintenance of the plant for a period defined in relevant section of the document.

Apart from technical aspects, assessment of pilot scale testing would also look into its influence on the regulatory and institutional arrangements, particularly for operation and maintenance of such systems, and policies and procedures that would be required to ensure sustainability of these schemes. The outcome of successful implementation of such pilot area will be improved urban sanitation service delivery in the state.

The results are intended to facilitate demand for sanitation solutions, thus allowing replication in other project towns.

# 6.2 SPECIFICATION

### 6.2.1 Standard Specification

Standard specification is available on RUIDP web site.

# 6.2.2 PARTICULAR SPECIFICATION

# 1. GENERAL RESPONSIBILITY OF CONTRACTOR

## 1.1 Contractor's Office Location And Labour Camp

The Contractor shall establish his office nearby or within to the project site. The Contractor will be free to use the space available within FSTP campus for constructing and establishing his offices, laboratories, storage spaces and workshop as long as they do not interfere with the layout of the works to be carried out under the Project.

The Contractor is therefore required to set-up their project office, fully equipped and staffed as required. This project office shall be duly backed up by a full service office at the Contractor's headquarters to enable continuous submission, interaction, and timely deliverables.

## 1.2 Contractor's Submittals

The cost of this activity is deemed to be included in contractor's quoted price, unless it is separately mentioned in the bill of quantities.

### 1.2.1 As-Built Drawing

The Contractor shall submit to the Engineer within one months of actual completion, "As-Built Drawing" also called as "Completion Drawings" as specified herein for the whole of the works executed. These Drawings shall be accurate and correct in all respects and shall be shown to and approved by the Engineer. Initial Submission of the Drawings shall be approved (with all necessary corrections, if any - incorporated).

Final Drawings shall be submitted in Hard form (2 copies) and One (1) Soft copy in CD. The Number and Size of Drawings to be submitted shall be the same, which have been issued to the Contractor for execution of the works.

The drawings shall be of standardized sizes as instructed by the Engineer and shall contain the following basic information on the Submittal Form:

i. Project name
ii. Name and number of the Contract
iii. Contractor's name
iv. Number and title of the data sheet or drawing
v. Date and scale (if applicable)
vi. Name, address and phone number for the equipment manufacturer or material supplier
vii. Revision Number (R0 for drawing submitted initially and R1, R2, etc., for drawings submitted subsequently).
viii. Signature of Contractor's authorized personnel making the submittal

A blank space 75 mm x 50 mm shall be provided immediately above the signature block for the approval stamp. The Contractor shall be responsible for preparation of the submittal data and drawings, as specified in the Contract.

No separate payment shall be made for this activity and it is deemed to be included in Contractor's quoted price.

### 1.2.2 Recording

The Contractor shall maintain an approved system of recording and tracking submissions indicating dates, status (i.e. approved, not approved, approved subject to conditions), quantities, and other details as required.

Copies of all approved submissions will be retained securely and properly filed on site, available for reference by the Engineer at any time.

## 1.3 Sample of Materials

The Engineer may at his discretion request or take samples of any material or product intended for use in the Works. Where samples are requested in the Specifications they shall be submitted in the number requested or if not specified then as directed by the Engineer. Samples shall be of the type and size specified and fully representative of the materials proposed to be used.

Samples of materials requiring prior approval, such as cement, aggregates, reinforcement, building specialties and backfill materials shall be furnished by the Contractor to the Engineer in large enough quantities with descriptive data. Samples shall be submitted at least 7 days before their proposed usage in the work to permit inspection and testing. The samples shall be properly marked to show the name of the material, name of the manufacturer, applicable Specification Subsection, place of origin and application for which it is to be used.

Samples shall be indelibly and clearly marked with the date of submission, material reference and any other data required to determine the source and kind of sample.

One or more samples of each kind submitted will either be returned marked "ACCEPTED" and signed by a representative of the Engineer or the Contractor will be requested to provide new samples and be notified of deficiencies present in the submitted samples.

One or more "accepted" samples will be retained by the Engineer for comparison with materials and workmanship supplied and will form the standard of acceptance.

One or more "accepted" samples shall be retained at the Contractor's site office and be available for reference on request.

The Engineer may reject any materials and goods which in his opinion are inferior to the samples thereof previously approved and the Contractor shall promptly remove such materials and goods from the Site. No separate or additional payment shall be made for the samples or the replacement of defective materials.

Only upon approval by the Engineer, shall be the materials be brought to the Project Site. Samples once approved shall be on a exhibition at all times, properly stored and prevented from deterioration for the propose of comparison with the materials brought to site of work from time to time for use in the work.

The Contractor shall provide the Engineer with one copy of orders for the supply of materials and goods if required, in connection with the Works.

Cost of this activity is deemed to be included in Contractors quoted price.

## 1.4 Work Program

The Contractor shall submit in triplicate the Program and particulars required for carrying out works smoothly within 15 days of receiving the letter of acceptance and before

signing of the Contract Agreement. The Contractor shall provide all information needed for fulfillment of the Program in accordance with the Conditions of Contract including the sequence in which the Contractor intends to work including implementation of quality assurance plan. In the Program the Contractor shall provide details of how the Contractor proposes to carry out the Works and how he proposes to adopt a detailed Statement of Construction Management Procedures the Contractor proposes to adopt.

Cost of this activity is deemed to be included in Contractors quoted price.

### 1.5 Personal Requirement of Contractor

Given elsewhere in the Bidding Document

### 1.6 Equipment Requirements

Given elsewhere in the Bidding Document

### 1.7 Project Sign Board

The Contractor shall erect and maintain notice board/s of size 1.2m (L) x 0.6m (H) at the site, giving details of the contract in the format and wording as directed by the Engineer. These boards shall be erected within 7 days after the Contractor has been given the Possession of Site.

The Contractor shall not erect any advertisement sign board on or along the work without the written approval of the Employer.

All sign boards shall be removed by the Contractor by the end of the Contract Period.

Cost of this activity is deemed to be included in Contractors quoted price.

### 1.8 Quality Assurance

The Contractor shall prepare a detailed plan for this Contract for Quality Assurance and Quality Control and get it approved by the Engineer. The Contractor shall deploy an adequate number of suitable staff whose sole responsibility shall be to strictly implement the QA/QC Plan and conduct necessary tests to ensure the highest quality standards are being met. All other measures that the Contractor may feel necessary he may add with the approval of the Engineer or as may be directed by the Engineer shall also be implemented.

Cost of this activity is deemed to be included in Contractors quoted price.

### 1.9 Safety Assurance

The Contractor will take all measures required to maintain the highest level of recognized safety standards on the project site. The measures taken shall include all but not be limited to the relevant provisions of the Local Standards. The Contractor shall prepare a Safety Plan for the project and have it approved by the Engineer prior to starting work on a particular site. The Contractor shall deploy a Safety Officer on each work site to ensure compliance with his Safety Plan.

The Contractor shall be responsible for the safety of all workmen and other persons entering or in the work areas and shall take all measures necessary to ensure their safety at his own expense. Such measures shall include the provisions of helmets (hardhats), the provision of gum-boots to workers engaged in cement concrete, and eye protection (goggles). Scaffolding or other measures required for working at a height shall be load rated and rigid and be provided with suitable and convenient access. Safety measures

that the Engineer may direct, depending on the exigencies of the location and nature of work and other relevant factors, shall be provided by the Contractor.

No additional payment will be made for these safety measures as such work will be considered incidental. Cost of this activity is deemed to be included in Contractors quoted price.

### 1.9.1 First Aid Station

The Contractor shall arrange for medical services to be promptly available when necessary. He shall provide First-Aid stations at suitable locations within easy reach of the workmen and other staff engaged in the work. Each First-Aid station shall be properly equipped and shall be the charge of a suitably qualified supervisory staff member. The Contractor shall also provide for transport of serious cases to the nearest hospital. All these arrangements shall be included in the Contractor's Safety Plan.

### 1.9.2 First Aid Kit

A first aid kit along with proper medical supplies must be available in the camps for treating injuries or common health problems. Services shall also include on-the-way service and other arrangements required for taking them to the nearest hospital in case of emergency. If imported laborers are required for construction, proper medical tests of the laborers shall be carried out to prevent the spread of diseases such as STD and HIV/AIDS amongst the communities near the construction sites.

The scope of work shall include service of at least one part-time experienced health worker/health assistant with a minimum of once a week full time site visit as work assignment. The Contractor shall also supply and provide adequate medicines and facilities required for standard first aid. The Contractor shall inform the Engineer regarding the medical facility within a week after its establishment and operation.

### 1.9.3 Fire Fighting

The Contractor shall provide a suitable method for fire-fighting. He shall provide a suitable number of fire extinguishers, axes, shovels, pry bars and an adequate number of buckets, some of which are to be always filled with sand and some with water. This equipment shall be provided at suitable prominent and easily accessible locations at each work site as identified in the Contractor's Safety Plan and shall be properly maintained.

### 1.9.4 Health and Safety

The Contractor shall at his own expense and throughout the period of the Contract ensure that suitable arrangements are made for the prevention of epidemics and for all necessary welfare and hygiene requirements for his staff and labour, and shall comply with all the regulations and requirements of the local health authorities with respect to disease prevention and control. He shall warn his staff and labour of the dangers of communicable diseases including those transmitted by insects, water, faecal/oral contact and sexual activity.

The Contractor shall take the precautions necessary to protect all staff and labour employed on the Site from insect nuisance, rats and other pests and minimise the dangers to health and the general nuisance caused by the same. Should malaria or other insect-borne diseases be prevalent in the area, he shall provide his staff and labour with suitable prophylactics, equip living accommodation with screens and bed-nets, and carry out spraying with approved insecticides, as appropriate and to the Engineer's satisfaction.

All workers shall be provided with adequate safety wear such as gloves, face masks, ear plugs and helmets to prevent injuries and health hazards.

### 1.10 Project Site Office for Employer

The Contractor shall keep provision for Employers office. One room shall be exclusive for use of the Engineer's Representative during project duration. However, the exact locations of the offices shall be as approved by the Engineer's Representative.

The Contractor' shall be responsible for providing 24 hours electricity supply including the costs of installation and maintenance, and payment for all official telephone calls, facsimile, e-mail and internet charges within country. The office shall be equipped with required furniture with minimum two officers, equipment and maintain the services including timely delivery of consumables to enable good working environment to his workers. The contractor should have required apparatus/equipments for carrying out field tests as and when required.

The Contractor shall be responsible for employing watch & ward to ensure safety to the documents in the office and he shall ensure that all the office rooms and yard are cleaned every day. Cost of this activity is deemed to be included in Contractors quoted price.

### 1.11 Storage Facilities

Space allocated for storage of materials such as cement, gabion wire, reinforcing wire, pipes etc. shall in general be damp-free, rain-proof and away from petroleum products storage. Permission may be granted by the Engineer to erect temporary suitable camps within the right of way free of charge, if such establishments do not cause obstructions to traffic, nuisance to works execution and adverse effect to the environment. Camps must be located in stable areas where there are no possibilities of landslides or erosion.

Cost of this activity is deemed to be included in Contractors quoted price.

### 1.12 Temporary Electricity Provision

The Contractor shall make his own arrangement for the supply of electrical power that will be required his construction. The Contractor shall provide the power required up through the contract period. Cost of this activity is deemed to be included in Contractors quoted price.

During operation electrical power from the Power Corporation may not be continuously available due to various reasons including load shedding and may not be available to the Contractor. In case of non-availability of electrical power the Contractor will have to generator his own electrical service. The Contractor must include such features in his Bid Price.

### 1.13 Temporary Water and Sanitation Provision

The Contractor shall provide on the Site at his expense an adequate supply of drinking water for the use of Contractor's staff, Employers representatives and work people, together with sanitary facilities (portable toilets or latrines), to the satisfaction of the Engineer. The Contractor shall also provide any additional treatment or equipment (such as electric water filter) necessary for the provision of drinking water.

The Contractor shall ensure that proper drinking water, waste disposal and toilet facilities are provided to the labour camps. This arrangement shall be enforced to avoid proliferation and generation of various water borne diseases. The Contractor shall inform

the Engineer regarding sources, installation and operation of supply of potable water within a week after the supply is commenced.

Provision of toilets for labor and employees shall be made to avoid public nuisance as well as pollution of water courses and air. Toilets shall not be located near streams or rivers. The Contractor shall construct suitable temporary septic tanks and/or soak pits along with room of pit-type latrines. Sufficient water must be provided and maintained in the toilets. Proper methods of sanitation and hygiene should be employed during the whole project duration. The contractor shall provide waste disposal facilities such as dustbins and waste disposal pits.

Cost of this activity is deemed to be included in Contractors quoted price.

### 1.14 Removal of Camps

On completion of the Works in accordance with Conditions of Contract the Contractor shall remove those facilities not required during the Defects Liability Period. At the end of the Defects Liability Period the Contractor shall remove the remaining facilities from site in accordance with the Conditions of Contract. All furniture and furnishing provided by the Contractor for the use of the Engineer's Representative except those items brought by the Engineer, shall become the property of the Contractor at the end of the Contract.

The Contractor shall take down and remove all structures connected with this camp, and shall take out all pipes, drains and culverts, backfill trenches, fill up all latrine pits, soak ways and other sewage disposal excavations, and shall restore the site as far as practicable to its original conditions and leave it neat and tidy to the satisfaction of the Engineer.

During shifting of the camp all trash and unwanted material must be burnt or disposed off properly. Pit latrines must be adequately covered. Areas without any vegetation must be re-vegetated carrying out appropriate bioengineering works.

Cost of this activity is deemed to be included in Contractors quoted price.

### 1.15 Topographical Survey for Verification

The contractor needs to verify the various survey data provided in Toposheet/survey drawings with reference to the bench marks established by Thromde. These permanent bench marks and any other temporary bench marks created by the Contractor to facilitate his work needs to be protected by the contractor till the completion of the Project

The topographical survey verification work shall be carried out with Total Stations technology and applicable surveying and mapping software shall be used for creating the required drawings. This survey shall include all physical details, mainly along roads and corridor. In case of confirmatory and additional survey work, the documents and drawings shall be in sufficient detail for review by the Engineer.

Cost of this activity is deemed to be included in Contractors quoted price.

### 1.16 Soil Investigation

The Contractor shall carry out soil investigation as per instruction and direction of Engineer in Charge. This survey shall include all soil details as per the project requirement. Contractor shall submit report and drawings relevant to soil investigation survey. It shall be paid separately.

## 1.17 Handing Over of Project Site to Contractor

The sites will be made available on the date of the issuance of the Letter to Proceed and the Contractor can plan his work accordingly. The Employer will make the individual work sites available to the Contractor so that he will have space available for him to carry out his work for at least the next one month unhindered as per the approved work plan.

In the event that some local obstruction/objection arises which would impede the progress of the Contractor's work in any one area, the Contractor will be required to redeploy his resources to other unaffected areas in order to maintain the progress of work so that the overall completion of the whole Project is not affected.

## 1.18 Completeness of Work

The Contractor shall be fully responsible to ensure that the whole Project including each individual component/stretch, is constructed in a manner so that the system as a whole operates as a fully integrated system which is capable of achieving the required output in an efficient and economical manner, and includes all plant, equipment and accessories required for the safe and satisfactory operation of the facilities.

To achieve this, the Contractor shall ensure that each individual component performs in a manner which is complementary to that of all other components. Any accessories which are not specifically mentioned in the specifications, but which are usual or necessary for completion of the Works and successful performance of the overall system and facilities shall be provided by the Contractor within the Contract Price.

## 1.19 Clarification

If the bidder or contractor feels lack of transparency or ambiguity in the document, he shall request clarification at least 15 days prior to address or take up the activity and it will be resolved by the Engineer prior to proceeding with the specific work/purpose. In case, he fails to place such ambiguity for clarification before such days prior to proceed for the work, decision of Engineer (or Engineer, or Engineer or Engineer or Project Manager) will be final and contractor has to do the work without additional cost and time.

# 2. GENERAL CIVIL ENGINEERING WORKS

The "Standard Specifications" (referred elsewhere in the document) issued on behalf of the Employer, establishes the Specifications that shall be followed for the construction of general civil works under the project. Specifications for additional specialized items of civil works and for mechanical and electrical works, shall be as set out in relevant subsections of this Volume.

In the event of any discrepancy between the provisions of the Standard Specifications and the Particular specifications contained herein, the provisions of these Particular specifications shall take precedence.

## 2.1 Material and Standard

### 2.1.1 Materials

The term "materials" shall mean all materials, goods and articles of every kind whether raw, processed or manufactured and equipment and plant of every kind to be supplied by the Contractor for incorporation in the Works.

Except as may be otherwise specified for particular parts of the works the provision of clauses in "Materials and Workmanship" shall apply to materials and workmanship for any part of the works.

All materials shall be new and of the kinds and qualities described in the Contract and shall be at least equal to approved samples.

Materials and workmanship shall comply with the relevant Indian Standards (with amendments) current on the date of submission of the tender.

Where the relevant standard provides for the furnishing of a certificate to the Engineer, at his request, stating that the materials supplied comply in all respects with the standard, the Contractor shall obtain the certificates and forward it to the Engineer.

For detail specification of material, Standard Specification shall be followed. If any material is not included either in Particular Specification or Standard specification, but required to for successful completion of work shall comply with the relevant Indian Standards (with amendments upto date).

### 2.1.2 Samples and Tests of Materials

The Contractor shall submit samples of such materials as may be required by the Engineer and shall carry out the specified tests directed by the Engineer at the Site, at the supplier's premises or at a laboratory approved by the Engineer.

Samples shall be submitted and tests carried out sufficiently early to enable further samples to be submitted and tested if required by the Engineer.

Approval by the Engineer as to the placing of orders for materials or as to samples or tests shall not prejudice any of the Employer's powers under the Contract.

### 2.1.3 Standards

Materials and workmanship shall comply with the relevant Indian Standards (with amendments upto date).

Where the relevant standard provides for the furnishing of a certificate to the Engineer, at his request, stating that the materials supplied comply in all respects with the standard, the Contractor shall obtain the certificates and forward it to the Engineer.

All standards, specifications, codes of practices referred to herein shall be the latest editions including all applicable official amendments and revisions. In case, the material is not listed under BIS, international standard shall be followed.

If the material is new and innovative in nature, contractor has to furnish appropriate justification and records for its use. It shall only be accepted after approval by the Engineer.

## 2.2 Earthwork

### 2.2.1 General

The Contractor shall furnish all tools, plant instruments, qualified supervisory personnel, labour, materials, any temporary works, consumables, any and everything necessary, whether or not such items are specifically stated herein for completion of the work in accordance with the Department's Requirements for a soil ranging from ordinary soil to rocky soil.

The Contractor shall survey the site before excavation and set out all lines and establish levels for various works such as grading, basement, foundations, plinth filling, roads, drains, cable trenches, pipelines etc. Such survey shall be carried out by taking accurate cross sections of the area perpendicular to established reference/grid lines at 8 m in case of buildings and 30 m in case of roads and pipe lines works intervals or nearer, if necessary, based on ground profile and thereafter properly recorded.

The excavation shall be carried out to correct lines and levels. This shall also include, where required, proper shoring to maintain excavations and also the furnishing, erecting and maintaining of substantial barricades around excavated areas and warning lamps at night.

Excavated material shall be dumped in regular heaps, bunds, riprap with regular slopes and levelling the same so as to provide natural drainage. Rock/soil excavated shall be stacked properly as approved by the Engineer. As a rule, all softer material shall be laid along the centre of heaps, the harder and more weather resisting materials forming the casing on the sides and the top.

Topsoil shall be stock piled separately for later re-use.

### 2.2.2 Clearing

The area to be excavated/filled shall be cleared of fences, trees, plants, logs, stumps, bush, vegetation, rubbish, slush, etc. and other objectionable matter. If any roots or stumps of trees are encountered during excavation, they shall also be removed. The material so removed shall be disposed off as approved by the Engineer. Where earthfill is intended, the area shall be stripped of all loose/ soft patches, top soil containing objectionable matter / materials before fill commences.

### 2.2.3 Excavation

Excavation for permanent work shall be taken out to such widths, lengths, depths and profiles as are shown on the approved drawings or such other lines and grades as may be agreed with the Engineer Rough excavation shall be carried out to a depth of 150 mm above the final level. The balance shall be excavated with special care. Soft pockets shall be removed below the final level and extra excavation filled up with material as approved by the Engineer. The final excavation should be carried out just prior to laying the blinding course. Excavation be taken for extra width and length w.r.t. specified width and pipe length, no payment will be given to the contractor.

To facilitate the permanent works the Contractor may excavate, and also backfill later, outside the lines shown on the approved drawings or as agreed with the Engineer. Should any excavation be taken below the specified elevations, the Contractor shall fill it up with material as approved by EIC upto the required elevation at no cost to the department.

All excavations shall be to the minimum dimensions required for safety and ease of working. Prior approval of the Engineer shall be obtained by the Contractor in each

individual case, for the method proposed for the excavation, including dimensions, side slopes, dewatering, disposal, etc. This approval, shall not in any way relieve the Contractor of his responsibility for any consequent loss or damage. The excavation must be carried out in the most expeditious and efficient manner. Side slopes shall be as steep as will stand safely for the actual soil conditions encountered. Every precaution shall be taken to prevent slips. Should slips occur, the slipped material shall be removed and the slope dressed to a modified stable slope.

Standard specification shall be followed for any other instruction/specification on earthwork in excavation.

## 2.3 Fill, Backfilling and Site Grading

### 2.3.1 General

All fill material shall be subject to the Engineer's approval. If any material is rejected by Engineer, the Contractor shall remove the same forthwith from the site. Surplus fill material shall be deposited / disposed off as directed by Engineer after the fill work is completed.

No earth fill shall commence until surface water discharges and streams have been properly intercepted or otherwise dealt with to the approval of the Engineer.

All the trenches will be refilled and compacted in layers as specified in Standard Specifications. Contractor will take regular photographs of refilling in layers and compaction of each layer to required density and will provide with the running payments.

### 2.3.2 Materials

To the extent available, selected surplus soil from excavations shall be used as backfill. Backfill material shall be free from lumps, organic or other foreign material. All lumps of earth shall be broken or removed unless otherwise stated. Where excavated material is mostly rock, the boulders shall be broken into pieces not larger than 150 mm size, mixed with properly graded fine material consisting of murrum or earth to fill the voids and the mixture used for filling.

If fill material is required to be imported, the Contractor shall make arrangements to bring such material from outside borrow pits. The material and source shall be subject to the prior approval of the Engineer. The approved borrow pit areas shall be cleared of all bushes, roots of trees, plants, rubbish, etc. Topsoil containing foreign material shall be removed. The materials so removed shall be disposed of as directed by Engineer. The Contractor shall provide the necessary access roads to borrow areas and maintain the same if such roads do not exist.

### 2.3.3 Filling in Pits and Trenches Around Foundations

The spaces around the foundations, structures, pits, trenches, etc., shall be cleared of all debris, and filled with earth in layers not exceeding 15 cm, each layer being watered, rammed and properly consolidated to the satisfaction of Engineer. Earth shall be rammed with approved mechanical compaction machines. Usually no manual compaction shall be allowed unless the Engineer is satisfied that in some cases manual compaction by tampers cannot be avoided. The final backfill surface shall be trimmed and leveled to a proper profile to the approval of the Engineer.

The filling shall be done after the concrete or masonry is fully set and done in such a manner as not to cause undue thrust on any part of the structure.

### 2.3.4 Plinth Filling

Plinth filling shall be carried out with approved material such as soil, sand or murum as in layers not exceeding 15 cm, watered and compacted with mechanical compaction machines. When filling reaches the finished level, the surface shall be flooded with water, unless otherwise directed, for at least 24 hours, allowed to dry and then the surface again

compacted as specified above to avoid settlement at a later stage. The finished level of the filling shall be trimmed to the level/slope specified.

Compaction of large areas shall be carried out by means of 12 ton rollers smooth wheeled, sheep-foot or wobbly wheeled rollers. In case of compaction of granular material such as sands and gravel, vibratory rollers shall be used. A smaller weight roller may be used only if permitted by the Engineer. As rolling proceeds, water sprinkling shall be done to assist consolidation. Water shall not be sprinkled in case of sandy fills.

The thickness of each unconsolidated fill layer can in this be upto a maximum of 300 mm. The Contractor will determine the thickness of the layers in which fill has to be consolidated depending on the fill material and equipment used and the approval of the Engineer obtained prior to commencing filling.

The process of filling in the plinth, filling upto finished ground level, watering and compaction shall be carried out by the contractor in such a way as not to endanger the foundation columns, plinth walls etc. already built up. Under no circumstances Black cotton soil shall be used for plinth in filling.

Rolling shall commence from the outer edge and progress towards the centre and continue until compaction is to the satisfaction of Engineer, but in no case less than 10 passes of the roller will be accepted for each layer.

The compacted surface shall be properly shaped, trimmed and consolidated to an even and uniform gradient. All soft spots shall be excavated, then filled and consolidated.

At some locations/ areas, it may not be possible to use rollers because of space restrictions, etc. The Contractor shall then be permitted to use pneumatic tampers, rammers, etc. and he shall ensure proper compaction.

### 2.3.5 Sand Filling

Where backfilling is required to be carried out with local sand it shall be clean, medium grained and free from impurities. The filled-in-sand shall be kept flooded with water for 24 hours to ensure maximum consolidation. The surface of the consolidated sand shall be dressed to required level or slope. Construction of floors or other structures on sand fill shall not be started until the Engineer has inspected and approved the fill.

### 2.3.6 General Site Grading

Site grading shall be carried out as indicated in the approved drawings. Excavation shall be carried out as specified in the Department's Requirements. Filling and compaction shall be carried out as specified elsewhere in the document.

If no compaction is called for, the fill may be deposited to the full height in one operation and leveled. If the fill has to be compacted, it shall be placed in layers not exceeding 200 mm and leveled uniformly and compacted before the next layer is deposited.

To ensure that the fill has been compacted as specified, field and laboratory tests shall be carried out by the Contractor.

Field compaction tests shall be carried out in each layer of filling until the fill to the entire height has been completed. This shall hold good for embankments as well. The fill will be considered as incomplete if the desired compaction has not been obtained.

The Contractor shall protect the earth fill from being washed away by rain or damaged in any other way. Should any slip occur, the Contractor shall remove the affected material and make good the slip.

### 2.3.7 Field Density

Unless otherwise specified the compaction, where so called for, shall comply with minimum 90% compaction by Standard Proctor at moisture content differing not more than 4% from the optimum moisture content. The Contractor shall demonstrate adequately by field and laboratory tests that the specified density has been obtained.

### 2.3.8 Timber Shoring

As per Standard specification and the provisions of relevant IS shall apply.

### 2.3.9 Dewatering

The Contractor shall ensure at his cost that the excavation and the structures are free from water during construction and shall take all necessary precautions and measures to exclude ground/ rain water so as to enable the works to be carried out in reasonably dry conditions in accordance with the construction programme. Sumps made for dewatering must be kept clear of the excavations/ trenches required for further work. The method of pumping shall be approved by Engineer, but in any case, the pumping arrangement shall be such that there shall be no movement of subsoil or blowing in due to differential head of water during pumping. Pumping arrangements shall be adequate to ensure no delays in construction. The dewatering shall be continued for at least (7) seven days after the last pour of the concrete. The Contractor shall, however, ensure that no damage to the structure results on stopping of dewatering.

The Contractor shall study the sub-soil conditions carefully and shall conduct any test necessary at the site with the approval of the Engineer to test the permeability and drainage conditions of the sub-soil for excavation, concreting etc., below ground level.

The scheme for dewatering and disposal of water shall be approved by the Engineer. The Contractor shall suitably divert the water obtained from dewatering from such areas of site where a build-up of water in the opinion of the Engineer obstructs the progress of the work, leads to unsanitary conditions by stagnation, retards the speed of construction and is detrimental to the safety of men, materials, structures and equipment.

When there is a continuous inflow of water and the quantum of water to be handled is considered in the opinion of Engineer, to be large, a well point system-single stage or multistage, shall be adopted. The Contractor shall submit to the Engineer, details of his well point system including the stages, the spacing number and diameter of well points, headers etc., and the number, capacity and location of pumps for approval.

If any foundation pits are filled due to accumulation of surface flow during the progress of work or during rainy season, or due to any other cause all pumping required for dewatering the pits & removing silt shall be done without extra cost.

### 2.3.10 Rain Water Drainage

Grading in the vicinity of excavation shall be such as to exclude rain/ surface water draining into excavated areas. Excavation shall be kept clean of rain and such water as the Contractor may be using for his work by suitably pumping out the same. The scheme for pumping and discharge of such water shall be approved by the Engineer.

### 2.3.11 Rock Filling

Where backfilling is required to be carried out with local rocks it shall be done with mixture of sand. It shall be clean, medium grained and free from impurities. The filled-in-rock sand mixture shall be kept flooded with water for 24 hours to ensure maximum consolidation. The surface of the consolidated sand shall be dressed to required level. Construction of other structures on fill shall not be started until the Engineer has inspected and approved the fill.

## 2.4 Reinforced Cement Concrete

### 2.4.1 General

The aggregates and cement shall be proportioned by weight only. The mixing shall always be carried out in a mechanically operated mixer in such a way so as to avoid any loss of water or cement. The drum of the mixer should be free from holes to avoid any loss of water or cement. No hand mixed concrete will normally be allowed. The concrete so prepared, shall be carefully conveyed, placed in position and compacted using suitable type of mechanical vibrator, as rapidly as practicable, but in no case the time

required till compaction shall exceed 30 minutes after mixing. During concreting, standby concrete mixer and vibrator shall be kept available at site. Ordinary Portland Cement (OPC) conforming to IS: 8112-1989 mark (grade-43) shall only be used. Cement manufactured in mini-cement plants shall not be used. All reinforcement used shall be of TMT Steel (Fe-415/Fe500) having ISI mark and shall be clean and free from loose mill scales, rust and coating of oil or other coatings which may destroy or reduce bond. Minimum size of reinforcement bars shall be of 8 mm. Only steel shuttering shall be used. Shuttering shall be new or in a good condition without holes or dents and the Contractor shall get the same approval by the Engineer, before its use. The individual elements of shuttering shall correctly match with the required shape of structural member to ensure a gap-free shuttering. Suitable systems have to be provided for keeping the shuttering in place and in case of walls, maintaining the supports at an appropriate distance. The construction joints should be predetermined by the Engineer and these have to be executed with utmost care. Before commencing concreting for subsequent lifts/ panels, surface previously concreted member shall be thoroughly cleaned to remove all loose materials in contact with it. Honeycombing has to be avoided by suitably fixing of shuttering, preparation of surface of joints and proper use of vibrators. The exposed surfaces of concrete shall be kept continuously in a wet condition by ponding or covering with a layer of sackings, canvas, Hessian or similar materials and kept continuously wet for at least 21 days from the date of placing of concrete.

To obtain a dense concrete and to reduce chances of honeycombing, adequate admixture approved by Engineer shall be used as integral water proofing compound in concrete work. The quantity of the admixture to be used shall be as prescribed by the manufacturer and approved by the Engineer.

Minimum grade shall be M25.

### 2.4.2 Materials

All Material shall comply with the relevant specification described in subsequent clauses in RUIDP standard specification.

### 2.4.3 Water

Water used for both mixing and curing shall conform to IS : 456-2000 and free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials that may be deleterious to concrete or steel. The pH value of water shall not be less than 6.

### 2.4.4 Reinforcement

Reinforcement shall be any of the following :

- Mild Steel and medium tensile bars to IS 432 Part 1.
- High strength deformed bars and wires to IS 1786.
- Rolled steel Grade A made from structural steel to IS 2062.

All reinforcement shall be free from loose mill scales, loose rust and coats of paints, oil, mud or other coatings which may destroy or reduce bond.

### 2.4.5 Admixtures

Accelerating, retarding, water reducing and air entraining admixtures shall conform to IS: 9103 and integral water proofing admixtures to IS : 2645.

Admixtures may be used in concrete as per manufacturer's instructions only with the approval of the Engineer. An admixture's suitability and effectiveness shall be verified by trial mixes with the other materials used in the works. If two or more admixtures are to be used simultaneously in the same concrete mix, their interaction shall be checked and trial mixes done to ensure their compatibility. There should also be no increase in risk of corrosion of the reinforcement or other embedment.

Calcium chloride shall not be used for accelerating set of the cement for any concrete containing reinforcement or embedded steel parts. When calcium chloride is permitted such as in mass concrete works, it shall be dissolved in water and added to the mixing water by an amount not exceeding 1.5 percent of the weight of the cement in each batch of concrete. The designed concrete mix shall be corrected accordingly.

### 2.4.6 Samples and Tests of Raw Materials

All materials used for the works shall be tested before use.

Manufacturer's test certificate shall be furnished for each batch of cement /steel and when directed by the Engineer samples shall also be got tested by the Contractor in a laboratory approved by the Engineer.

Sampling and testing shall be as per IS : 2386 under the supervision of the Engineer.

Water to be used shall be tested to comply with requirements of IS : 456.

The Contractor shall furnish manufacturer's test certificates and technical literature for the admixture proposed to be used. If directed, the admixture shall be got tested at an approved laboratory at no extra cost.

## 2.5 Design Mix Concrete

### 2.5.1 Mix Design and Testing

For Design Mix Concrete, the mix shall be designed according to IS : 10262 and SP 23 to provide the grade of concrete having the required workability and characteristic strength not less than appropriate values given in IS:456. The design mix shall be cohesive and does not segregate and should result in a dense and durable concrete and also capable of giving the finish as specified. For liquid retaining structures, the mix shall also result in watertight concrete. The Contractor shall exercise great care while designing the concrete mix and executing the works to achieve the desired result.

The minimum cement content for Design Mix Concrete shall be as per IS:456.

The minimum cement content stipulated above shall be adopted irrespective of whether the Contractor achieves the desired strength with less quantity of cement. The Contractor's quoted rates for concrete shall provide for the above eventuality and nothing extra shall become payable to the contractor in this account. Even in the case where the quantity of cement required is higher than that specified above to achieve desired strength based on an approved mix design, nothing extra shall become payable to the contractor.

It shall be the Contractor's sole responsibility to carry out the mix designs at his own cost. He shall furnish to the Engineer at least 30 days before concreting operations, a statement of proportions proposed to be used for the various concrete mixes and the strength results obtained. The strength requirements of the concrete mixes ascertained on 150 mm cubes as per IS : 516 shall comply with the requirements of IS : 456.

### 2.5.2 Batching and Mixing of Concrete

Proportions of aggregates and cement, as decided by the concrete mix design, shall be by weight. These proportions shall be maintained during subsequent concrete batching by means of weigh batchers capable of controlling the weights within one percent of the desired value.

Amount of water added shall be such as to produce dense concrete of required consistency, specified strength and satisfactory workability and shall be so adjusted to account for moisture content in the aggregates. Water-cement ratio specified for use by the Engineer shall be maintained. Each time the work stops, the mixer shall be cleaned out and while recommencing, the first batch shall have 10% additional cement to allow for sticking in the drum.

Arrangement should be made by the Contractor to have the cubes tested in an approved laboratory or in field with prior consent of the Engineer. Sampling and testing of strength and workability of concrete shall be as per IS:1199, IS : 516 and IS : 456.

### 2.5.3 Mixing

Concrete shall be mixed in a mechanical mixer conforming to IS 1791. The mixing shall be continued until there is uniform distribution of materials and the mass is uniform in colour and consistency. If there is segregation after unloading, the concrete should be remixed.

### 2.5.4 Formwork

Formwork shall be all inclusive and shall consist of but not be limited to shores, bracings, sides of footings, walls, beams and columns, bottom of slabs etc. including ties, anchors, hangers, inserts, false work, wedges etc.

The design and engineering of the formwork as well as its construction shall the responsibility of the Contractor. However, if so desired by the Engineer, the drawings and calculations for the design of the formwork shall be submitted to the Engineer for the approval.

Formwork shall be designed to fulfill the following requirements:

- Sufficiently rigid and tight to prevent loss of grout or mortar from the concrete at all stages and appropriate to the methods of placing and compacting.
- Capable of providing concrete of the correct shape and surface finish within the specified tolerance limits.
- Capable of withstanding without deflection the worst combination of self weight, reinforcement and concrete weight, all loads and dynamic effects arising from construction and compacting activities, wind and weather forces.
- Capable of easy striking out without shock, disturbance or damage to the concrete.
- Soffit forms capable of imparting a camber if required. Soffit forms and supports capable of being left in position if required
- Capable of being cleaned and/or coated if necessary immediately prior to casting the concrete; design temporary openings where necessary for these purposes and to facilitate and the preparation of construction joints.

The formwork may be of timber, plywood, steel, plastic or concrete depending upon the type of finish specified. Sliding forms and slip form may be used with the approval of the Engineer. Timber for formwork shall be well seasoned, free from sap, shakes, loose knots, worm holes, warps and other surface defects. Joints between formwork and structures shall be sufficiently tight to prevent loss of slurry from concrete, using seals if necessary.

The faces of formwork coming in contact with concrete shall be cleaned and two coats of approved mould oil applied before fixing reinforcement. All rubbish, particularly chippings, shavings, sawdust, wire pieces dust etc. shall be removed from the interior of the forms before the concrete is placed. Where directed, cleaning of forms shall be done by blasting with a jet of compressed air at no extra cost.

Forms intended for reuse shall be treated with care. Forms that have deteriorated shall not be used. Before reuse, all forms shall be thoroughly scraped, cleaned, nails removed, holes suitably plugged, joints repaired and warped lumber replaced to the satisfaction of the Engineer. The Contractor shall equip himself with enough shuttering to allow for wastage so as to complete the job in time.

Permanent formwork shall be checked for its durability and compatibility with adjoining concrete before it is used in the structure. It shall be properly anchored to the concrete.

Wire ties passing through beams, columns and walls shall not be allowed. In their place bolts passing through sleeves shall be used. Formwork spacers left in-situ shall not impair the desired appearance or durability of the structure by causing spalling, rust staining or allowing the passage of moisture.

For liquid retaining structures, sleeves shall not be provided for through bolts nor shall through bolts be removed if provided. The bolts, in the latter case, shall be cut at 25 mm depth from the surface and the hole made good by cement mortar of the same proportion as the concrete just after striking the formwork.

Where specified all corners and angles exposed in the finished structure shall have chamfers or fillets of 20 mm x 20 mm size.

Forms for substructure may be omitted when, in the opinion of the Engineer, the open excavation is firm enough (in hard non-porous soils) to act as a form. Such excavations shall be larger, as approved by the Engineer, than that required as per drawing to compensate for irregularities in excavation.

The Contractor shall provide adequate props carried down to a firm bearing without overloading any of the structures.

The shuttering for beams and slabs shall be so erected that the side shuttering of beams can be removed without disturbing the bottom shuttering. If the shuttering for a column is erected for the full height of the column, one side shall be built up in sections as placing of concrete proceeds or windows left for placing concrete from the side to limit the drop of concrete to 1.0 m or as approved by the Engineer. The Contractor shall temporarily and securely fix items to be cast (embedments/ inserts) in a manner that will not hinder the striking of forms or permit loss of grout.

Formwork showing excessive distortion, during any stage of construction, shall be repositioned and strengthened. Placed concrete affected by faulty formwork, shall be entirely removed and formwork corrected prior to placement of new concrete at Contractor's cost.

### 2.5.5 Preparation Prior To Concrete Placement

Before concrete is actually placed in position, the inside of the formwork shall be cleaned and mould oil applied, inserts and reinforcement shall be correctly positioned and securely held, necessary openings, pockets, etc. provided.

All arrangements- formwork, equipment and proposed procedure, shall be approved by the Engineer. Contractor shall maintain separate Pour Card for each pour as per the format enclosed.

### 2.5.6 Check for Reinforcement and Concreting

All reinforcement shall be got checked and recorded prior to pouring of concrete, by a representative of the Engineer.

Minimum Requirement for all Reinforced or Plain Concrete Structures

All blinding and leveling concrete shall be minimum 100 mm thick in concrete M10 grade.

All structural reinforced concrete other than for water retaining structures shall at least be of M25 grade with maximum 20mm size downgraded coarse aggregates.

The minimum grade of concrete for water retaining structures shall be M25 having minimum cement content of 360 kg/$m^3$ with maximum 20mm size downgraded coarse aggregates.

Minimum cover to reinforcement for all water retaining structures shall be 40mm including the bottom of the roof. For other structures the minimum clear cover shall be as specified in IS:456 – 2000.

Approved quality water proofing compound (chloride free) shall be added during concreting of all water retaining structure, in the proportion specified by the manufacturer/as per design mix or upto 2% (percent) by weight of cement.

The minimum thickness required for different reinforced concrete members shall be as per the working structural drawings to be provided to him within 15 days of award of the work.

### 2.5.7 Transportation, Placing and Compacting Concrete

Concrete shall be transported from the mixing plant to the formwork with minimum time lapse by methods that shall maintain the required workability and will prevent segregation, loss of any ingredients or ingress of foreign matter or water. During hot or cold weather, concrete shall be transported in deep containers other suitable measures to reduce loss of water by evaporation and heat loss in cold weather may also be adopted.

In all cases concrete shall be deposited as nearly as practicable directly in its final position to avoid re-handling. To avoid segregation, concrete shall not be re-handled or caused to flow. For locations where direct placement is not possible and in narrow forms and Contractor shall provide suitable drops and "Elephant Trunks". Concrete shall not be dropped from a height of more than 1.0 m. Care shall be taken to avoid displacement of reinforcement or formwork.

Concrete shall not be placed in flowing water. Under water, concrete shall be placed in position by tremies or by pipeline from the mixer and shall never be allowed to fall freely through the water.

While placing concrete the Contractor shall proceed as specified below and also ensure the following:

- Continuously between construction joints and pre-determined abutments.
- Without disturbance to forms or reinforcement
- Without disturbance to pipes, ducts, fixings and the like to be cast in; ensure that such items are securely fixed. Ensure that concrete cannot enter open ends of pipes and conduits etc.
- Without dropping in a manner that could cause segregation or shock.
- In deep pours only when the concrete and formwork designed for this purpose and by using suitable chutes or pipes.
- Do not place if the workability is such that full compaction cannot be achieved
- Without disturbing the unsupported sides of excavations; prevent contamination of concrete with earth. Provide sheeting if necessary in supported excavations, withdraw the linings progressively as concrete is placed.
- If placed directly onto hardcore or any other porous material, dampen the surface to reduce loss of water from the concrete.
- Ensure that there is no damage or displacement to sheet membranes.
- Record the time and location of placing structural concrete.

Concrete shall normally be compacted in its final position within thirty minutes of leaving the mixer. Concrete shall be compacted during placing with approved vibrating equipment without causing segregation until it forms a solid mass free from voids thoroughly worked around reinforcement and embedded fixtures and into all corners of the formwork. Immersion vibrators shall be inserted vertically at points not more than 450 mm apart and withdrawn slowly till air bubbles cease to come to the surface, leaving no voids. When placing concrete in layers advancing horizontally, care shall be taken to ensure adequate vibration, blending and melding of the concrete between successive layers. Vibrators shall not be allowed to come in contact with reinforcement, formwork

and finished surfaces after start of initial set. Over-vibration shall be avoided; under vibration is likewise harmful.

The vibrator should penetrate rapidly to the bottom of the layer and atleast 15 cm into the preceding layer if there is any. It should be held generally 5 to 15 sec. until the compaction is considered adequate and then withdrawn slowly at thereof about 8 cm/s.

Concrete may be conveyed and placed by mechanically operated equipment after getting the complete procedure approved by the Engineer. The slump shall be held to the minimum necessary for conveying concrete by this method. When concrete is to be pumped, the concrete mix shall be specially designed to suit pumping. Care shall be taken to avoid stoppages in work once pumping has started.

Except when placing with slip forms, each placement of concrete in multiple lift work, shall be allowed to set for at least 24 hours after the final set of concrete before the start of subsequent placement. Placing shall stop when concrete reaches the top of the opening in walls or bottom surface of slab, in slab and beam construction, and it shall be resumed before concrete takes initial set but not until it has had time to settle as approved by the Engineer. Concrete shall be protected against damage until final acceptance.

### 2.5.8 Mass Concrete Works

Sequence of pouring for mass concrete works shall be as approved by the Engineer. The Contractor shall exercise great care to prevent shrinkage cracks and shall monitor the temperature of the placed concrete if directed.

### 2.5.9 Curing

Curing and protection shall start immediately after the compaction of the concrete to protect it from

- premature drying out, particularly by solar radiation and wind;
- If placed directly onto hardcore or any other porous material, dampen the surface to reduce loss of water from the concrete.
- leaching out by rain and flowing water;
- rapid cooling during the first few days after placing;
- high internal thermal gradient;
- low temperature of frost;
- vibration and impact which may disrupt the concrete and interfere with its bond to the reinforcement

After the concrete has begun to harden i.e. 1 to 2 hr. after laying curing shall be started.

All concrete, unless approved otherwise by the Engineer, shall be cured by use of continuous sprays or ponded water or continuously saturated coverings of sacking, canvas, hessain or other absorbent material for the period of complete hydration with a minimum of 10 days. The quality of curing water shall be the same as that used for mixing.

Where a curing membrane is approved to be used by the Engineer, the same shall of a non-wax base and shall not impair the concrete finish in any manner. The curing compound to be used shall be approved by the Engineer before use and shall be applied with spraying equipment capable of a smooth, even textured coat.

When concrete is used as subgrade for flooring, the flooring may be commenced before the curing period of subgrade is over, but curing of subgrade shall be continued along with the top layer of flooring for a minimum period of 10 days.

Curing may also be done by covering the surface with an impermeable material such as polyethylene, which shall be well sealed and fastened.

### 2.5.10 Acceptance of Concrete

The concrete tested in accordance with 'Testing of Concrete' clause above, shall meet the criteria for acceptance of concrete as per IS:456-2000. The strength of concrete shall be the average strength of three specimens tested at 28 days and conform to strength requirements for different grades of concrete. If 7 days tests show crushing strengths that are too low than required, corrective measures shall be taken at once, at the Engineers direction, without waiting for the results of the 28 days test.

### 2.5.11 Failure to Meet Strength of Requirements

In case where concrete tested fails to meet the test requirements, the Engineer shall have the right to require any one or all the following additional tests. The Contractor, at his own expense, shall carry out such tests. The Engineer shall be the final authority for interpreting the results and shall decide upon the acceptance or otherwise.

Curing and load testing of the concrete member concerned represented by the test, which failed.

Replacement of any such portions of the structure - No payment shall be made for the dismantling of the concrete, relevant formwork, or reinforcement. The Contractor at his own expenses shall make good embedded parts and/ or reinforcement that may get damaged during dismantling.

Collecting and testing of a core specimen from the hardened concrete. The location number and size of such specimen shall be taken as directed by the Engineer. Any other test such as, ultrasonic and/ or rebound hammer test, etc. shall be done as decided by the Engineer.

### 2.5.12 Construction Joints and Keys

The position and arrangement of construction joints shall be as indicated by the contractor in his working drawings dually approved by the department. Concrete shall be placed without interruption until completion of work between construction joints. If stopping of concreting becomes unavoidable anywhere, a properly formed construction joint shall be made with the approval of the Engineer.

Dowels for concrete work, not likely to be taken up in the near future, shall be coated with cement slurry and encased in lean concrete as indicated on the drawings or as approved by the Project Manager.

Before resuming concreting on a surface which has hardened all laitance and loose stone shall be thoroughly removed by wire brushing/hacking and surface washed with high pressure water jet and treated with thin layer of cement slurry for vertical joints and horizontal layers.

When concreting is to be resumed on a surface, which has not fully hardened, all laitance shall be removed by wire brushing, the surface wetted, free water removed and a coat of cement slurry applied. On this, a layer of concrete not exceeding 150 mm thickness shall be placed and well rammed against the old work. Thereafter work shall proceed in the normal way.

For horizontal joints, the surface shall be covered with a layer of mortar about 10-15 mm thick composed of cement and sand in the concrete mix. This cement slurry or mortar shall be freshly mixed and applied immediately before placing concrete.

### 2.5.13 Foundation Bedding

All earth surfaces upon which or against which concrete is to be placed, shall be well compacted and free from standing water, mud or debris. Soft or spongy areas shall be cleaned out and filled with either soil-cement mixture, lean concrete or clean sand compacted as approved by the Project Manager. The surfaces of absorptive soils shall be moistened.

Concrete shall not be deposited on large sloping rock surfaces. The rock shall be cut to form rough steps or benches by picking, barring or wedging. The rock surface shall be kept wet for 2 to 4 hours before concreting.

Excavation, in clay or other soils that are likely to be affected by exposure to airtmosphere, shall be concreted as soon as they are dry. Alternatively, unless otherwise mentioned the bottom of the excavation shall be protected immediately by 8 cm thick layer of cement concrete not leaner than M10 or in order to obtain a dry hard bottom, the last stretch of excavation of about 10 cm shall be removed just before concreting.

### 2.5.14 Repair and Replacement of Unsatisfactory Concrete

Immediately after the shuttering is removed, all defective areas such as honey-combed surfaces, rough patches, holes left by form bolts etc, shall be inspected by the Project Manager who may permit patching of the defective areas or reject the concrete work.

All through holes for shuttering shall be filled for full depth and neatly plugged flush with surface.

Rejected concrete shall be removed and replaced by the Contractor at no additional cost to the Employer.

For patching of defective areas all loose materials shall be removed and the surface shall be prepared as approved by the Project Manager.

Bonding between hardened and fresh concrete shall be done either by placing cement mortar or by applying epoxy. The decision of the Project Manager as to the method of repairs to be adopted shall be final and binding on the Contractor. The surface shall be saturated with water for 24 hours before patching is done with cement sand mortar. The use of epoxy for bonding fresh concrete shall be carried out as approved by the Project Manager.

### 2.5.15 Hot weather Requirements

Concreting during hot weather shall be carried out as per IS 7861 (Part I).

Adequate provision shall be made to lower concrete temperatures, which shall not exceed 40 deg C at time of placement of fresh concrete.

Where directed by the Project Manager, the Contractor shall spray non-wax based curing compound on unformed concrete surfaces at no extra costs.

### 2.5.16 Cold Weather Requirements

Concreting during cold weather shall be carried out as per IS: 7861(Part II).

The ambient temperature during placement and upto final set shall not fall below 5 deg. C. Approved antifreeze/accelerating additives shall be used where directed.

For major and large scale concreting works the temperature of concrete at times of mixing and placing, the thermal conductivity of the formwork and its insulation and stripping period shall be closely monitored.

### 2.5.17 Liquid Retaining Structures

The Contractor shall take special care for concrete for liquid retaining structures, underground structures and those others specifically called for to guarantee the finish and water tightness.

The Contractor shall make all arrangements for hydro-testing of structure, all arrangements for testing such as temporary bulk heads, pressure gauges, pumps, pipe lines etc.

The Contractor shall also make all temporary arrangements that may have to be made to ensure stability of the structures during construction.

Any leakage that may occur during the hydro-test or subsequently during the defects liability period or the period for which the structure is guaranteed shall be effectively

stopped either by cement/epoxy pressure grouting, guniting or such other methods as may be approved by the Project Manager. All such rectification shall be done by the contractor to the entire satisfaction of the Project Manager at no extra cost to the department.

### 2.5.18 Water Stops

**Material**

The material for the PVC water stops shall be a plastic compound with the basic resin of polyvinyl chloride and additional resins, plasticizers, inhibitors, which satisfies the performance characteristics specified below as per IS : 12200. Testing shall be in accordance with IS : 8543

| | |
|---|---|
| Tensile strength | 3.6 N/mm$^2$ minimum |
| Ultimate elongation | 300% minimum |
| Tear resistance | 4.9 N/mm$^2$ minimum |
| Stiffness in flexure | 2.46 N/mm$^2$ minimum |
| Accelerated extraction<br>i) Tensile strength<br>ii)Ultimate elongation | <br>10.50 N/mm$^2$ minimum<br>250% minimum |
| Effect of Alkali<br>i) Weight increase<br>ii)Weight decrease<br>iii)Hardness change | 7 days<br>0.10% maximum<br>0.10% maximum<br>± 5 points |
| Effect of Alkali<br>i) Weight increase<br>ii)Weight decrease<br>iii)Dimension change | 28 days<br>0.40% maximum<br>0.30% maximum<br>± 1% |

PVC water stops shall be either of the bar type, serrated with centre bulb and end grips for use within the concrete elements or of the surface (kicker) type for external use.

PVC water stops shall be of approved manufacture. Samples and the test certificate shall be got approved by the Project Manager before procurement for incorporation in the works.

**Workmanship**

Water stops shall be cleaned before placing them in position. Oil or grease shall be removed thoroughly using water and suitable detergents.

Water stops shall be procured in long lengths as manufactured to avoid joints as far as possible. Standard L or T type of intersection pieces shall be procured for use depending on their requirement. Any non-standard junctions shall be made by cutting the pieces to profile for jointing. Lapping of water stops shall not be permitted. All jointing shall be of fusion-welded type as per manufacturer's instructions.

Water stops shall be placed at the correct location/level and suitably supported at intervals with the reinforcement to ensure that it does not deviate from its intended position during concreting and vibrating. Care shall also be taken to ensure that no honeycombing occurs because of the serrations/ end grips, by placing concrete with smaller size aggregates in this region. Projecting portions of the water stops embedded in concrete shall be thoroughly cleaned of all mortar/concrete coating before resuming further concreting operations. The projecting water stops shall also be suitably supported at intervals with the reinforcement to maintain its intended position during concreting so as to ensure that it does not bend leading to formation of pockets. In addition, smaller size aggregates shall be used for concreting in this region also.

#### 2.5.19 Preformed Filler and Joint Sealing Compound

Preformed filler for expansion / isolation joints shall be non-extruding and resilient type of bitumen impregnated fibres conforming to IS : 1838 Part I or IS 1838 Part 2.

Bitumen coat to concrete/masonry surfaces for fixing the preformed bitumen filler strip shall conform to IS:702. Bitumen primer shall conform to IS : 3384.

Sealing compound for filling the joints above the preformed bitumen filler shall conform to Grade 'A' as per IS:1834. Other organic solvents such as polysulphate based joint sealents to IS:1433 Part 1 or IS 12118 Part 1 may be used with the approval of Project Manager.

#### 2.5.20 Nominal Mix Concrete

The above relevant activities shall be applicable for nominal mix concrete.

### 2.6 Plain Cement Concrete

As per Standard Specification.

### 2.7 Structural Steel Works

#### 2.7.1 General

As much fabrication work as is reasonably practicable work shall be completed in shops, where steel work is fabricated. All workmanship and finish shall be of the best quality and shall conform to the best approved method of fabrication. All materials shall be finished straight and shall be machined/ground smooth true and square where so specified. All holes and edges shall be free of burrs. Shearing and chipping shall be neatly and accurately done and all portions of work exposed to view shall be neatly finished. Tolerances for fabrication of steel structures conform IS 7215. Tolerances for erection of steel structures shall conform to IS 12843.

#### 2.7.2 Corrosion Protection

Unless, otherwise specified, the thickness of steel section shall be governed as below:

- Steel work exposed to weather

  Where steel work is directly exposed to weather and is fully accessible for clearing and repairing the thickness shall not be less than 6 mm; and where steel is exposed to weather and is not accessible for cleaning and painting, the thickness shall not be less than 8 mm. This shall not apply for hot rolled sections covered by Indian Standards.

- Steel work not directly exposed to weather

The thickness of steel work not directly exposed to the weather shall be not less than 6 mm. The thickness of steel in secondary members shall be not less than 4.5 mm. For hot rolled sections to Indian Standards, the mean thickness of flange be considered and not the web thickness.

The requirements (a) and (b) above does not apply to light structural work or sealed box section or to steel work in which special provision against corrosion has been made and also in case of steel work exposed to highly corrosive fumes or vapour in which case the thickness shall be as approved by the Project Manager.

### 2.7.3 Painting

All fabricated steel material, except those galvanised shall receive protective paint coating as prescribed in IS 1477 Parts 1 & 2.

All surfaces to be painted, oiled or otherwise treated shall be dry thoroughly cleaned to remove all loose scale and loose rust.

Shop contact surfaces need not be painted unless otherwise specified.

Surfaces which will not be in contact but inaccessible after shop assembly shall receive full specified protective treatment before assembly. This does not apply to interior of hollow seatings.

Chequered plates shall be painted after the details of painting are approved by the Project Manager.

In case of surfaces to be welded, steel shall not be painted within a suitable distance of any edges to be welded if paint would be harmful to the welder or impair the quality of welds.

Welds and adjacent parent metal shall not be painted prior to slugging, inspection and approved.

Parts to be encased on concrete shall not be painted or oiled.

### 2.7.4 Surface Treatment

All the surfaces of steel work to be painted shall be thoroughly cleaned of all loose mill scale, rust, grease, dirt and other foreign matter. The type of surface treatment shall be as specified in the respective item of work. The workmanship shall generally conform to the requirements of IS 1477- Part I.

### 2.7.5 Materials

A. All the materials shall be of the best quality from an approved manufacturer. contractor shall obtain prior approval of the Project Manager for the brand of manufacturer and the colour/shade prior to procurement for usage in the works.

B. Primer and finish paints shall be compatible with each other to avoid cracking and wrinkling. As such it is recommended that the primer and finish paint shall be from the same manufacturer.

C. The colour and shade shall conform to IS Standards referred to in Appendix 'D' of IS 1477-Part II. To facilitate choosing the correct shade/number from the alternatives available, contractor shall adopt trial painting in small patches in consultation with and as directed by the Project Manager.

D. All paint delivered to the fabrication shop/site shall be ready mixed, in original sealed containers, as packed by the manufacturer. Thinner shall not be permitted for usage unless specifically directed by the Project Manager.

E. Paints shall be stirred thoroughly to keep the pigment in suspension.

F. Contractor shall at his own cost arrange for testing of paints as per relevant Indian Standard laboratory whenever Project Manager wants the tests to be carried out for each

batch of paints. Test results shall be submitted to the Project Manager for obtaining approval.

### 2.7.6 Workmanship

1. The type and the number of coats of the primer paint and finish paint shall be as specified in the respective items of work.

2. Painting shall be carried out only on thoroughly dry surfaces.

3. No painting shall be done in frosty/foggy weather or when the humidity is high enough to cause condensation on the surface to be painted. Paint shall not be applied when the temperature of the surface to be painted is at 50 $^{0}$ C or lower.

4. Primers shall adhere to the surface firmly and offer a key to the subsequent coats.

5. The application of paint film serves the twin purpose of protecting the steel from corrosion and giving the decorative appearance. Paint which gives the steel adequate protection over a long period together with good appearance shall therefore be adopted.

6. Workmanship shall generally conform to requirements specified in IS 1477-Part-II.

7. It is essential to ensure that immediately after preparation of the surfaces, the first coat of primer paint shall be applied by brushing and working it well to ensure a continuous film without "holidays". After the first coat becomes hard dry a second coat of primer shall be applied by brushing to obtain a film free from holidays.

8. Structural steel surfaces shall be given the first coat of primer at shop and the second coat after it is erected in position. Further, any abraded surfaces of the first coat during transport from shop to site and during erection shall be provided with a touch up coat of the primer.

9. The dry film thickness of each coat of primer shall be not less than 25 microns.

10. Application of finishing paints shall be carried out within the shortest possible time interval after primer since the primer coats are too thin to give adequate corrosion protection to the steel surface over a long duration.

11. Filler coats shall be applied to fill dents and to obtain a smooth finish wherever necessary. Only factory prepared filler suitable for steel work shall be used. Filler prepared by whiting and linseed oil by craftsmen at site shall never be used as such fillers may be unbalanced and incompatible with primer and finishing coats. Application of filler shall be done with good putty knife and necessary skill. Filler applied shall be just sufficient to fill the depression or unevenness and it shall be restricted to the minimum. It shall be applied in thin layers. In filling depression or unevenness, due as many coats as are necessary may be applied allowing each layer to dry hard. The hardened coat shall be cut down by wet rubbing before the subsequent coat is applied. Where necessary, filler coats shall be applied over the undercoats also.

12. Painting shall be carried out either by brushing or by spraying. contractor shall procure the appropriate quality of paint for this purpose as recommended by the manufacturer.

13. After the second coat of primer is hard dry, the entire surface shall be wet rubbed cutting down to a smooth uniform surface. When the surface becomes dry, the undercoat of paint of optimum thickness shall be applied by brushing/spraying with minimum of brush marks. The coat shall be allowed to hard-dry. The under coat shall then be wet rubbed cutting down to a smooth finish, taking adequate care to ensure that at no place the undercoat is completely removed. The surface shall then be allowed to dry.

14. The first finishing coat of paint shall be applied by brushing or by spraying and allowed to hard dry. The gloss from the entire surface shall then be gently removed and the surface dusted off. The second finishing coat shall then be applied by brushing or by spraying.

15. At least 24 hours shall elapse between the application of successive coats. Each coat shall vary slightly in shade and this shall be got approved by the Project Manager.

16. Minimum dry film thickness of each coat of finish paint of synthetic enamel shall be 25 microns. Minimum dry film thickness of other finish paints shall be as specified in the respective item of work.

17. Epoxy primer and epoxy paint shall be applied within the specified pot life all as per recommendations of the manufacturer.

18. Surfaces inaccessible after assembly shall receive two coats of primer prior to assembly.

19. Surfaces inaccessible after erection, including top surfaces of floor beams supporting grating or chequered plate shall receive one additional coat of finish paint over and above the number of coats specified prior to erection.

20. Portion of steel members embedded to be encased in concrete shall not be painted. Joints to be site welded shall have no shop paint for at least 50 mm from the welding zone. Similarly, the steel surfaces shall not be painted in areas where connection is by use of friction grip bolts. On completion of the joint, the surfaces shall receive the painting as specified.

21. Maintenance painting of steel structures will become necessary if the painting already carried out shows signs of chalking, hairline cracking, deep checking, fine checking, peeling, blistering and rusting. The breakdown of a paint film is progressive from the top finish paint to the primer coat and the object of maintenance painting is to renovate periodically to effectively check the breakdown and protect the steel surfaces from corrosion. It is essential that same quality of paint as specified earlier need be adopted to ensure compatibility. The general workmanship for maintenance painting shall conform as per Clause 7 of IS 1477 - Part II.

22. Contractor shall provide suitable protection as necessary to prevent paint finishes from splashing on equipment, floors, walls etc.

## 2.8 Brickwork

### 2.8.1 Materials

Bricks used in the works shall conform to the requirements laid down in IS : 1077, IS 2180, IS 2222, IS 2691, IS 3952, IS 6165. The class of the bricks shall be as specifically indicated in the respective items of work prepared by the Contractor.

Brick shall be sound, hard, homogeneous in texture, well burnt in kiln without being vitrified, hand/ machine moulded, deep red, cherry or copper coloured, of regular shape and size and shall have sharp and square edges with smooth rectangular faces. The bricks shall be free from pores, cracks, flaws and nodules of free lime. They shall have smooth rectangular faces with sharp corners and shall be uniform in colour, tolerance of brick dimension shall be ± 3 % of designation 10 & above and ± 8 % lower designation. Hand moulded bricks shall be moulded with a frog and those made by extrusion process may not be provided with a frog. Bricks shall give a clear ringing sound when struck.

### 2.8.2 Compressive Strength

Five bricks shall be tested. The average compressive strength shall be as per class designation.

### 2.8.3 Water Absorption

Five bricks shall be tested for water absorption and shall not exceed 20 % by weight.

### 2.8.4 Efflorescence

Five bricks shall be tested for efflorescence. The efflorescence shall be 'nil' to 'moderate'

Sample bricks shall be submitted to the Project Manager for approval and bricks supplied shall conform to approved samples. If demanded by Project Manager, brick samples shall be got tested as per IS : 3495 by Contractor. Bricks rejected by Project Manager shall be removed from the site of works within 24 hours.

Mortar for brick masonry shall consist of cement and sand.

Mortar leaner than 1.5 and richer than 1:3 shall not be used.

## 2.9 Mortar

### 2.9.1 Materials

**Water**

Water used shall be clean and reasonably free from injurious or deleterious materials such as oils, acids, alkalis, salts. The pH value of water shall not be less than 6.

**Cement**

Cement shall conform to any of the following:

| | | | | |
|---|---|---|---|---|
| 43 Grade | Ordinary | Portland | Cement | IS : 8112 |

**Sand**

Sand for masonry mortars shall confirm to IS 2116

Mortars shall be prepared and tested as per IS 2250. Mixing of cement mortar shall be done in mechanical mixers.

### 2.9.2 Workmanship

Workmanship of brick work shall conform to IS : 2212. All bricks shall be thoroughly soaked in clear water for at least one hour immediately before being laid. The cement mortar for brick masonry work shall be as specified in the respective item of work prepared by the Contractor. Brick work 230 mm thick and over shall be laid in English Bond unless otherwise specified. 100mm/ 115 mm thick brickwork shall be laid with stretchers. For laying bricks, a layer of mortar shall be spread over the full width of suitable length of the lower course. Each brick shall be slightly pressed into the mortar and shoved into final position so as to embed the brick fully in mortar. Only full size bricks shall be used for the works and cut bricks utilized only to make up required wall length or for bonding. Bricks shall be laid with frogs uppermost.

All brickwork shall be plumb, square and true to dimensions shown. Vertical joints in alternate courses shall come directly one over the other and be in line. Horizontal courses shall be levelled. The thickness of brick courses shall be kept uniform. In case of one brick thick or half brick thick wall, at least on e face should be kept smooth and plane, even if the other is slightly rough due to variation in size of bricks. For walls of thickness greater than on e brick both faces shall be kept smooth and plane. All interconnected brickwork shall be carried out at nearly one level so that there is uniform distribution of pressure on the supporting structure and no portion of the work shall be left more than one course lower than the adjacent work. Where this is not possible, the work be raked back according to bond (and not saw toothed) at an angle not exceeding 45 deg. But in no case the level difference between adjoining walls shall exceed one meter. Brickwork shall not be raised more than one metre per day.

Bricks shall be so laid that all joints are well filled with mortar. The thickness of joints shall not be less than 6 mm and not more than 10 mm. The face joints shall be raked to a minimum depth of 10 mm/ 15 mm by raking tools during the progress of work when the mortar is still green, so as to provided a proper key for the plastering/ pointing respectively to be done later. When plastering or pointing is not required to be done, the joints shall be uniform in thickness and be struck flush and finished at the time of laying. The face of brickwork shall be cleaned daily and all mortar droppings removed. The

surface of each course shall be thoroughly cleaned of all dirt before another course is laid on top.

During harsh weather conditions, newly built brick masonry works shall be protected by tarpaulin or other suitable covering to prevent mortar being washed away by rain.

Brickwork shall be kept constantly moist on all the faces for at least seven days after 24 hrs of laying. The arrangement for curing shall be got approved from the Project Manager.

Double scaffolding having two sets of vertical supports shall be provided to facilitate execution of the masonry works. The scaffolding shall be designed adequately considering all the dead, live and possible impact loads to ensure safety of the workmen, in accordance with the requirements stipulated in IS : 2750 and IS : 3696 (Part - I). Scaffolding shall be properly maintained during the entire period of construction. Single scaffolding shall not be used on important works and will be permitted only in certain cases as decided by the Project Manager. Where single scaffolding is adopted, only minimum number of holes, by omitting a header shall be left in the masonry for supporting horizontal scaffolding poles. All holes in the masonry shall be carefully made good before plastering/ pointing.

In the event of usage of traditional bricks of size 230 mm x 115 mm x 75 mm, the courses at the top of the plinth and sills as well as at the top of the wall just below the roof/ floor slabs and at the top of the parapet shall be laid with bricks on edge.

All brick work shall be built tightly against columns, floor slabs or other structural members.

To overcome the possibility of development of cracks in the brick masonry following measures shall be adopted.

For resting RCC slabs, the bearing surface of masonry wall shall be finished on top with 12 mm thick cement mortar 1:3 and provided with 2 layers of Kraft paper Grade 1 as per IS : 1397 or 2 layer of 50 micron thick polyethylene sheets.

RCC/ steel beams resting on masonry wall shall be provided with reinforced concrete bed blocks of 150 mm thickness, projecting 150mm on either sides of the beam, duly finished on top with 2 layer of Kraft paper Grade 1 as per IS : 1397 or 2 layers of 50 micron thick polyethylene sheets.

Steel wire fabric shall be provided at the junction of brick masonry and concrete before taking up plastering work.

Bricks for partition walls shall be stacked adjacent to the structural member to predeflect the structural member before the wall is taken up for execution. Further, the top most course of half or full brick walls abutting against either a deshuttered slab or beam shall be built only after any proposed masonry wall above the structural member is executed to cater for the deflection of the structural element.

Reinforced cement concrete transomes and mullions of dimensions as indicated in the construction Drawings to be prepared by the Contractor are generally required to be provided in the half brick partition walls.

Where the drawings prepared by the Contractor indicate that structural steel sections are to be encased in brickwork, the brickwork masonry shall be built closely against the steel section, ensuring a minimum of 20 mm thick cement-sand mortar 1:4 over all the steel surfaces. Steel sections partly embedded in brickwork shall be provided with bituminous protective coating to the surfaces at the point of entry into the brick masonry.

## 2.10 Un-Coursed Random Rubble Masonry

### 2.10.1 Materials

Stones for the works shall be of the specified variety which are hard, durable, fine grained and uniform in colour (for superstructure work) free from defects like cracks, sand holes,

patterns of soft / loose materials veins, other defects. Quality and work shall conform to the requirements specified in IS: 1597 (Part-I). The percentage of water absorption shall not exceed 5 percent as per test conducted in accordance with IS : 1124. The Contractor shall supply sample stones to the Project Manager for approval. Stones shall be laid with its grains horizontal so that the load transmitted is always perpendicular to the natural bed.

Cement-stand mortar for stone masonry works shall be as per IS 2250.

### 2.10.2 Scaffolding

Type of scaffolding to be used shall be as specified in the section of brick masonry

### 2.10.3 Workmanship

For all works below ground level the masonry shall be random rubble uncoursed with ordinary quarry dressed stones for the hearting and selected quarry dress stones for the facing.

For all R.R. masonry in superstructure the masonry shall be well bounded, faced with hammer dressed stones with squared quoins at corners. The bushing on the face shall not be more that 40 mm on an exposed face and on the face to be plastered it shall not project by more than 12 mm nor shall it have depression more than 10mm from the average wall surface.

Face stones shall extend back sufficiently and bond well with the masonry. The depth of stone from the face of the wall inwards shall not be less than the height or breadth at the face. The length of the stone shall not exceed three times the height and the breadth on base shall not be greater than three-fourths the thickness of wall nor less than 150 mm. The height of stone may be upto a maximum of 300 mm. Face stones or hearting stones shall not be less than 150 mm in any direction.

Chips and spalls shall be used wherever necessary to avoid thick mortar joints and to ensure that no hollow spaces are left in the masonry. The use of chips and spalls in the herating shall not exceed 20 percent of the quantity of stone masonry. Spalls and chips shall not be used on the face of the wall and below hearting stones to bring them to the level of face stones.

The maximum thickness of joints shall not exceed 20 mm. All joints shall be completely filled with mortar. When plastering or pointing is not required to be done, the joints shall be struck flush and finished as the work proceeds. Otherwise, the joints shall be raked to a minimum depth of 20 mm by a raking tool during the progress of the work while the mortar is still green.

Through or bond stones shall be provided in wall upto 600 mm thick and in case of wall above 600mm thickness, a set of two or more bond stones overlapping each other by at least 150mm shall be provided in a line from face to back. Each bond stone or a set of bond stones shall be provided for every 0.5 sq.m of wall surface.

All stones shall be sufficiently wetted before laying to prevent absorption of water from the mortar. All connected walls in a structure shall be normally raised uniformly and regularly. However if any part of the masonry is required to be left behind, the wall shall be raked back (and not saw toothed) at an angle not exceeding 45 deg. Masonry work shall not be raised by more than one metre per day.

Green work shall be protected from rain by suitable covering. Masonry work shall be kept constantly moist on all the faces for a minimum period of seven days for proper curing of the joints.

## 2.11 Damp Proof Course

### 2.11.1 Material and Workmanship

All the walls in a building shall be provided with damp-proof course covering plinth to prevent water from rising up the wall. The damp-proof course shall run without a break

throughout the length of the wall, even under the door or other opening. Damp-proof course shall consist of minimum 100mm thick cement concrete of M-20 mix with nominal reinforcement and approved water-proofing compound admixture conforming to IS:2645 in proportion as directed by the manufacturer. Concrete shall be with 10mm down graded coarse aggregates.

The surface of brick work/stone masonry work shall be levelled and prepared before laying the cement concrete. Side shuttering shall be properly fixed to ensure that slurry does not leak through and is also not disturbed during compaction. The upper and side surface shall be made rough to afford key to the masonry above and to the plaster. Damp-proof course shall be cured properly for at least seven days after which it shall be allowed to dry for taking up further work.

### 2.11.2 Miscellaneous Inserts, Bolts, Etc.

All the miscellaneous inserts such as bolts, pipes, plate embedments etc., shall be accurately installed in the building works at the correct location and levels, all as detailed in the construction Drawing to be prepared by the Contractor. Contractor shall prepare and use templates for this purpose, if so directed by the Project Manager. In the event, of any of the inserts are improperly installed, contractor shall make necessary arrangement to remove and reinstall at the correct locations/levels all as directed by the Project Manager.

### 2.11.3 Baste Concrete

The thickness and grade of concrete and reinforcement shall be as specified in items of works prepared by the Contractor.

Before placing the blinding concrete, the sub-base of rubble packing shall be properly wetted and rammed. Concrete for the base shall then be deposited between the forms, thoroughly tamped and surface finished level with the top edges of the forms. Two or three hours after the concrete has been laid in position, the surface shall be roughened using steel wire brush to remove any scum or laitance and swept clean so that the coarse aggregates are exposed. The surface of the base concrete shall be left rough to provide adequate bond for the floor finish to be provided later.

## 2.12 Floor Hardener Topping

### 2.12.1 Materials and Workmanship

Floor Hardener topping shall be provided either as integrally finished over the structural slab/grade slab or laid monolithically with the concrete/granolithic floor finish on top of hardened concrete base.

Floor hardener of the metallic or non-metallic type suitable for the performance of normal/medium /heavy duty function of the floor, the quantum of ingredients and the thickness of topping shall be as specified in the respective items of work prepared by the Contractor.

For monolithic application with the floor finish/slab the thickness of the layer shall be 15 mm. The topping shall be laid within 2 to 3 hours after concrete is laid when it is still plastic but stiffened enough for the workmen to tread over it by placing planks. The surface for the concrete layer shall be kept rough for providing adequate bond for the topping. Laitance shall be removed before placing the topping. The topping shall be screed and thoroughly compacted to the finished level. Trowelling to smooth finish shall be carried out. After the surface has hardened sufficiently, it shall be kept continuously moist for at least 10 days.

The procedure for mixing the floor hardener topping shall be as per manufacturer's instructions.

Surface shall be prevented from any damages due to subsequent building operations by covering with 75 mm thick layer of sand.

## 2.13 Cement Plastering Works

### 2.13.1 Materials

The proportions of the cement mortar for plastering shall be 1:4 (one part of cement to four parts of sand). Cement and sand shall be mixed thoroughly in dry condition and then just enough water added to obtain a workable consistency. The quality of water and cement shall be as per relevant IS standards. The quality and grading of sand for plastering shall conform to IS : 1542. The mixing shall be done thoroughly in a mechanical mixer unless hand mixing is specifically permitted by the Project Manager. If so desired by the Project Manager sand shall be screened and washed to meet the Specifications. The mortar thus mixed shall be used as soon as possible preferably within 30 minutes from the time water is added to cement. In case the mortar has stiffened due to evaporation of water this may be re-tempered by adding water as required to restore consistency but this will be permitted only upto 30 minutes from the time of initial mixing of water to cement. Any mortar which is partially set shall be rejected and removed forthwith from the site. Droppings of plaster shall not be re-used under any circumstances.

### 2.13.2 Workmanship

Preparation of surfaces and application of plaster finishes shall generally conform to the requirements specified in IS : 1661 and IS : 2402.

Plastering operations shall not be commenced until installation of all fittings and fixtures such as door/ window panels, pipes, conduits etc. are completed.

All joints in masonry shall be raked as the work proceeds to a depth of 10 mm / 20mm for brick/ stone masonry respectively with a tool made for the purpose when the mortar is still green. The masonry surface to be rendered shall be washed with clean water to remove all dirt, loose materials, etc., Concrete surfaces to be rendered shall be roughened suitably by hacking or bush hammering for proper adhesion of plaster and the surface shall be evenly wetted to provide the correct suction. The masonry surfaces should not be too wet only damp at the time of plastering. The dampness shall be uniform to get uniform bond between the plaster and the masonry surface.

### 2.13.3 Interior Plain Faced Plaster

This plaster shall be laid in a single coat of 12 mm thickness. The mortar shall be dashed against the prepared surface with a trowel. The dashing of the coat shall be done using a strong whipping motion at right angles to the face of the wall or it may be applied with a plaster machine. The coat shall be trowelled hard and tight forcing it to surface depressions to obtain a permanent bond and finished to smooth surface. Interior plaster shall be carried out on jambs, lintel and sill faces, etc. as shown in the drawing and as directed by the Project Manager.

### 2.13.4 Plain Faced Ceiling Plaster

This shall be applied in a single coat of 6 mm thickness. Application of mortar shall be as stipulated in above paragraph.

### 2.13.5 Exterior Plain Faced Plaster

This plaster shall be applied in 2 coats. The first coat or the rendering coat shall be approximately 14 mm thick. The rendering coat shall be applied as stipulated above except finishing it to a true and even surface and then lightly roughened by cross scratch lines to provide bond for the finishing coat. The rendering coat shall be cured for at least two days and then allowed to dry. The second coat or finishing coat shall be 6mm thick. Before application of the second coat, the rendering coat shall be evenly damped. The second coat shall be applied from top to bottom in one operation without joints and shall be finished leaving an even and uniform surface. The mortar proportions for the coats shall be as specified in the respective item of work. The finished plastering work shall be cured for at least 7 days.

Interior plain faced plaster 20 mm thick if specified for uneven faces of brick walls or for random/ coursed rubble masonry walls shall be executed in 2 coats similar to the procedure stipulated in above paragraph.

For external plaster, the plastering operation shall be commenced from the top floor and carried downwards. For internal plaster, the plastering operations for the walls shall commence at the top and carried downwards. Plastering shall be carried out to the full length of the wall or to natural breaking points like doors/ windows etc. Ceiling plaster shall be completed first before commencing wall plastering.

Double scaffolding to be used shall be as specified in clause 6.6.1.8.

The finished plaster surface shall not show any deviation more than 4mm when checked with a straight edge of 2 m length placed against the surface.

To overcome the possibility of development of cracks in the plastering work following measures shall be adopted.

Plastering work shall be deferred as much as possible so that fairly complete drying shrinkage in concrete and masonry works take place.

Steel wire fabric shall be provided at the junction of brick masonry and concrete to overcome reasonably the differential drying shrinkage/ thermal movement.

Ceiling plaster shall be done, with a trowel cut at its junction with wall plaster. Similarly trowel cut shall be adopted between adjacent surfaces where discontinuity of the background exists.

## 2.14 Cement Pointing

### 2.14.1 Materials

The cement mortar for pointing shall be in the proportion of 1:3 (one part of cement to three parts of fine sand). Sand shall conform to IS : 1542 and shall be free from clay, shale, loam, alkali and organic matter and shall be of sound, hard, clean and durable particles. Sand shall be approved by Project Manager and if so directed it shall be washed/ screened to meet specification requirements.

### 2.14.2 Workmanship

Where pointing of joints in masonry work is specified, the joints shall be raked at least 15 mm/ 20 mm deep in brick/ stone masonry respectively as the work proceeds when the mortar is still green.

Any dust/ dirt in the raked joints shall be brushed out clean and the joints shall be washed with water. The joints shall be damp at the time of pointing. Mortar shall be filled into joints and well pressed with special steel trowels. The joint shall not be disturbed after it has once begun to set. The joints of the pointed work shall be neat. The lines shall be regular and uniform in breadth and the joints shall be raised, flat, sunk or 'V' as may be specified in the respective items of work. No false joints shall be allowed.

The work shall be kept moist for at least 7 days after the pointing is completed. Wherever coloured pointing has to be done, the colouring pigment of the colour required shall be added to cement in such proportions as recommended by the manufacturer and as approved by the Project Manager.

## 2.15 Water Proofing Admixtures

Water-proofing admixtures shall conform to the requirements of IS : 2645 and shall be of approved manufacture. The admixture shall not contain calcium chloride. The quantity of the admixture to be used for the works and method of mixing etc. shall be as per manufacturer's instructions and as directed by the Engineer.

## 2.16 Painting of Surfaces

### 2.16.1 Materials

Oil bound distemper shall conform to IS : 428. The primer shall be alkali resistant primer of the same manufacture as that of the distemper.

Acrylic wood emulsion paint shall be applied to exterior surfaces.

Lead free acid, alkali and chlorine resisting paint shall conform to IS: 9862.

Colour wash shall be made by addition of a suitable quantity of mineral pigment, not affected by lime, to the prepared white wash to obtain the shade/ tint as approved by the Project Manager.

All the materials shall be of the best quality from an approved manufacturer. Contractor shall obtain prior approval of the Project Manager for the brand of manufacture and the colour/ shade. All materials shall be brought to the site of works in sealed containers.

### 2.16.2 Workmanship

Contractor shall obtain the approval of the Project Manager regarding the readiness of the surfaces to receive the specified finish, before commencing the work on painting.

Painting of new surfaces shall be deferred as much as possible to allow for thorough drying of the sub-strata.

The surfaces to be treated shall be prepared by thoroughly brushing them free from dirt, mortar droppings and any loose foreign materials. Surfaces shall be free from oil, grease and efflorescence. Efflorescence shall be removed only by dry brushing of the growth. Cracks shall be filled with Gypsum. Workmanship of painting shall generally conform to IS : 2395.

### 2.16.3 White Wash

The prepared surfaces shall be wetted and the finish applied by brushing. The operation for each coat shall consist of a stroke of the brush first given horizontally from the right and the other from the left and similarly, the subsequent stroke from bottom upwards and the other form top downwards, before the first coat dries. Each coat shall be allowed to dry before the next coat is applied. Minimum of 2 coats shall be applied unless otherwise specified. The dry surface shall present a uniform finish without any brush marks.

### 2.16.4 Colour Wash

Colour wash shall be applied in the same way as for white wash. A minimum of 2 coats shall be applied unless otherwise specified. The surface shall present a smooth and uniform finish without any streaks. The finished dry surface shall not show any signs of peeling/ powdery and come off readily on the hand when rubbed.

### 2.16.5 Cement Paints

The prepared surfaces shall be wetted to control surface suction and to provide moisture to aid in proper curing of the pain. Cement paint shall be applied with a brush with stiff bristles. The primer coat shall be a thinned coat of cement paint. The quantity of thinner shall be as per manufacturer's instructions. The coats shall be vigorously scrubbed to work the paint into any voids for providing continuous paint film free form pinholes for effective water proofing in addition to decoration. Cement paint shall be brushed in uniform thickness and the covering capacity for two coats on plastered surfaces shall be 3 to 4 kg/ sq.m. A minimum of 3 coats of the same colour shall be applied. Atleast 24 hours shall be left after the first coat to become sufficiently hard before the second coat is applied. The painted surfaces shall be thoroughly cured by sprinkling with water using a fog spray at least 2 to 3 times a day. Curing shall commence after about 12 hours when the paint hardens. Curing shall be continued for atleast 2 days after the application of final coat. The operations for brushing each coat shall be as detailed above.

### 2.16.6 Oil Bound Distemper

The prepared surfaces shall be dry and provided with one coat of alkali resistant primer by brushing. The surface shall be finished uniformly without leaving any brush marks and allowed to dry for at least 48 hours. A minimum of two coats of oil bound distemper shall be applied, unless otherwise specified. The first coat shall be of a lighter tint. At least 24 hours shall be left after the first coat to become completely dry before the application of the second coat. Broad, stiff, double bristled distemper brushed shall be used for the work. The operations for brushing each coat shall be as detailed above. It shall be applied to interior surfaces only, unless instructed to apply outside.

### 2.16.7 Acid, Alkali Resistant Paints

A minimum of 2 coats of acid/ alkali resisting paint shall be applied over the prepared dry surfaces by brushing. Primer coat shall be as per manufacturer's instructions.

### 2.16.8 Acrylic Emulsion Paints

Acrylic emulsion paint shall be applied in the same way as for plastic emulsion paint. A minimum of 2 finishing coats over one coat of primer shall be provided unless otherwise specified.

## 2.17 Sanitary Appliances

Given in separate chapter

## 2.18 Construction Joints

As construction joints are week in shear normally construction joints, if required, shall be provided in location where shear stress is minimum. However, construction joints should be avoided in the bottom slab of any water retaining structure. In the walls of the water retaining structures vertical construction joints should be avoided to the maximum possible extent. In the event the Contractor solely for his convenience proposes construction joints in the bottom slab and or vertical construction joints in the wall of the water retaining structures, then the Contractor shall provide approved PVC water-stop of 230mm width and 8mm thick in all such joints. For the convenience of construction and to avoid segregation of concrete horizontal construction joints shall be provided in a planned way at a height not more than 2.0M in case of approved admixture, at his cost, is used by the contractor in the concrete to increasing the workability of the concrete without affecting the designed water cement ratio. In case such admixture is not used the height of such cast shall be restricted maximum up to 1.5M.

All such construction joints should be prepared properly like removing of all loose materials by wire brush and soaking with rich cement slurry mixed with approved water-proofing compound in prescribed ratio, before pouring next concrete. Next pour of concrete in any construction joints in water retaining structures should be within 24 hours of last pour.

## 2.19 Water Proofing

### 2.19.1 Water Proofing With Bitumen Felt

A four layer course treatment shall consist of the following layers

- Initial layer of bonding material applied hot at specified weight per unit area.
- 2.nd layer of self finished bitumen felt of specified brand and manufacture conforming to the type and grade given in the description of the item.
- Third layer of bonding material
- Final layer of stone grit of pea sized gravel spread at specified volume of material per unit area.

Note: The primer or under lay where required to be provided shall not count against the number of courses specified.

**Laying**

Bitumen bonding material of required grade shall be heated to the working temperature specified for the particular grade by the bitumen manufactures and conveyed to the roof in buckets or pouring canes in weighed quantities.

Suitable working temperature for different grades of bitumen are as under :

i) Blown type petroleum bitumen of IS grade 85/25 180 degree C.

ii) Residual type petroleum bitumen of penetration 30/40 180 degree to 190 degree C (IS grade S-35).

Drain outlets shall be given a four or six course treatment as specified for the roof in the described of the item in the manner specified for the flat roof surface. Water proofing treatment shall be carried into the drainpipe or outlets by at least 10 cm. The water proofing treatment laid on the roof surface shall overlap the upper edge of the water proofing treatment in the drain outlets by at least 10 cm.

The self-finished felt shall be cut to the required length, brushed clean of dusting material and laid out flat on the roof to eliminate curls and subsequent stretching. The felt shall normally be laid in length at right angles to the direction of the slope and laying shall be commenced at the lowest level and worked up to crest. The felt shall not be laid in single piece of very long lengths as they are likely to shrink, 6 to 8 m are suitable lengths. The roof surfaces shall be cleaned and dry before the felt treatment is begun. Each length of felt shall be laid in position and rolled up for a distance of half its length. The hot bonding material shall be poured on the roof across the full width of the rolled felt as the later is steadily rolled out and pressed down. The pouring shall be so regulated that the correct weight of bonding material per unit area is spread uniformly over the surface. Excess bonding material that gets squeezed out at the ends shall be leveled up as laying proceeds, When the first half of the strip of felt has been bonded to the roof, the other half shall be rolled up and then unrolled on the hot bonding material in the same way. Subsequently strips shall also be laid in the same manner. Each strips shall overlap the preceding one by at least 7.5 cm at the longitudinal edges and 10 cm at the ends. All overlaps shall be firmly bonded with hot bitumen. Streaks and tailings of bitumen near edges of laps shall be leveled by heating the overlap with a blowlamps and leveling down unevenness.

The third layer of bonding material in the four-course treatment shall be carried out in a similar manner after the flashing has been completed.

## 2.20 Roofing

As per Standard specification.

# 3. ROAD AND PAVEMENT WORKS

## 3.1 Granular Sub-Base

### Scope

This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the requirements of these Specifications. The material shall be laid in layers as sub-base as necessary according to lines, grades and cross-sections shown on the Drawings or as directed by the Engineer.

### Materials

The material to be used for the work shall be natural sand, moorum, gravel, crushed stone, or combination thereof depending upon the grading required. Materials like crushed slag, crushed concrete, brick metal and kankar may be allowed only with the specific approval of the Engineer. The material shall be free from organic or other deleterious constituents and as per RUIDP Standard Specifications (Civil Works).

### Physical requirements

The material shall have a 10 percent fineness value of 50 kN or more (for sample in soaked condition) when tested in compliance with BS: 812 (Part III). The water absorption value of the coarse aggregate shall be determined as per IS: 2386 (Part 3): if this value is greater than 2 percent, the soundness test shall be carried out on the material delivered to site as per IS: 383. For Grading II and III materials, the CBR shall be determined at the density and moisture content likely to be developed in equilibrium conditions which shall be taken as being the density relating to a uniform air voids content of 5 per cent.

Table :. Grading for Coarse Graded Granular Sub-Base Materials

| Grading No. | Size Range | Sieve Designation | Percent by Weight Passing the Sieve |
|---|---|---|---|
| 1 | 90 mm to 45 mm | 125 mm | 100 |
| | | 90 mm | 90-100 |
| | | 63 mm | 25-60 |
| | | 45 mm | 0-15 |
| | | 22.4 mm | 0-5 |
| 2 | 63 mm to 45 mm | 90 mm | 100 |
| | | 63 mm | 90-100 |
| | | 53 mm | 25-75 |
| | | 45 mm | 0-15 |
| | | 22.4 mm | 0-5 |
| 3 | 53 mm to 22.4 mm | 63 mm | 100 |
| | | 53 mm | 95-100 |
| | | 45 mm | 65-90 |
| | | 22.4 mm | 0-10 |

| Grading No. | Size Range | Sieve Designation | Percent by Weight Passing the Sieve |
|---|---|---|---|
| | | 11.2 mm | 0-5 |

**Strength of Sub-base**

It shall be ensured prior to actual execution that the material to be used in the sub-base satisfies the requirements of CBR and other physical requirements when compacted and finished.

When directed by the Engineer, this shall be verified by performing CBR tests in the laboratory as required on specimens remolded at field dry density and moisture content and any other tests for the "quality" of materials, as may be necessary.

**Construction Operations**

Preparation of subgrade

Immediately prior to the laying of sub-base, the subgrade already finished to applicable Clauses and shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water if necessary and rolled with two passes of 80-100 kN smooth wheeled roller.

Spreading and compacting

The sub-base material of grading specified in the Contract shall be spread on the prepared subgrade with the help of mortar grade of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slope and grade during the operation or other means as approved by the Engineer.

Moisture content of loose material shall be checked in accordance with IS: 2720 (Part 2) and suitably adjusted by sprinkling additional water from a truck mounted or trailer mounted water tank and suitable for applying water uniformly and at controlled quantities to variable widths of surface or other means approved by the Engineer so that, at the time of compaction, it is from 1 per cent above to 2 per cent below the optimum moisture content corresponding to IS: 2720 (Part 8). While adding water, due allowance shall be made for evaporation losses. After water has been added, the material shall be processed by mechanical or other approved means like disc harrows, rotators until the layer is uniformly wet.

**Surface Finish and Quality Control of Work**

The surface finish of construction shall conform to the requirements of Section 902 of MoST Specifications for Road and Bridge Works (Latest Revision). Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900 of MoST Specifications for Road and Bridge Works (Latest Revision).

**Measurements for Payment**

Granular sub-base shall be measured as finished work in position in cubic metres as per RUIDP Standard Specifications (Civil Works) and as approved by the Engineer.

**Rate**

The contract unit rate for granular sub-base shall be payment in full for carrying out the required operations including full compensation as per BOQ and as specified in RUIDP Standard Specifications (Civil Works).

## 3.2 Wet Mix Macadam Sub-Base/Base

**Scope**

This work shall consist of laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass on prepared subgrade/sub-

base/base or existing pavement as the case may be in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as necessary to lines, grades and cross-sections shown on the approved Drawings or as directed by the Engineer.

The thickness of a single compacted Wet Mix Macadam Layer shall not be less than 75 mm. When vibrating or other approved types of compacting equipment are used, the compacted depth of a single layer of the sub-base course may be increased to 200 mm upon approval of the Engineer.

**Materials**

Physical requirements-

Coarse aggregates shall be crushed stone. If crushed gravel/shingle is used, not less then 90 per cent by weight of the gravel/shingle pieces retained on 4.75 mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in Table 13-7 below.

Physical Requirements of Coarse Aggregates for Wet Mix Macadam for Sub- Base/Base Courses as per as specified in RUIDP Standard Specifications (Civil Works).

If the water absorption value of the coarse aggregate is greater than 2 per cent, the soundness test shall be carried out on the material delivered to site as per IS: 2386 (Part-5).

**Construction Operations**

While constructing wet mix macadam, arrangement shall be made for the lateral confinement of wet mix. This shall be done by laying materials in adjoining shoulders along with that of wet mix macadam layer and following the sequence of operations described in in RUIDP Standard Specifications (Civil Works).

Preparation of mix

Wet mix macadam shall be prepared in an approved mixing plant of suitable capacity having provision for controlled addition of water and forced/positive mixing arrangement like pug mill or pan type mixer of concrete batching plant. For small quantity of wet mix work, the Engineer may permit the mixing to be done in concrete mixers.

Optimum moisture for mixing shall be determined in accordance with IS: 2720 (Part-8) after replacing the aggregate fraction retained on 22.4 mm sieve with material of 4.75 mm to 22.4 mm size while adding water, due allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits. The mixed material should be uniformly wet and no segregation should be permitted.

Spreading of mix

Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared subgrade/sub-base/base in required quantities. In no case should these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly completed stretch be permitted. The mix may be spread either by a paver finisher or motor grader. For portions where mechanical means cannot be used, manual means as approved by the Engineer shall be used. The motor grader shall be capable of spreading the material uniformly all over the surface. Its blade shall have hydraulic control suitable for initial adjustments and maintaining the same so as to achieve the specified slope and grade.

The paver finisher shall be self-propelled, having the following features:

1. Loading hoppers and suitable distribution mechanism

2. The screed shall have tamping and vibrating arrangement for initial compaction to the layer as it is spread without rutting or otherwise marring the surface profile. 3. The paver

shall be equipped with necessary control mechanism so as to ensure that the finished surface is free from surface blemishes.

The surface of the aggregate shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. The layer may be tested by depth blocks during construction. No segregation of larger and fine particles should be allowed. The aggregates as spread should be of uniform gradation with no pockets of fine materials.

Compaction

After the mix has been laid for the required thickness, grade and cross fall/camber the same shall be uniformly compacted, to the full depth with suitable roller. If the thickness of single compacted layer does not exceed 100 mm, a smooth wheel roller of 80 to 100 kN weight may be used. For a compacted single layer upto 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 kN or equivalent capacity roller. The speed of the roller shall not exceed 5 km/h. In portions having unidirectional cross fall/super elevation, rolling shall commence from the lower edge and progress gradually towards the upper edge. Thereafter, roller should progress parallel to the center line of the road, uniformly over-lapping each preceding track by at least one third width until the entire surface has been rolled. Alternate trips of the roller shall be terminated in stops at least 1 m away from any preceding stop.

In portions in camber, rolling should begin at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall then progress gradually towards the center parallel to the center line of the road uniformly overlapping each of the preceding track by at least one-third width until the entire surface has been rolled. Any displacement occurring as a result of reversing of the direction of a roller or from any other cause shall be corrected at once as specified and/or removed and made good. Along forms, kerbs, walls or other places not accessible to the roller, the mixture shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added material shall not be permitted.

Rolling should not be done when the subgrade is soft or yielding or when it causes a wave- like motion in the sub-base/base course or subgrade. If irregularities develop during rolling which exceed 12 mm when tested with a 3 m straight edge, the surface should be loosened and premixed material added or removed as required before rolling again so as to achieve a uniform surface conforming to the desired grade and cross fall. In no case should the use of unmixed material be permitted to make up the depressions. Rolling shall be continued till the density achieved is at least 98 per cent of the maximum dry density for the material as determined by the method outlined in IS: 2720 (Part-8). After completion, the surface of any finished layer shall be well-closed, free from movement under compaction equipment or any compaction planes, ridges, cracks and loose material. All loose segregated or otherwise defective areas shall be made good to the full thickness of the layer and re-compacted.

Setting and drying

After final compaction of wet mix macadam course, the road shall be allowed to dry for 24 hours.

Quality control

Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900 of MoST Specifications for Road and Bridge Works (Latest Revision).

Rectification of Surface Irregularity

Where the surface irregularity of the wet mix macadam course exceeds the permissible tolerances or where the course is otherwise defective due to subgrade soil getting mixed with the aggregates, the full thickness of the layer shall be scarified over the affected

area, reshaped with added premixed material or removed and replaced with fresh premixed material as applicable and re-compacted in accordance with Clause 13.3.3. The area treated in the aforesaid manner shall not be less than 5 m long and 2 m wide. In no case shall depressions be filled up with unmixed and ungraded material or fines.

**Measurements for Payment**

Wet mix macadam shall be measured as finished work in position in cubic metres.

**Rates**

The contract unit rate for granular sub-base shall be payment in full for carrying out the required operations including full compensation as specified in RUIDP Standard Specifications (Civil Works) as per the BOQ.

## 3.3 Surface Base and Surface Courses (Bituminous prime coat)

**Scope**

This work shall consist of preparing an existing granular or black-topped surface bituminous course. The work shall be performed on such widths and lengths as shown on Drawings or as instructed by the Engineer. The existing surface shall be firm and clean and treated with Prime coat as shown on the drawings as otherwise stated in the contract.

**Materials**

For scarifying and re-laying the granular surface

The materials used shall be coarse aggregates salvaged from scarification of the existing granular base course supplemented by fresh coarse aggregates and screenings so that aggregates and screenings thus supplemented correspond to Water bound macadam or Wet mix macadam, as the case may be.

For patching potholes and sealing cracks

Where the existing surface to be overlaid is bituminous, any existing potholes and cracks shall be repaired and sealed in accordance with Clause 3004.2 and 3004.3 of MoST Specifications for Road and Bridge Works (IV Revision).

For profile corrective course

A profile corrective course for correcting the existing pavement profile shall be laid to varying thickness as shown on the drawings or as indicated in the contract documents. The profile corrective course shall be laid to tolerances and densities as specified for wearing course if a single layer, or base course, if it is to be covered with wearing course layer.

Profile corrective course and its application

The type of material for profile corrective course shall be as shown on the Drawing or as directed by the Engineer. Where it is to be laid as part of the overlay/strengthening course, the profile corrective course material shall be of the same Specification as that of the overlay/strengthening course. However, if provided as a separate layer, it shall be of the same Specifications and details given in the contract drawings.

(1) Any high spot in the existing surface shall be removed by a milling machine or other approved method, and all loose material shall be removed to the satisfaction of the Engineer.

(2) Where the maximum thickness of profile corrective course will be not more than 40 mm, the profile corrective course shall be constructed as an integral part of the over lay layer, adopting such construction procedures and using such equipment as approved by the Engineer, to lay the specified type of material, to thickness and tolerance as specified, for the course, to be provided.

**Construction Operations**

Preparing existing granular surface

Where the existing surface is granular, all loose and disintegrated materials shall be removed and the surface lightly watered if the profile corrective course to be provided as a separate layer is also granular. Where the profile corrective course of bituminous material is to be laid over the latter shall, after removal of all loose material, be primed. The surface finish of all granular layers on which bituminous work are to be placed, shall, unless otherwise specifically instructed by the Engineer, be free from dust. All such layers must be capable of being swept, after the removal of any non-integral loose material, by means of mechanical broom, without shedding significant quantities of material and dust removed by air jet, washing, or other means approved by the Engineer. After cleaning the surface shall be correct to line and level, with tolerances specified for base courses.

Scarifying existing bituminous surface

Where specified or shown on drawings, the existing bituminous layer in the specified width shall be removed with care without causing undue disturbance to the underlying layer by suitable method approved by the Engineer. After removal, all loose and disintegrated material, the underlying layer which might have been disturbed should be suitably reworked and compacted to line and level. After supplementing the base material as necessary with suitable fresh stone, the compacted finished surface shall be primed on the process of removal shall, before laying of the overlay course, be reset properly by spreading/hand packing of aggregates and compacting with suitable roller/heavy hand rammers/approved mechanical temper so that the level of the top surface of such scarified area shall be even and properly graded with respect to adjoining surface. Where applicable, the granular surface, after removal of the existing bituminous layer, shall be primed. Reusable materials shall be stacked as directed by the Engineer with all lift and lead of 1000m of their origin.

Patching of potholes and sealing of cracks

Where the existing surface to be overlaid is bituminous, any existing pot-holes and cracks shall be repaired and sealed in accordance with Clauses 3004.2 and 3004.3 of MoST Specifications for Road and Bridge Works (IV Revision) or as directed by Engineer.

Covering the profile corrective course

Profile Corrective Course particularly shall be so planned that layer shall be covered by the designed base / wearing course at the earliest opportunity.

**Surface Finish and Quality Control of work**

The relevant provisions of Section 900 of MoST Specifications for Road and Bridge Works (IV Revision) shall apply.

**Measurement**

Prime Coat is to be measured and paid for on a square meter basis.

**Rates**

The contract unit rate as per BOQ for prime coat bituminous surfaces, including repairing/ reworking disturbed underlying layers and stacking reusable / unusable material shall include for but not necessarily be limited to, the cost of all labour, supply of materials needed for repair / reworking, hire charges of tools and plants, and transportation of scarified materials with in 1000 m of their origin.

### 3.4 Dense Graded Bituminous Macadam

**Scope**

This clause specifies the construction of Dense Graded Bitumen Macadam, (DBM), for use mainly, but not exclusively, base, binder and profile corrective course. DBM is also intended for use as road base material. This work shall consist of construction in a single

or multiple layers of DBM on a previously prepared base or sub base. The thickness of a single layer shall be 50mm to 100 mm shown in the construction drawing.

**Materials**

Bitumen

The bitumen shall be paving bitumen of Penetration Grade complying with Indian Standard Specification for "Paving Bitumen" IS 73, and of the penetration indicated in Table 13-11 for dense Bitumen or this Bitumen as modified by one of the methods specified in Clause 521 of MoST Specifications for Road and Bridge Works (IV Revision) or as otherwise specified in the Contract. Guidance on the selection of an appropriate grade of bitumen is given in the Manual for Construction and Supervision of Bituminous Works.

Coarse aggregates

The coarse aggregates shall consist of crushed rock, crushed gravel or other hard material retained on 2.36 mm sieve. They shall be clean, hard, and durable, of cubical shape, free from dust and soft or friable matter, organic or other deleterious substances. Where the contractor's selected source of aggregates have poor affinity for bitumen, as a condition for the approval of that source, the bitumen shall be treated with an approved anti stripping agent, as per the manufacturer's recommendations, without additional payment. Before approval of source, the aggregates shall be tested for stripping. The aggregates shall satisfy the physical requirements as specified in RUIDP Standard Specifications (Civil Works) for dense bituminous macadam. Where the crushed gravel is proposed for use as aggregates, not less than 90 % by weight of the crushed material retained on 4.75 mm sieve shall have at least two fractured faces. The plasticity index of the fraction passing the 425 micron sieve shall not exceed 4.

Fine Aggregates

Fine aggregates shall consist of crushed or naturally occurring mineral material, or a combination of the two passing the 2.36 mm sieve and retained on the 75 micron sieve. They shall be clean, hard, durable, dry and free from dust, and soft or friable matter, organic or other deleterious matter. The fine aggregates shall have a sand equivalent value of not less than 50 when tested in accordance with the requirement of IS 2720 (Part 37). The plasticity index of the fraction passing the 0.425mm sieve shall not exceed 4 when tested in accordance with IS 2720 (Part 5)

Filler

Filler shall consist of finely divided mineral matter such as rock dust, hydrated lime or cement as approved by the Engineer as specified in RUIDP Standard Specifications (Civil Works).

The filler shall be graded within the limits indicated in RUIDP Standard Specifications (Civil Works).

**Mixture Design**

Requirement for the mixture

Apart from conformity with grading and quality requirements of individual ingredients, the mixture shall meet the requirements set out in Table in RUIDP Standard Specifications (Civil Works).

**Construction Operations**

Weather and Seasonal Limitations

The provisions of Clause 501.5.1 of MoST specification for Road & Bridge Works (IV Revision) shall apply.

Preparation of base

The base on which Dense Graded Bituminous Material is to be laid shall be prepared in accordance with Clauses 501 and 902 of MoST specification for Road & Bridge Works (IV Revision) as appropriate, or as directed by the Engineer. The surface shall be thoroughly swept clean by a mechanical broom, and the dust removed by compressed air. In locations where mechanical broom cannot access, other approved method shall be used as directed by the Engineer.

Geosynthetics

Where Geosynthetics are specified in the Contract this shall be in accordance with requirements stated in Clause 703 of MoST specification for Road & Bridge Works (IV Revision).

Stress absorbing layer

Where a stress absorbing layer is specified in the Contract, this shall be applied in accordance with the requirements of Clause 522 of MoST specification for Road & Bridge Works (IV Revision).

Prime coat

Where the material on which the dense bituminous macadam is to be laid is other than a bitumen bound layer, a prime coat shall be applied, as specified, in accordance with the provisions of Clause 13.19, in RUIDP Standard Specifications (Civil Works) or as directed by the Engineer.

Spreading

The provisions of Clauses 501.5.3 and 501.5.4 of MoST specification for Road & Bridge Works (IV Revision) shall apply.

Rolling

The general provisions of Clauses 501.6 and 501.7 of MoST specification for Road & Bridge Works (IV Revision) shall apply, as modified by the approved laying trials. The compaction process shall be carried out by the same plant, and using the same method, as approved in the laying trials, which may be varied only with the express approval of the Engineer in writing.

**Opening to Traffic**

The newly laid surface shall not be open to traffic for at least 24 hrs after laying and completion of compaction, without the express approval of the Engineer in writing.

**Surface Finish and Quality Control of Work**

The surface finish of the completed construction shall conform to the requirements of Clause 902 of MoST Specifications for Road and Bridge Works (IV Revision). All materials and workmanship shall comply with the provisions set out in Section 900 of MoST specification for Road & Bridge Works (IV Revision).

**Measurements for payment**

Dense Graded Bituminous Materials shall be measured as finished work either in cubic metres, tons or by the square meter at a specified thickness as detailed on the Contract drawings, or documents, or as directed by the Engineer.

**Rate**

The contract unit rate for Dense Graded Bituminous Macadam shall be payment in full for carrying out the required operations as specified, and shall include, but not necessarily limited to all components listed in Clause 13.4.8.2 (i) to (xi). The rate shall include the provision of bitumen, at 4.25 per cent by weight of the total mixture and no extra cost shall be provided.

## 3.5 Bituminous Concrete

### Scope

This clause specifies the construction Bituminous Concrete, for use in wearing and profile corrective courses. This work shall consist of construction in a single or multiple layers of bituminous concrete on a previously prepared bituminous bound surface. A single layers shall be 25mm to 100mm in thickness.

### Materials

Bitumen

The bitumen shall be paving bitumen of Penetration grade complying with Indian Standard Specification for Paving Bitumen, IS: 73 and of the penetration indicated in Table 13-14 in RUIDP Standard Specifications (Civil Works)., for bituminous concrete, or this bitumen as modified by one of the methods specified in Clause 521 of MoST specification for Road & Bridge Works (IV Revision), or as otherwise specified in the Contract. Guidance on the selection of an appropriate grade of bitumen is given in The Manual for Construction and Supervision of Bitumenous Works.

Coarse aggregates

The coarse aggregates shall be generally as specified in Clause 13.6.2.2 shall apply, except that the aggregates shall satisfy the physical requirements of Table 13.14A in RUIDP Standard Specifications (Civil Works).

Fine aggregates

The fine aggregates shall be all as specified in Clause 13.6.2.3 in RUIDP Standard Specifications (Civil Works).

Filler

Filler shall be generally as specified in in RUIDP Standard Specifications (Civil Works). Where the aggregates fail to meet the requirements of the water sensitivity test in Table 13.14A in RUIDP Standard Specifications (Civil Works). then 2 percent by total weight of aggregate, of hydrate lime shall be added without additional cost.

Aggregates grading and binder content

When tested in accordance with IS: 2386 Part 1 (Wet grading method), the combined grading of the coarse and fine aggregates and added filler shall fall within the limits shown in Table 13-14 in RUIDP Standard Specifications (Civil Works) for grading 1 or 2 as specified in the Contract.

### Mixture Design

Requirement for the mixture

Apart from conformity with the grading and quality requirements of individual ingredients, the mixture shall meet the requirements set out in Table 13-15 in RUIDP Standard Specifications (Civil Works).

The requirements for minimum per cent voids in mineral aggregate (VMA) are set out in Table 13-12A in RUIDP Standard Specifications (Civil Works).

Binder content

The binder content shall be optimized to achieve the requirements of the mix set out in Table 13-15 in RUIDP Standard Specifications (Civil Works) and the traffic volume as specified in the Contract. The Marshall method for determining the optimum binder content shall be adopted as described in the Asphalt Institute Manual MS-2, replacing the aggregates retained on the 26.5mm sieve and retained on the 22.4mm sieve, where approved by the Engineer.

Job mix formula

The procedure for formulating the job mix formula shall be generally as specified in Clause 13.6.3.3 and the results of the tests enumerated in Table 13-15 in RUIDP Standard Specifications (Civil Works).

**Construction Operations**

Weather and seasonal limitations

The provisions of Clause 501.5.1 of MoST Specifications for Road and Bridge Works (IV Revision) shall apply.

Preparation of base

The surface on which the bituminous concrete is to be laid shall be prepared in accordance with Clause 501 and 902 of MoST Specifications for Road and Bridge Works (IV Revision) as appropriate, or as directed by the Engineer. The surface shall be thoroughly swept clean by mechanical broom and dust removed by compressed air. In location where mechanical broom cannot access, other approved method shall be used as directed by Engineer.

Geosynthetics

Where Geosynthetics are specified in the contract this shall be in accordance with the requirements stated in Clause 703 of MoST Specifications for Road and Bridge Works (IV Revision).

Stress absorbing layer

Where a stress absorbing layer is specified in the Contract, this shall be applied in accordance with the requirements stated in Clause 522 of MoST Specifications for Road and Bridge Works (IV Revision).

Mixing and transportation of the mixture

The provisions as specified in Clause 501.3 and 501.4 of MoST Specifications for Road and Bridge Works (IV Revision) shall apply.

Spreading

The general provisions of Clause 501.5.3 and 501.5.4 of MoST Specifications for Road and Bridge Works (IV Revision) shall apply.

Rolling

The general provisions of Clause 501.6 and 501.7 of MoST Specifications for Road and Bridge Works (IV Revision) shall apply, as modified by the approved laying trials.

Opening to Traffic

The newly laid surface shall not be open to traffic for at least 24 hours after laying and the completion of compaction, without the express approval of the Engineer in writing.

Surface Finish and Quality Control of Work

The surface finish of the completed construction shall conform to the requirements of Clause 902 of MoST Specifications for Road and Bridge Works (IV Revision). All materials and workmanship shall comply with the provisions set out in Section 9000 of this Specification.

Arrangements for Traffic

During the period of construction, arrangement of traffic shall be made in accordance with the provisions of Clause 1.9.2 in RUIDP Standard Specifications (Civil Works)..

**Measurements for Payment**

The measurement shall be all as specified in Clause 507.8 of MoST Specifications for Road and Bridge Works (IV Revision).

**Rate**

The contract unit rate shall be all as specified in Clause 13.6.9 in RUIDP Standard Specifications (Civil Works). except that the rate shall include the provision of bitumen at 5.0 per cent, by weight of total mixture.

# 4. PIPES AND PIPE LAYING

## 4.1 HDPE Pipes:

### 4.1.1 Applicable Codes

The manufacturing, testing, supplying and testing at work sites of HDPE pipes shall comply with all currently applicable statutes, regulations, standards and Codes. In particular, the following standards, unless otherwise specified herein, shall be referred. In all cases the latest revision of the Codes shall be referred to. If requirements of this Specification conflict with the requirements of the standards / Codes, this Specification shall govern:

| Code No. | Title/Specification |
|---|---|
| IS 2530-1963 | Methods of test for polyethylene moulding materials and polyethylene compounds |
| IS 4905-1968 | Methods for random sampling |
| IS 14333: 2001 | High Density Polyethylene Pipes for Sewerage-Specification |
| IS 7328-1992 | High density polyethylene materials for moulding and extrusion- Specification |
| IS 7634-Part 2-1975 | Laying & Jointing of Polyethylene (PE) Pipes |
| IS 8008: Part 2-2003 | Part 2: Specific Requirements for 90 degree Bend. |
| IS 8008: Part 3- 2003 | Part 3: Specific Requirements for 90 degree Tee. |
| IS 8008: Part 4-2003 | Part 4: Specific Requirements for Reducers. |
| IS 8008: Part 6-2003 | Part 6: Specific Requirements for Pipe ends. |
| IS 8008: Part 9-2003 | Part 9: Specific Requirements for End Caps. |
| IS 8360 Part 1: 1977 | Specification for fabricated high density polyethylene (HDPE) fittings for potable water supplies – Part 1 : General requirements. |
| IS 8360 Part 2: 1977 | Part 2 Specific requirements for 90 0Tees. |
| IS 8360 Part 3: 1977 | Part 3 Specific requirements for 90 0 bends. |

Others Codes not specifically mentioned here but pertaining to the use of HDPE pipes form part of these Specifications.

### 4.1.2 Marking

All pipes shall be marked at maximum interval of 1 m.

The marking shall indicate at least the following information.

(i) Manufacturer's name & / or trade mark.

(ii) The dimensions (nominal outside diameter X nominal wall thickness)

(iii) The designation of pipes material (PE 80)

(iv) The nominal pressure (PN 2.5)

(v) The production period (date or code)

### 4.1.3 Handling, Transportation, Storage and Lowering of Pipes

During handling, transportation, storage and lowering, all sections shall be handled by such means and in such a manner that no distortion or damage is done to the section or to the pipes as a whole.

The following procedures should be followed so as to eliminate potential damage to pipes and fittings and to maintain

a) Maximum safety during unloading, lifting and lowering.

b) Pipes must not be stored or transported where they are exposed to heat sources likely to exceed 60 degree C.

c) Pipes shall be stored such that they are not in contact with direct sunlight, lubricating or hydraulic oils, petrol, solvents and other aggressive materials

d) Scores or scratches to a depth of greater than 10% or more of wall thickness are not permissible; any pipes having such defects should be strictly rejected.

e) PE pipes should not be subjected to rough handling during loading and unloading operations. Rollers shall be used to move, drag the pipes across any surface.

f) Only polyester webbing slings should be used to lift heavy PE (>315mm) pipes by crane. Under no circumstances, chains, wire ropes and hooks be used on PE pipes.

g) Pipes shall not be dropped to avoid impact or bump. If any time during handling or during installation, any damage, such as gouge, crack or fracture occurs, the pipe shall be repaired if so permitted by the competent authority before installation.

h) Straight lengths should be stored on horizontal racks giving continuous support to prevent the pipe taking on a permanent set

i) The truck used for transportation of the PE pipes shall be exclusively used of PE pipes only with no other material loaded – especially no metallic, glass and wooden items. The truck shall not have sharp edges that can damage the Pipe.

j) Pipes manufactured at factory are to be carried to the site of work directly or stacked suitably and neatly along the alignment/road side/elsewhere near by the work site or as directed by the Project Manager.

k) Damages during transit, handling, storage will be to the Contractor's account and replacement for such pipes has to be made by the Contractor without any extra cost as directed by the Project Manager.

### 4.1.4 Workmanship / Appearance

Pipes shall be free from all defect including indentations, delaminating, bubbles, pinholes, cracks, pits, blisters, foreign inclusions that due to their nature degree or extent detrimentally affect the strength and serviceability of the pipe. The pipe shall be as uniform as commercially practicable in colour opacity, density and other physical properties as per relevant IS Code or equivalent International Code. The inside surface of each pipe shall be free of scouring, cavities, bulges, dents, ridges and other defects that result in a variation of inside diameter from that obtained on adjacent unaffected portions of the surface. The pipe ends shall be cut clearly and square to the axis of the pipe.

### 4.1.5 Measurement

The net length of pipes as laid or fixed shall be measured in running meters correct to a cm. Specials shall be excluded and measured and paid separately under the relevant item. The portion of the pipe at the joints (inside the joints) shall not be included in the length of pipe work. Excavation, refilling, masonry and concrete work wherever required shall be measured and paid for separately under relevant items of work.

#### 4.1.6 Colour

The colour of the pipe shall be black in general. In case employer has other choice on standard colour, then this shall be applied.

#### 4.1.7 Anti-Oxidant

The percentage of anti-oxidant used shall not be more than 0.3 percent by mass of finished resin.

#### 4.1.8 Reworked Material

No addition of Reworked/ Recycled Material from the manufacturer's own rework material resulting from the manufacture of pipes is permissible and the vendor is required to use only 100% virgin resin compound.

#### 4.1.9 Maximum Ovality of Pipe

The outside diameter of pipes, tolerance on the same and ovality of pipe shall be as given in table 2 of IS 14333. Ovality shall be measured as the difference between maximum outside diameter and minimum outside diameter measured at the same cross section of the pipe, at 300 mm away from the cut end. For pipes to be coiled the ovality shall be measured prior to coiling. For coiled pipes, however, re-rounding of pipes shall be carried out prior to the measurement of ovality.

#### 4.1.10 Wall Thickness

The minimum & maximum wall thickness of pipe for the PE80 shall be as given in table 4 in IS: 14333.

#### 4.1.11 Length of Straight Pipe

The length of straight pipe used shall be 5 m to 20 m as agreed by Project Manager. Short lengths of 3 meter (minimum) up to a maximum of 10% of the total supply may be permitted.

#### 4.1.12 Coiling

The pipes supplied in coils shall be coiled on drums of minimum diameter of 25 times the nominal diameter of the pipe ensuring that kinking of pipe is prevented.

#### 4.1.13 Fittings and Specials

All HDPE fittings / specials shall be Injection moulded fittings as per IS: 8008 (Part I to IX). The fittings shall be supplied only by the manufacturer of the pipes. Nominal pressure rating of flanges will be PN10.

#### 4.1.14 Inspection and Testing

The material will be inspected and tested by the Inspectors to be nominated by the Employer. The following tests shall be conducted

a) Physical Dimensions and visual inspection: The Manufacturers test reports shall be provided for review.

b) Density: The density will be tested as per the provisions of Annex-A of IS 7328. It should match to the density claimed by the raw material supplier for compounded material / specifications.

c) MFR test as per clause 9.2.4 of IS 14333. MFR shall also be within 30% of the MFR of the material used in manufacturing pipes.

d) Carbon black content / dispersion test shall be as per clause 9.2.4 of IS 14333.

e) Hydraulic Characteristics shall be as per Clause 8.1 of IS 14333

f) Reversion Test shall be as per Clause 8.2 of IS 14333

### 4.1.15 Method of Fusion

Method of jointing between the pipes to pipes and pipes to specials shall be with fusion welding using automatic or semi automatic, hydraulically operated, superior quality heat fusion machines which will ensure good quality heat fusion welding of HDPE pipes The most widely used method for joining individual lengths of large diameter polyethylene pipe (>75mm) is by heat fusion of the pipe ends This technique produces a permanent, economical and flow-efficient joint. Field-site heat-welding may be made readily by trained operators using specially developed heat fusion machines. The Fusion Jointing between HDPE pipes and specials shall be done as per the latest IS: 7634 part- II

### 4.1.16 General Guidelines for Fusion Welding

The welding area has to be protected from unfavorable welding conditions such as moisture, wind, dirt, excessive surface temperature and low temperatures < 5 degree C and intensive UV radiation. If the pipe is exposed to such UV radiation, the pipe ends are to be thoroughly scrapped (by planning tool) before the welding procedure is adopted.

Heating Pressure 0.15 N/sq. mm

Welding Temperature 200-220 deg. C

The seven steps involved in making a heat fusion joint are:

a) Securely fasten the components to be joined

b) Square cut the surface of the pipe end

c) Face the pipe ends

d) Align the pipe profile

e) Melt the pipe interfaces

f) Join the two profiles together

g) Hold under pressure and release

Heat fusion cycle and parameters are given in Annex A in ISO 11414 – the contractors are requested to follow this guideline for a good weld.

Caution: An additional 10 to 60 minutes cooling time may be required (depending on pipe size) after removing the pipe from the fusion equipment before subjecting the pipe for bending, burying, pressure testing or similar handling .

### 4.1.17 Bead Removal

In some pipe system usage, the bead from the heat fusion process may be undesirable. Inside beads may create minor flow turbulence of liquids or may become an obstacle on which solids in the fluids may become lodged. Furthermore, outside beads may be a hindrance to relining operations. Equipments are available to remove the bead. The bead removal shall not affect the performance of the pipe and the weld

However, it must be noted that the friction factor ('c' value; 'k' value) as given elsewhere in the manual takes cognizance of the inside bead. Hence the bead does not effect the design parameters for flow rates in PE pipes.

### 4.1.18 Fusion Equipment

The Contractor should have automatic superior quality fusion welding machines with hydraulic jacks, surface cleaning planner, and digitally controlled heating mirror and hydraulic power pack for doing the installation.

The contractor is cautioned for the proper procurement of the welding equipment and the Inspection agencies shall necessarily be assured that the welding contracting company has the proper machine for a good field weld.

The heat fusion equipment shall incorporate a facility for supporting the heating plate and planning tool (necessary to square cut the pipe end) when in use. The machine shall be robust enough to stand normal field use.

The design of the heat fusion machine shall allow the heating plate to be removed and the pipe ends closed after heating, without damaging the heating surfaces, within a time frame of maximum of 6 secs upto d<250mm and 12 secs for d>250mm.

The clamp alignment system shall be such that there shall be perfect axial alignment of the pipe surface – during heating and during pressurizing the pipe ends after heating, is assured.

The guide elements of the machine shall be such that the gap between the pipe ends shall not exceed 0.25mm for d<250mm and 0.5mm d>250mm

Heat-welding machines shall have a locking system to hold the fusion force is to be ensured in all the systems.

All the systems shall be protected against over pressure. It shall be capable of maintaining the required interface force on the pipe or fittings end as long as necessary

There shall be a display of the pressure applied.

### 4.1.19 Trained Manpower for Fusion Welding

Only trained and technically qualified for the welding method are to be employed for the welding operation

It is necessary that the manufacturer certified person need only be authorized for heat-welding. These persons shall carry at all the time in the field during site work, a valid and authentic certificate that the person performing welding has been so trained.

### 4.1.20 Testing After Laying

The sewer line laid will be tested in the following manner including the house connection pipes

**Leak Testing**

This low-pressure air testing practice detects damaged piping or improper jointing by measuring the rate at which air under pressure escapes from an isolated section of sewer.

The rate of air loss indicates the presence or absence of damaged piping or leaking joints. This practice is not intended to show total system water leakage limits and shall not be used as a quantitative measure of leakage under service conditions for infiltration or ex-filtration.

This practice provides assurance of initial condition and quality of workmanship of properly-installed sewer pipe.

This practice provides procedures for testing non-pressure plastic pipe sewer lines, using low-pressure air to prove the integrity of the installed material and the construction procedures.

This practice is performed on lines after all connections and service laterals have been plugged and braced adequately to withstand the test pressure. The time between completion of the backfill operation and low-pressure air testing may be specified by the approving authority.

This practice is used as a preliminary test, which enables the installer to show the condition of a buried line prior to final backfill, paving, and other construction activities.

This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use

**Air Test Method-Gravity sewer**

All sanitary sewer lines, including service connections, shall be substantially watertight and shall be tested for excessive leakage upon completion and before connections are made to the service by others.

For gravity flow sewers, the sewer shall be subjected to ex-filtration testing, by the ASTM F1417 (low pressure air) test method regardless of pipe material.

The requirements set forth for maximum leakage shall be met as a condition for acceptance of the sewer section represented by the test. All testing shall be performed by the Contractor without any direct compensation being made therefore, and the Contractor shall furnish all necessary equipment and materials, including plugs as required.

The Table below contains the values of pressure rating and allowable minimum time required to drop the pressure from 0.36 kg/cm2 to 0.26 kg/cm2 (Gravity Sewer Lines):

**HDPE Pipe PE - 80**

| Nominal Pipe Diameter | Inside Pipe Diameter (inch) | Shortest time allowed for the air pressure drop to 1 PSI | Max. Length of Stretch to be tested |
|---|---|---|---|
| 90 | 3.48 | 3 min 21 Sec | up to 120 m |
| 110 | 4.26 | 4 min 6 Sec | up to 120 m |
| 125 | 4.84 | 4 min 40 Sec | up to 120 m |
| 140 | 5.42 | 5 min 13 Sec | up to 120 m |
| 160 | 6.2 | 5 min 58 Sec | up to 100 m |
| 180 | 6.97 | 6 min 43 Sec | up to 100 m |
| 200 | 7.75 | 7 min 27 Sec | up to 80 m |
| 225 | 8.72 | 8 min 23 sec | up to 80 m |
| 250 | 9.69 | 9 min 19 sec | up to 60 m |
| | | 10 min 08 sec | 60 to 80 m |
| 280 | 10.85 | 10 min 27 sec | up to 60 m |
| | | 12 min 42 sec | 60 to 80 m |
| 315 | 12.21 | 11 min 45 sec | up to 40 m |
| | | 12 min 03 sec | 40 to 60 m |
| | | 16 min 05 sec | 60 to 80 m |

Source: ASTM F1417 – 11a "Standard practice for installation acceptance of plastic

Non – pressure sewer lines using low – pressure Air

Note: 1 PSI = 0.0703 kg/cm2

In the event of test failure on any test section, testing shall be continued until all leakage has been detected and corrected to meet the requirements. All repair work shall be

subject to approval of the Engineer. Introduction of sealant substances by means of the test water will not be permitted.

Unsatisfactory repairs or test results may result in an order to remove and replace pipe as the Engineer considers necessary for test conformance. All repair and replacement work shall be at the Contractor's expense.

**Deflection Test**

Deflection tests shall be performed on all flexible gravity sewer pipes. The test shall be conducted after the sewer trench has been backfilled to the desired finished grade for a minimum of 30 days.

The deflection test shall be performed by pulling a rigid ball or pointed mandrel through the pipe without the aid of mechanical pulling devices. The ball or mandrel shall have a minimum diameter equal to 92.5 % of the actual inside diameter of the pipe. The maximum allowable deflection shall not exceed 5 % of the pipe's internal diameter. The line will be considered acceptable if the mandrel can progress through the line without binding. The time of the test, method of testing, and the equipment to be used for the test shall be subject to the approval of the City.

All testing shall be performed by the Contractor at its expense without any direct compensation being made therefore, and he shall furnish all necessary equipment and materials required

In the event of test failure on any test section, the section shall be replaced, with all repair work subject to approval of the City. The replaced section shall be re-tested for leakage and deflection in conformance with the specifications contained herein. All repairs, replacement, and re-testing shall be at the Contractor's expense

**Flow Test**

After completion of entire network of the sewer line, flow test shall be carried out.

## 4.2 Unplatisized Polyvinyl Chloride (U-PVC) Pipes

### 4.2.1 Applicable Codes

The manufacturing, testing, supplying and testing at work sites of PVC-U pipes shall comply with IS 15328:2003 and all currently applicable statutes, regulations, standards and Codes. In particular, the following standards, unless otherwise specified herein, shall be referred. In all cases the latest revision of the Codes shall be referred to. If requirements of this Specification conflict with the requirements of the standards / Codes, this Specification shall govern:

| Code No. | Title/Specification |
|---|---|
| IS 4905:1968 | Methods for random sampling. |
| IS 4985:2000 | Unplasticized PVC pipes for potable water supplies — Specification (third revision). |
| IS 5382:1985 | Specification for rubber sealing rings for gas mains, water mains and sewers (first revision). |
| IS 12235 | Methods of test for unplasticized PVC pipes for potable water supplies: |
| (Part 1): 1986 | Method of measurement of outside diameter. |
| (Part 5):1986 | Reversion test |

| Code No. | Title/Specification |
|---|---|
| (Part 8):1986 | Internal hydrostatic pressure test |
| IS 14182:1994 | Solvent cement for use with unplasticized polyvinyl chloride pipe and fittings — Specification |
| IS 15328:2003 | Unplasticized non-pressure polyvinyl chloride (PVC-U) pipes for use in underground drainage and sewerage systems— Specification |

Others Codes not specifically mentioned here but pertaining to the use of PVC-U pipes form part of these Specifications.

#### 4.2.2 Marking

Each pipe shall be clearly and indelibly marked in ink/ paint or hot embossed on white base at intervals of not more than 3 m, but at least once per pipe, in the colour differs from the basic colour of the pipe. The marking shall be legible without magnification. The marking shall not initiate cracks or other types of defects which adversely influence the performance of the pipe. Marking by indentation reducing the wall thickness not more than 0.15 mm shall be deemed to conform to this clause without infringing the requirements for the wall thickness given in 6.1.2. of IS 15328. The markings shall include the following:

a) Identification of the source of manufacture or trade-mark,

b) The nominal pipe diameter,

c) Stiffness class of pipe,

d) Insertion depth of end for joint to be marked on perimeter of pipe on both the ends by 10 mm thick red colour.

d) Batch No. /Lot No. or date of manufacture.

#### 4.2.3 Inspection and Testing

The material will be inspected and tested by the third party Inspectors to be nominated by the Employer. The sampling procedure to be adopted and the criteria for conformity shall be as given in Annex F of IS: 15328.

a) Physical Dimensions and visual inspection: The Manufacturers test reports shall be provided for review.

b) Vicat Softening temperature shall be carried out as per Annex A of IS 15328.

c) Ring Stiffness shall be as per IS 15328.

d) Resistance to Internal Hydrostatic pressure shall meet the requirements of IS 15328.

#### 4.2.4 Joints

Elastomeric sealing rings shall be free from substances (for example, plasticizers) that can have a detrimental effect on the polyvinyl chloride of the pipes or fittings used in conjunction with the pipes.

The design of the profile and dimensions of the sealing ring is left to the manufacturer, as long as the pipe with the sealing ring meets the requirements of this standard. Where the design of the socket is such that the sealing ring is not firmly fixed in position, the housing for the ring shall be so designed as to minimize the possibility of the ring being dislodged during insertion of the pipe (or spigot of a fitting) to complete the joint.

Elastomeric sealing rings shall be in accordance with one of the types (Type 1 to Type 6) of IS 5382. The manufacturer has to, however, specify the type of sealing ring (namely Type 1, 2, 3, 4, 5 or 6) that is being offered.

### 4.3 Laying and Jointing of Waste Pipes

a) All the waste pipes/sewer lines are to be laid perfectly true both in alignment and to gradient specified. In case of spigot and socket pipe, the socket end of the pipe shall face upstream.

b) The waste pipe/sewer lines shall be laid such that the marking on pipes appears at the top of the pipes.

c) Properly fitted temporary wooden stoppers shall be provided to close the ends of all incomplete sewer line. The stoppers are only to be removed when pipes are being laid and jointed. Opening of sewer at end of day's work shall be capped and sealed.

d) Waste pipes/Sewer pipe laying and jointing shall be started and completed only section wise as per the instruction of the Project Engineer. The sections shall be chosen manhole to manhole. However in unavoidable circumstances the section of sewer line shall be changed as per site condition & as directed by Project Engineer. The work of sewer line laying, manhole construction and house sewer connections shall be done simultaneously so that all the necessary testing can be done efficiently.

e) After laying of pipe line the trench shall be filled up to top of pipe with moist soil. The trench can be filled up to the top of the pipe level with moist soil to ensure curing of concrete and then after testing of sewer line, trench should be filled. In the duration before filling the trench, soil should be kept moist to ensure adequate curing.

f) The waste pipe/sewer lines shall be secured in place with approved backfill material tamped under it and proper care shall be taken during tamping at the socket end of the pipe to check that it is not damaged. The watering shall be done on the refilled material in the trench before compaction based on the OMC of the soil to achieve 90 % MDD of the refilled material.

g) Special arrangements such as cranes, tripods with chain pulley block for lowering the pipes and fittings shall be made by Contractor at his own cost. In no case pipes and fittings shall be dropped.

h) The posts and rails shall in no case be removed until the trench is excavated, the pipes are laid and Engineer gives permission to proceed with the backfilling.

i) The pipes fittings and other construction material shall be placed along the alignment in advance with utmost care during transit so that they are not damaged. Any damage due to these reasons shall be Contractor's liability.

### 4.4 Bedding of Waste Pipe Lines

The bedding below the pipe line and backfilling shall be provided as per the standard / approved drawing / as per direction of the Project Engineer. After the work of laying and jointing of pipes is completed, the pipes line shall be subjected to hydraulic test at work site. The pipes line should be tested immediately after laying of pipe line. The water required for testing and for any other purpose shall be arranged by the Contractor at his own cost.

### 4.5 Precast RCC Chambers/Manholes

**Structure**

It is proposed to provide circular or rectangular chambers/ manholes. The general construction of the manhole shall be RCC Precast manholes as per the approved

drawings. The contractor will be responsible to ensure procurement and placement of the precast elements in position without any damage. The jointing of the various elements will be made so as to achieve the required water tightness. RCC pre-cast and RCC cast in situ elements shall be tested in accordance with the provisions of IS 456:2000.

RCC works shall generally confirm to IS.456-2000. The location of manhole shall be as per the approved drawing or layout given by the Project Manager or as directed by the Project Manager. The Manhole dimensions and other details shall be as per the approved drawings. The Contractor, while constructing the manholes, shall suitably provide HDPE/PVC-U pipe connection lines for the sewer connection to prevent the undue breaking of man hole or road in future, as directed by the Project Manager. The location of manholes shall be as per the approved drawing or layout given by the Project Manager. The vent shaft connection shall be as per the approved drawing.

Pre-cast RCC M25 to M40 manhole & sewer chambers shall be procured / constructed simultaneously with the laying of sewers as per approved drawing and detailed specification.

RCC precast manholes shall be constructed as per approved drawings.

In case of Pre-cast RCC manholes, design mix concrete of grade M25 to M40 shall only be used for the pre-cast manhole elements as per approved drawings.

The Contractor shall provide steel reinforcement as per design requirement in each Pre-Cast Circular Rings including Starter Base Wall at the bottom of the manhole chamber, subject to a minimum of nominal reinforcement as per Code of "Practice of Plain and Reinforced Concrete" IS:456 2000. No extra payment shall be made to the contractor on this part. The Contractor should therefore take provisions accordingly.

Contractor may study the design, drawings and specifications carefully and if felt necessary, may increase the sectional thickness, reinforcement or the grade of concrete suitably. No extra payment shall be made to the contractor over the rates quoted by the contractor for any modifications / changes proposed by him. The contractor shall be fully responsible for the structural safety of the pre-cast manhole elements /components.

Any data or information received by the Contractor, from the department or otherwise, shall not relieve the Contractor from his responsibility for the design and execution and structural stability of the pre-cast elements.

**Top Conical Piece**

a) Providing and fixing of Pre-cast RCC concrete eccentric conical piece for manhole manufactured using Weigh Batching Plant.

b) Only Design Mix Concrete of Grade M25 to M40 shall be used.

c) Shape: - Eccentric frustum of cone of designated diameter and thickness as per the enclosed drawings and specifications

d) Testing: Apart from the usual strength test on of the concrete mix non-destructive test for strength of the concrete is to be carried out on sample piece of pre-cast manhole elements as per the instruction of Project Manager.

**Circular Rings**

a) Providing and fixing of Pre-cast M-40 grade cement concrete circular rings for manhole chambers manufactured by using Weight Batching Plant.

b) Only Design Mix Concrete of Grade M-40 shall be used.

c) Shape: - Circular in shape with end keys at top and bottom of designated diameter, height and thickness as per the enclosed drawings and specifications. The height of rings can be increased in the multiples of 30cms after inspection and approval of Project Manager.

d) Testing: Apart from the usual strength test on of the concrete mix non-destructive test for strength of the concrete is to be carried out on sample piece of pre-cast manhole elements lot as per the instruction of Project Manager.

e) The contractor shall be responsible for the quality of the works during the executions of works with good Engineering practices. He shall, therefore, have his own independent and adequate setup for ensuring the same.

## 4.6 Polyethylene Manholes

### 4.6.1 Reference Specification

PE manholes shall be as per EN 13598-2:2009 and ISO 9001:2008.This specification references the standard American Society of Testing and Materials (ASTM) standard specifications, which are made a part hereof by such reference and shall be the latest edition and revision thereof.

ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene(PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

ASTM D3350 Standard Specification for Polyethylene Plastic Pipes and Fittings Materials.

ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe(SDR-PR) Based on Outside Diameter.

ASTM F894 Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.

ASTM F1759 Standard Practice for Design of High Density Polyethylene Manholes in Subsurface Applications.

### 4.6.2 Definitions

Base: The bottom surface of the MH either flat or shaped (benched).

Chimney: A reduced diameter portion of the MH extending from the riser to the underside of the MH top (usually a cast iron frame and grate).

DVS certified: Deutscher Verband fur Schwei(3>en (German Welding Standards).

Fabricator: The firm responsible for creation of shop drawings, and the accumulation of all components and the execution of the works to create the manhole produced in accordance with this specification and the shop drawings.

Inspector: The authorized representative of the purchaser entrusted with the duty of inspecting the manhole or components used in the fabrication of the manhole, and witnessing tests performed under this specification.

Inspection: Inspection of the components or the complete fabrication, by the inspector.

Manufacturer: The firm producing the riser pipe and stub out pipes.

Purchaser: The person, firm, corporation or government agency engaging in a contract or agreement to purchase a PE fabrication according to this specification.

Riser: The vertical body of the manhole.

Stub out: Short sections of PE pipe that are part of the manhole fabrication that are to be attached to the sewer connections to the manhole in the field. Stub outs may start inside the riser ID or they may be continuous extending through the MH.

### 4.6.3 Design Requirements

The manhole riser's performance limits are based on ring deflection, ring (hoop) and axial stress (or strain), and ring and axial buckling. Evaluation of suitability for service is to be performed in accordance with ASTM F1759 - Standard Practice for Design of High

Density PE Manholes in Subsurface applications. Suitability for service is affected by the ground water level, and the characteristics and uniformity of the embedment materials. Confirmation of the 'suitability for service' and the 'as constructed' embedment is the responsibility of the owner or his representative.

When the MH is to be installed in a location that is exposed to live loads, a live-load cap shall be designed to support these vehicular (or other loads); the cap foundation ring must be placed on well compacted embedment materials surrounding the manhole riser. The cap itself must be physically separated by several inches, as specified on the project drawings, from the PE manhole riser.

### 4.6.4 Delivery Storage and Handling

Delivery: Manholes shall be prepared for standard commercial shipment unless otherwise specified. Delivery vehicles should be provided with a clean, flat bed, free of sharp objects. Care must be taken to prevent slippage or excessive bowing of the manholes. The load shall be well secured to prevent rubbing. Nylon straps, not chains or ropes, shall be used to secure the load. Do not rest manholes on the socket. Avoid contamination from chemicals such as diesel oil.

Storage: All Materials should be carefully inspected at the time of receipt of delivery and any defects should be noted and reported immediately. Manholes should be placed on firm, flat ground to support the weight of the manhole and the lifting equipment. For safety it is recommended that manholes be stored away from heat sources. Protect all materials and equipment from theft, vandalism, accidental damage and contamination.

Handling: Manholes can be unloaded from the truck by using a boom and sling arrangement that places lifting loads on the riser and not on the stub-outs. Chains or hooks should not be used.

### 4.6.5 Fabrication Requirements

Joints & Connections: All joints and connections between PE components shall be made by means of extrusion welding or fusion (heat, or socket) welding.

Where heat or socket fusion is used, it shall meet the requirements of ASTM F2620-Standard Specification for Heat Heat Fusion of Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

Where extrusion welding is used, it shall be undertaken by joining technicians under the direction of DVS certified extrusion-welding trainers.

The manhole fabrication shall be factory leak tested with air or water to assess the integrity of all joints /connections. The factory test shall be completed in accordance with a documented testing procedure unless otherwise agreed to by the Manufacturer and the Purchaser.

The testing may be witnessed by the Purchaser's Inspector when the Purchaser so specifies on the purchase order. The inspector shall have free access to the inspection area of the manufacturer's plant. The fabricator shall furnish a certificate of compliance to these specifications upon request to do so in the purchase order.

### 4.6.6 Marking Requirements

Pipe used in the fabrication of a PE MH shall be marked in accordance with the requirements of the applicable pipe specification. The orientation of the riser shall be selected to maintain as much of the pipe marking string as possible.

The MH shall have an affixed label adjacent to any locations where pressure gauges were located used to pressure test the fitting, indicating that the fabrication met the pressure testing requirements.

Each extrusion weld made during fabrication of the MH assembly shall be identified using either an indenting tool or with a stamp (with initial(s) particular for each operator) applied on the extrusion weld seam. Root weld shall be identified in the same way, the only

difference being the mark placement on the side of the weld. The identification shall consist of the operator's initials; the maximum depth of indent/stamp shall be 1/16" (approx 1.5 mm).

The MH shall be legibly marked in such a way as to not lower its quality and shall remain legible after installation and inspection.

#### 4.6.7 Joining Methods

PE Pipe shall be extrusion welded to PE manhole(s) by manual extrusion welding techniques on both the interior and exterior of the manhole. When the PE mainline pipe is a closed profile pipe, several extrusion jointing details are possible. One of the following joint types shall be used for joining pipes.

Interior (or exterior) v-welded joint. This joint is suitable for direct burial of gravity flow pipes subject to long term positive head up to 5 psi.

Interior and exterior v-welded joint. This joint is suitable for direct burial of pipe subject to long term positive head exceeding 5 psi.

Full wall welded joint. This joint is suitable for direct burial of pipe subject to long-term positive head exceeding 5 psi.

#### 4.6.8 Interior and Exterior V-Welded Joints

External band clamps may be used to assist with pipe alignment. The external clamp shall be placed by the contractor under the direction of the pipe manufacturer's Field Service Technicians. Temporary internal braces or jacks may also be used to assist with pipe wall alignment. Pipe ends shall be positioned to align the "Profile cut" notches and to provide the maximum amount of surface contact between adjacent pipe faces while minimizing or eliminating the space between pipe ends. Welding is completed using the manual extrusion welding procedure recommended by the pipe manufacturer on the wall of the pipe profile. In most cases the internal v-weld will be completed and then the external alignment band clamp will be removed to complete the exterior v-weld. It will be necessary to provide access to the weld 'work area' by removing temporarily the bedding material under the joint. Once all the extrusion welding work is completed at the joint, the bedding material must be replaced and compacted in accordance with the contract requirements.

#### 4.6.9 Full Wall Welded Joint

External band clamps may be used to assist with pipe alignment. The external clamp shall be placed by the contractor under the direction of the pipe manufacturer's Field Service Technician(s) or other approved persons. Temporary internal jacks may be placed to assist with pipe alignment. Pipe ends shall be positioned to align the 'Profile cut' notches and to provide a suitable equally spaced gap between pipe ends. Extrusion welding is completed by the pipe manufacturer's Field Service Technician(s) or other approved party(s) using semi-automated extrusion welding equipment and procedure.

#### 4.6.10 Testing of Joints for Water Tightness

The inlet/ outlet connections of the manhole will be tested for water tightness along with the testing of manholes.

### 4.7 Chamber/Manhole Frame and Cover

#### 4.7.1 Steel Fibre Reinforced Concrete (SFRC)

The selection of samples per lot for testing, failure percentage, no. of test, Concrete mix curing, etc shall be as per IS 12592 (part-I) for Pre-Cast Concrete Manhole Cover. The load of class AA shall be as per IRC guidelines.

The Manhole cover shall be heavy duty whereas for Road Side Chamber Cover and frame shall be medium duty in Steel Fibre Reinforced Concrete (SFRC) and shall confirm to IS 12592 (Part I & II) except for the scraper manhole. The inspection and testing for

these shall be done by Third Party agency also in the presence of Project Manager or his representative. The load test shall be done in accordance with Table 1 of IS 12592 (Part – I).The cover & frame shall be manufactured as per approved drawing. The frame and cover of manhole shall be in SFRC as per approved drawing.

### 4.7.2 Cast Iron Manhole Cover

Cast iron manhole cover with frame shall be of medium duty. It shall comply to IS specification. The weight of the cover to be not less than 58 kg. The frame of manhole cover shall be fixed firmly by plain concrete on the top of the RCC slab

### 4.7.3 Precast RCC

Pre-cast RCC M – 40 manhole & sewer chambers shall be procured / constructed simultaneously with the laying of sewers as per approved drawing and detailed specification. The Contractor shall provide steel reinforcement as per design requirement in each Pre-Cast M-40 Grade Circular slab, subject to a minimum of nominal reinforcement as per Code of "Practice of Plain and Reinforced Concrete" IS:456 2000. No extra payment shall be made to the contractor on this part. The Contractor should therefore take provisions accordingly.

## 4.8 Fibre Reinforced Plastic

The matrix must also meet certain requirements in order to first be suitable for FRPs and ensure a successful reinforcement of itself. The matrix must be able to properly saturate, and bond with the fibres within a suitable curing period. The matrix should preferably bond chemically with the fibre reinforcement for maximum adhesion. The matrix must also completely envelop the fibres to protect them from cuts and notches that would reduce their strength, and to transfer forces to the fibres. The fibres must also be kept separate from each other so that if failure occurs it is localized as much as possible, and if failure occurs the matrix must also debond from the fibre for similar reasons. Finally the matrix should be of a plastic that remains chemically and physically stable during and after the reinforcement and moulding processes. To be suitable as reinforcement material, fibre additives must increase the tensile strength and modulus of elasticity of the matrix and meet the following conditions; fibres must exceed critical fibre content; the strength and rigidity of fibres itself must exceed the strength and rigidity of the matrix alone; and there must be optimum bonding between fibres and matrix. It shall be chemical resistant.

## 5. TUBEWELL/BOREWELL CONSTRUCTION

The Contractor shall conduct Hydrogeological investigation to determine the most probably spot for bore hole to obtain water. The scientific investigation is to be carried in the presence and in the directions of the engineer and using specialised resistivity measuring instruments.

Construction of Tube-well upto 100 Meter depth and above in all type of soil/rocks by DTH system and over burden to accommodate casing pipe of following sizes in all types of soils and over burden including lowering of casing pipes, excluding the cost of casing pipes as per IS : 2800 (Part I & II) 1979 specifications. The work would be completed after obtaining sand free water and as per direction of the engineer. The tube well should have a throughout bore as per nominal dia of casing pipe:150 mm dia nominal bore.

Supplyand installation of ERW M.S black casing pipe ISI marked (IS: 4270/1992) of grade Fe410 of following nominal bore sizes at site of work - 150 mm diameter

Supply and installation of strainer pipes made of ERW M.S. black pipe ISI mark of following sizes at the site of work including required size of slotting as per IS: 8110 -1985 of following nominal bore sizes at site of work. Nominal bore dia: 150 mm

Testing verticality of tube well by plumbing system and yeild test and draw down test by pumping system as per IS: 2800 ( part II) 1979

Supply and fixing of tube well cover of M.S sheet( 6 mm thick) with nuts and bolts complete for casing size of 150 mm dia

Supply and fixing of MS clamp set of 50 x 6 mm flat iron with nuts and bolts etc for holding the riser pipe assembly of submersible pump set

Installation of submersible motor pump set in tube well complete (labour charges only) including transportation of tripod, pulley block, and any other material required for lowering purpose

Providing and lowering of GI flange pipe B class including rubber washer and nuts of 8 mm dis complete in all respect - 50 mm.

# 6. SANITARY APPLIANCES

## 6.1 General

All works under this contract shall be carried out in accordance with the technical specifications and the latest issue of the Indian Standard Specifications applicable to the particular class of work. If Indian Standards are not formulated for any particular material of work, the relevant equivalent International Standards shall apply. Relevant issues of I.S. Specifications applicable to the particular work have been described along with the specification for the respective works. In case of any confusion or dispute regarding the meaning & interpretation of any specification for the respective works, the decision of the Engineer shall be final and binding on the contractor.

All water supply, sanitary installations, sewerage & drainage works shall be carried out by skilled and licensed plumbers/ technicians in a workman like manner complying in all respects with the relevant by-laws of the local municipal corporation.

On completion of all works under this contract, the contractor shall prepare and submit (at his own cost), 1set hard copy and 1 soft copy of completion drawings showing the entire system of unit including water piping, sanitary installations, drainage & sewerage disposal incorporating upto date changes (if any) at site in all works mentioned above and permanent structures, roads, pathways, boundary lines etc.

All sanitary appliances shall be of Indian Manufacture and of first quality glazed porcelain, white or coloured. Water closets shall be with 'P' or 'S' traps and with left hand/right hand vent or no vent as per requirements. Wall hung type water closets shall be used where specifically mentioned. Coloured appliances shall be adopted where specifically mentioned.

## 6.2 Sanitary Installation

### 6.2.1 Plastic Overhead Tank

Plastic overhead storage tanks shall be of polyethylene (PE) of external black colour and internal PE lining in white. The tank material shall be non-toxic suitable for potable water. The materials must be as per Bureau of Indian Standards. The capacities of the tanks shall 200-300 lit for individual toilet.

### 6.2.2 India Type Water Closet (WC) Pan

Indian Type W.C. Pan (IWC) : The WC pan shall be of 1st quality white vitreous china of specified size and pattern. It shall be of back flush inlet type. The pan shall be of approved best quality and shall bear the mark of the manufacturer. The pan shall be provided with a 100 mm 'P' or 'S' trap as per requirement and suitability at site with a min. 50 mm seal.

Fixing : The WC pan shall be sunk or raised from the general floor as shown in drawing, but its surrounding floor shall be sloped towards the pan. Care shall be taken so that the pan is not damaged in the process of fixing; if damaged in any way, it shall be replaced immediately. It shall be fixed in a proper cement concrete base of 1:3:6 proportion (with a wire netting where required) taking care that the cushion is uniform and even without having any hollows between the concrete base and pan.

The joint between the pan and the trap shall be made with epoxy putty ( M-seal or equivalent) and shall be leak proof.

`Orissa' pattern water closets where required shall be 580mm size generally fitted with low level PVC flushing cisterns on the back wall, be fittings with flush valve.

Flush pipe (except for coupled closets) shall be (11/4") 32 mm. dia 90 deg. brass chromium plated long arm bend straight from cistern outlet to floor, in case of 'Orissa' closets

### 6.2.3 European Type WC Pan

European type W.C. Pan (EWC) : Shall be of wash down type, shall bear the mark of an approved firm and shall be of best quality. The closet shall be of 1st quality vitreous china ware having integrated trap 'P' or 'S' type with or without vent outlet,

Seat : The seat with lid shall be of PVC/Thermoplastic (black) and shall be fixed in position by using aluminium or plastic hinges supplied by manufacturer.

In case of low level cisterns supply, connections shall be brass chromium plated, C.P. plumbers union and tube bend as required shall be used. C.P. concealed type or angle type stop cock shall be adopted to isolate each cistern. Flush pipe (except for coupled closets) shall be (11/4") 32 mm. dia 90 deg. short bend in case of floor mounted type European closets.

### 6.2.4 Urinal

**Lipped Front Urinal**

The urinal shall be of flat back lipped front basin of required dimensions in first quality white vitreous china ware of an approved make. It shall be fixed in position by using rawl plugs embedded in the wall with SS. screws 75 mm long. Each urinal shall be connected to a 40 dia flexible PVC waste pipe which shall discharge into a 100 mm half round white porcelain channel & CI floor trap.

**Wall Type Urinal**

This shall be a standing urinal with 300 x 300 wall glazed tiles set on the vertical wall at an inclination of 1:30. Height of tiles shall be 1200 mm and inside width of urinal shall be 700 mm. Division plates shall be 25 mm thick gray kota stone or black stone 470 mm wide x 750 mm high. The stone shall be embedded in wall by 25-35 mm. The balance will protrude from the vertical wall edge. A half-round white porcelain channel will be embedded at the bottom of the wall tiles in a PCC (1:3:6) platform 125 mm thick. The platform will protrude 600 mm from the wall. The platform flooring will be with 300 x 300 mm non-skid ceramic tiles set in cement/sand mortar (1:4) – 12 mm thick. The bed will slope towards the channel. All details are shown in drawings.

### 6.2.5 Wash Basin

Lavatory Basin : The basins shall be 1st class of white vitreous china of approved pattern. The size of the basin shall be standard not more than 0.75m. The basins shall be of approved quality and make.

Fittings: Each WHB shall be provided with a PTMT (Polytetra Methylene Terephthalate) pillar tap (15 mm) and fitted with 32 mm dia PTMT waste complete in all respect of approved quality.

Fixing: The basin shall be supported on a pair of C.I., painted concealed type brackets embedded in wall with PCC (1:3:6) blocks. These brackets shall be painted to the standard shade.

A 32 mm dia flexible PVC waste pipe with brass coupling nut shall discharge into the floor trap inlet below the WHB.

### 6.2.6 Toilet Requisites

Water connection: Water connection to flushing cistern, lavatory basins shall be by means of white PVC 15 mm dia connector with PTMT coupling nuts. The length of connector shall be 375 mm.

Shelf : This shall be of PTMT approx. 500 mm. Long. Shelf shall be fixed to with SS screw and PVC hold fasts.

### 6.2.7 Fittings

All fittings shall be of standard manufacture and shall in all respect comply with the Indian Standard Specifications. The brass fittings shall be fixed in pipe line in a workman like manner. Care must be taken to see that joints between fittings are made leak proof. The fittings and joints shall be tested to a pressure of 7 Kg per sq.cm. unless otherwise specified. The defective fittings and the joints shall be repaired, redone or replaced at the contractors expense. PTMT with hardness 75 on Rockwell scale, dimensionally stable upto 1200C. These fittings should conform to BIS recommendation or equivalent IS code.

### 6.2.8 Cock

**Bib Cock**

The bib cock shall be of brass CP/PTMT specified quality with flat seat opening of screw down pattern of the size as specified.

**Stop Cock**

The stop cock shall be of brass CT/PTMT specified quality with flat seat opening of screw down pattern of the size as specified.

### 6.2.9 Shower Rose

The shower rose (fixed mounted or telephone) shall be of brass CT/PTMT specified quality 100 mm $\phi$ with uniform perforation. The inlet size shall be 20 mm or 15 mm as specified.

### 6.2.10 uPVC/HDPE Pipes and Fittings

Pipes and fittings: The pipes and fittings shall be of HDPE or UPVC of approved quality. It should be black in colour. It shall be used for Soil pipe, waste pipe and vent pipe.

The pipes and fittings shall be fixed to walls /ceilings by using proper clamps integrated with the pipes. The pipes shall be fixed perfectly vertical or in a line as directed. Where pipes are laid along walls, the pipes are to be fixed 10 mm away from the wall surface.

The access door fittings shall be of proper design so as not to form any cavities in which filth may accumulate. Doors shall be provided with SS bolts and synthetic rubber gaskets. The doors shall be secured to make it leak proof.

Connections between main pipe and the branch pipes shall be made by using required types of fittings with/without access doors for cleaning.

### 6.2.11 GI Pipe Fittings

The pipes shall be of galvanised (as per IS 4736), screwed and socketed and shall conform to I.S. 1239 (Part- I) with ISI mark. The fittings shall be of malleable cast iron (galvanised ) ( IS: 1879) with ISI mark.

| **Nominal Bore** | **Weight of Pipe in kg/mtr** | | |
|---|---|---|---|
| | Light | Medium | Heavy |
| 15 mm ( 1/2") | 0.96 | 1.23 | 1.46 |
| 20 mm ( 3/4") | 1.42 | 1.59 | 1.91 |
| 25 mm ( 1") | 2.03 | 2.46 | 2.99 |
| 32 mm ( 1 1/4") | 2.61 | 3.17 | 3.87 |
| 40 mm ( 1 1/2") | 3.29 | 3.65 | 4.47 |

| | | | |
|---|---|---|---|
| 50 mm ( 2") | 4.18 | 5.17 | 6.24 |
| 65 mm ( 2 1/2") | 5.92 | 6.63 | 8.02 |
| 80 mm ( 3") | 6.98 | 8.64 | 10.30 |
| 100 MM (4") | 10.20 | 12.40 | 14.70 |

Laying & Fixing: Where pipes have to be cut or re-threaded, ends shall be carefully reamed and filed so that no obstruction to bore is visible.

Jointing shall be done by applying a layer of white zinc paste and fine jute threads on the threaded part ( external & internal) and the socket or fitting is to be screwed tight to a torque of approximately 4 kg-m During pressure testing the joint shall show no sign of leakage.

All cutting holes, chases, trenches etc. at any place necessary in connection with the work as per items of this tender and subsequent mending damages are to be included in the rates.

Internal works: Internal G.I. pipes and fittings inside the duct walls shall be fixed exposed by means of M.S. galvanised holder bat clamps keeping the pipe 25 mm clear off the wall everywhere or concealed as directed. It shall be by chasing floors and walls as directed. The holder bat clamps shall be fixed at suitable distances.

All pipes and fittings shall be fixed truly vertical or horizontal or as directed by the Engineer.

For internal works in toilets etc. pipes may be concealed within wall chases. The depth of chase shall be at least the outer dia of pipes and fittings. The pipes shall be anchored by means of galvanised hooks.

External Works: For external work G.I. pipes and fittings shall be laid in trenches. The width of the trench shall be as shown in drawing. The pipes laid underground shall be at 900 mm (average) below ground level. The work of excavation and refilling shall be done in accordance with the general specification for earthwork. All burried pipes shall be painted with 2 coals of coal tar epoxy paint to a DFT of maximum 100 microns.

Painting: All internal G.I. pipes and fittings shall be painted with 2 coats of enamel paint of approved quality over a coat of epoxy primer. The cost of such painting shall be included in the contractor's rate. All pipes and fittings in external work shall be painted with 2 coats of enamel paint over a coat of epoxy primer.

Testing : All G.I. pipes and fittings shall be tested by hydraulic pressure machine to a pressure of 7 kg per sq.cm. All leaky joints must be made leak proof by tightening or re-doing at contractor's expense. Water for testing shall be at contractors own cost.

### 6.2.12 Water Meters

Water Meter shall conform to IS-779 and have ISI marking on it. The meter type, body & nominal size shall be as specified in the bill of quantities.

i) Type : Dry Dial, Wet-Dial, Inferential or Semipositive type.

ii) Body : Made out of bronze conforming to Grade 2 of IS-318.

Or

Brass conforming to Grade 3 of IS 292

### 6.2.13 Valves

Ball Cocks : It shall be of approved quality and manufacture in brass with copper, ball float or polythene ball float (as mentioned in schedule of quantities) and shall operate freely & efficiently in water.

Gun Metal Gate, Globe & Check Valve : These shall conform to I.S 778/1971 and shall have ISI marking on it. The type, class, nature of ends (screwed or flanged, male and female) and nominal size of the valve shall be as specified in the schedule of quantities.

The valves shall be minimum of PN10 pressure rating.

The component materials specifications shall be as under :

- Body & Bonnet as per IS 318/1962 Grade 2.
- Gland, Gland nut, Disc spindle nut Disc retaining nut etc. of non-ferrous alloy having ultimate tensile stress not less than 30 kgf/sq.cm and elongation not less than 20% on a 50 mm gauge length.
- Spindles of non ferrous materials with minimum ultimate tensile stress for Class 1 valves : 30 kgf/sq.mm. Ultimate tensile stress for Class II valves : 40 kgf/sq.mm minimum elongation on 50 mm gauge length : 20% minimum hardness number for the material specified shall be 80, when tested with 10 mm dia ball and a load of 1000 kg applied for 15 seconds.
- Trim : Includes body slats, discs, gates, balls, pistons hinge pins and swing discs of check valves may be made of materials similar to body for bonnet or other materials as specified for the required service conditions.
- Hand wheels of ferrous or non ferrous material. It's bolts shall have an ultimate tensil stress of not less than 44 kg/sq.mm and an elongation of not less than 20% on a 50 mm gauge length when tested per I.S. 1608/1960.

### 6.2.14 Ball Valve

Ball valves of material UPVC and pressure rating of 6kg/cm2 with long handles for operation. The ball valves must be fixed in place along with the process piping by means of o-rings, sealants, couplers and sleeves as per design requirement or direction of the site engineer. Ball valves to be procured from reputed brands such as astral, supreme, prince etc.

### 6.2.15 Sluice Valve

It shall conform to IS 780/1969 and shall bear ISI mark on it. The class, material, nominal size etc. shall be as specified in the schedule of quantities.

# 7. ELECTRO-MECHANICAL WORKS

## 7.1 Sludge Handling Pump

Non-Self priming submersible, single stage centrifugal pump designed to handle sludge of total solid content not exceeding 10%. Pump to be equipped with a grinder system, grinding destructible solids into small pieces so that they can be led away through pipes of relatively smaller diameter.

- Impeller to be hydraulically and dynamically balanced
- Pump to be directly coupled with a 3 Phase AC motor
- Inlet to be provided with a strainer/filter mesh of openings not more than 10mm

| Parameters | Specifications |
|---|---|
| Liquid to be pumped | Sewage sludge |
| Liquid solid content | Maximum 10% |
| Liquid temperature | 0 – 60 degrees |
| Maximum particle size at inlet | 10 mm |

The surface of the pump is smooth to prevent dirt and impurities from sticking to the pump. The pump is primarily made of cast iron. The clamp securing the motor to the pump housing is made of stainless steel to prevent corrosion and allow for ease of service of the pump. The power cable of the pump also incorporates wires for the thermal sensors in the motor winding. The cable connection is a plug solution. The totally sealed plug connection prevents moisture from entering the pump through the cable in case of cable breakage or adverse and/or careless handling of the pump cable.

Technical specification of the pump

| | |
|---|---|
| General | Required head of the pump: 10 m<br>Required flow rate: 20 m3 per hour<br>Type of impeller: GRINDER SYSTEM<br>Primary shaft seal: SIC/SIC |
| Materials | Pump housing: Cast iron EN-JL1030<br>Impeller: Cast iron EN-JL1030<br>Gasket: SIC/SIC |
| Installation | Maximum ambient temperature: 60 °C<br>Maximum operating pressure: 6 bar<br>Flange standard: DIN<br>Pump outlet: DN 40<br>Pressure stage: PN 10<br>Maximum installation depth: 10 m |
| Electrical data | Number of poles: 2<br>Power input - P1: 1.8 kW<br>Rated power - P2: 1.2 kW |

| | |
|---|---|
| | Mains frequency: 50 Hz<br>Rated voltage: 3 x 400-415 V<br>Voltage tolerance: +6/-10 %<br>Start. method: direct-on-line<br>Max starts per. hour: 30<br>Rated current: 3.2 A<br>Starting current: 21 A<br>Rated speed: 2750 rpm<br>Enclosure class (IEC 34-5): 68<br>Insulation class (IEC 85): F<br>Length of cable: 10 m<br>Cable type: H07RN-F<br>Type of cable plug: NO PLUG |
| Weight | Not exceeding 50 kgs |

### 7.2 Waste Water Pump

Non-self-priming, single-stage, centrifugal pump designed for handling wastewater, process water and unscreened raw sewage. The pump is designed for intermittent and continous operations in submerged installation. The impeller provides free spherical passage of solids up to 80 mm and is suitable for wastewater with a dry matter content of up to 3 %. A stainless-steel clamp assembling system enables quick and easy disassembly of the pump from the motor unit for service and inspection. Pipework connection is via a DIN flange.

| | |
|---|---|
| General | Required head of the pump: 6 m<br>Required flow rate: 3 m3/hour |
| Controls | Moisture sensor: with moisture sensors<br>Water-in-oil sensor: with water-in-oil sensor |
| Materials | Pump housing: Cast iron (EN-GJL-250); EN-GJL-250<br>Impeller: Cast iron (EN-GJL-250; EN-GJL-250 )<br>Motor: EN-GJL-250<br>Primary shaft seal: SIC/SIC<br>Secondary shaft seal: CARBON/CERAMICS |
| Installation | Maximum ambient temperature: 40 °C<br>Flange standard: DIN |

| | | |
|---|---|---|
| | Pump inlet: | 100 |
| | Pump outlet: | 100 |
| | Pressure stage: | PN 10 |
| | Maximum installation depth: | 10 m |
| Electrical data | Power input - P1: | 1.9 kW |
| | Rated power - P2: | 1.5 kW |
| | Mains frequency: | 50 Hz |
| | Rated voltage: | 3 x 380-415 V |
| | Voltage tolerance: | +10/-10 % |
| | Max starts per. hour: | 20 |
| | Rated current: | 4.1-4.2 A |
| | Number of poles: | 4 |
| | Start. method: | direct-on-line |
| | Enclosure class (IEC 34-5): | IP68 |
| | Insulation class (IEC 85): | H |
| | Explosion proof: | yes |
| | Length of cable: | 10 m |
| Weight | Not exceeding 50 kgs | |

The surface of the pump is smooth to prevent dirt and impurities from sticking to the pump. The pump is primarily made of cast iron. The clamp securing the motor to the pump housing is made of stainless steel to prevent corrosion and allow for ease of service of the pump. The power cable of the pump also incorporates wires for the thermal sensors in the motor winding. The cable connection is a plug solution. The totally sealed plug connection prevents moisture from entering the pump through the cable in case of cable breakage or adverse and/or careless handling of the pump cable.

### 7.3 Tubewell Pump

3" multi-stage, submersible pump designed for domestic water supply, liquid transfer in tanks, irrigation and environmental applications. The pump to have soft starting and protection against dry-running, upthrust, overvoltage, under voltage, overload and over temperature. The motor is a single-phase motor of the permanent magnet rotor type, fitted with a replaceable end cover with socket. The pump is designed for intermittent and continuous operations in submerged installation.

| | |
|---|---|
| General | Required head: 50 meters<br>Required flow rate: 5 m3/hour |

| | | |
|---|---|---|
| Liquid | Pumped liquid: | Water |
| | Maximum liquid temperature: | 35 °C |
| | Max liquid t at 0.15 m/sec: | 35 °C |
| | Liquid temperature during operation: | 20 °C |
| | Density: | 998.2 kg/m³ |
| | Kinematic viscosity: | 1 mm2/s |
| Material of construction | Pump: | Polyamide / Stainless steel |
| | | DIN W.-Nr. 1.4401; AISI 316 |
| | Impeller: | Polyamide |
| | Motor: | Stainless steel |
| | | DIN W.-Nr. 1.4401, AISI 316 |
| Installation | Pump outlet: | Rp 1 1/2 |
| | Minimum borehole diameter: | 76 mm |
| Electrical data | Motor type: | MS3-N |
| | Power input - P1: | 2.32 kW |
| | Rated power - P2: | 1.68 kW |
| | Mains frequency: | 50 Hz |
| | Rated voltage: | 1 x 200-240 V |
| | Rated current: | 11.2 A |
| | Power factor: | 1,00 |
| | Start. method: | direct-on-line |
| | Enclosure class (IEC 34-5): | IP68 |
| | Insulation class (IEC 85): | F |
| | Length of cable: | 1.5 m |

## 8. FAECAL SLUDGE TREATMENT PLANT (FSTP)

The feacal sludge treatment unit is designed for 20cum per day capacity. The stabilization and the drying part of the treatment process are divided into 2 modules of 10cum per day each to ensure effective digestion.

The faecal sludge from households of Phulera community would be conveyed 6 days in a week to the treatment unit.

The faecal sludge shall first be made to pass through the screening chambers (2 nos) for the retention of coarse materials/ solid waste present in the faecal sludge. The liquid sludge would be conveyed to Stabilistraion Reactor (2 nos) from where they are conveyed to Sludge Drying Beds (SDB), 20 in total, to remove the degradable organic substance and improve its dewatering ability. The solids collected at the bottom of the stabilisation reactor in the form of slurry flows to sludge drying beds by pump provided in the third chamber. The sludge drying beds are structures with sloped base for holding graded filter media. The sludge undergoes liquid-solid separation and also drying. The dried sludge from the drying beds are removed periodically and transferred to the sludge storage shed located within the premises and the rest of the part which is the liquid percolate or effluent wastewater is conveyed to the collection tank after which it is pumped to the integrated settler and Anaerobic Filter.

The effluent wastewater is then treated in two stages (primary and secondary stage) in DEWATS modules. The primary stages i.e. Settler is mainly meant for Sedimentation of any settleable solids that have entered the modules along with the percolate. The secondary stage i.e. Anaerobic Filter is for the anaerobic degradation of any dissolved and suspended organic matter. The partially treated wastewater from the secondary treatment unit would be conveyed into the horizontal planted gravel filter (HPGF). The treated wastewater from the HPGF is pumped for filtration in sand and carbon filter and pathogen removal in UV ray tank.

The area available in the selected location for FSTP is 74m x 74m. In future if the quantity of faecal sludge increases significantly, the same system can be replicated in the selected location to accommodate the extra loads.

### 8.1 Output Quality of Effluent

| **Parameter** | **Characteristics Value** |
|---|---|
| **Bio-Solids** | |
| pH at 5% suspension | 5-7 |
| Moisture | 10% - 30% |
| Organic Carbon | 10% - 25% |
| Organic Nitrogen | 2% - 5% |
| Phosphorus | 0.2% - 1% |
| Bulk density | 0.65 – 0.9 |
| **Treated Water** | |
| pH | 6.5 - 9 |
| Temperature | 25 – 35 degree Centigrade |

| Parameter | Characteristics Value |
|---|---|
| BOD at 5 day | <10 mg/l |
| COD | <50 mg/l |
| Total suspended solids | <10 mg/l |
| Faecal coliform | <100 per 100 ml |
| Total Nitrogen | <10 mg/l |

The above parameters shall be considered as the **Process Guarantees**.

### 8.2 Pre-Treatment Units

Pre-treatment unit is screen and grit chamber which are 2 in number.

Screen is a physical method for separation of solid waste and inorganic solids like sanitary napkins, plastic, cloth, sand, slit etc. from the faecal sludge to prevent clogging of subsequent treatment modules and also enhancing the value of treated end products. Screen chamber uses a series of vertical screens made from mild steel and coated with anti-corrosive elements for this purpose. In the screen chamber proposed for this treatment facility there is one vertical screens with a 2.5 cm opening between vertical bars. Grit chambers are like sedimentation tanks, designed to separate the intended heavier inorganic materials and to allow the lighter organic materials to pass through to the next treatment unit. Hence, the flow velocity is a decisive design consideration. The velocity should neither be too low as to cause the settling of lighter organic matter, nor should it be too high as to preclude the settlement of the silt and grit present in the sludge. A horizontal velocity of flow of 15 to 30 cm /sec is used at peak flows. The detention time proposed in the grit chamber varies between 30 to 60 seconds.

**Specification of Screen**

Screen mesh to be provided to remove non bio degradable foreign particles which are a part of the sludge, the design and dimensions of the screen are as per drawings provided, while the specifications are as follows:

Fabrication

The steel sections as specified shall be straightened and cut square to correct lengths and measured with a steel tape. The cut ends exposed to view shall be finished smooth. No two pieces shall be welded or otherwise jointed to make up the required length of member. All straightening and shaping to form, shall be done by pressure. Bending or cutting shall be carried out in such a manner as not to impair the strength of the metal.

Painting

All surfaces which are to be painted, oiled or otherwise treated shall be dry and thoroughly cleaned to remove all loose scale and loose rust. Surfaces not in contact but inaccessible after shop assembly, shall receive the full specified protective treatment before assembly. This does not apply to the interior of sealed hollow sections. Part to be encased in concrete shall not be painted or oiled. A priming coat of approved steel primer such as Red Oxide/Zinc Chromate primer conforming to IS 2074 shall be applied before any member of steel structure are placed in position or taken out of workshop.

Fixing

Screens shall not be "built in" as the work proceeds but opening shall be left out and frames fitted afterwards so that the minimum specified clearance between opening and unit frame is left alround. Necessary holes shall be made in the masonry and lugs not less than 50 cm long 50 x 50 mm S.S "equal L angle fixed in cement concrete blocks of

1:3:6 mix (1 cement : 3 coarse sand:6 graded stone aggregate 20mm nominal size). The frames of units shall be set in the opening by using wooden wedges at the jamb, head and sill, (wedges shall preferably be placed near the points where a glazing bar meets the frames and be plumbed in position). The lugs shall be placed in the same angle of inclination as that of the screen mesh design and the L angle will be placed in position to support the screen mesh.

### 8.3 Stabilisation Reactor

The stabilization reactor has 3 chambers. The first chamber has a retention time of 2 days and assists in homogenization of sludge. During the discharge of sludge from the desludging vehicle high turbulence is created in the chamber with an up-flow velocity of 4-5 m/hr.

The second chamber has a retention time of 7 days and is designed to stabilize the sludge through aiding the process of anaerobic digestion. The length of the chamber is kept low to prevent dead zones and liquid funnels that may be created at the outlet. A baffle wall is also designed for similar purpose. The up-flow velocity in this chamber is kept at 1.5 -2 m/hr, this is to disturb the sludge and help entrapped bio-gas to escape, thereby aiding liquid solid separation.

An over flow pipe is provided in the last chamber for providing passage of sludge from stabilisation tank to SDB in case of no pump operation is carried out.

### 8.4 Sludge Drying Bed

The sludge retained at the bottom of the stabilization reactor is pumped into each drying bed. Sludge drying beds are open tanks filled with sand and graded gravel. Each sludge drying bed is designed for 10 cum of faecal sludge.

The size and specifications of SDB are provided in the drawings and please refer to section 2 of the technical bid document for the same.

### 8.5 Integrated settler And Anaerobic Filter

The Integrated settler and Anaerobic Filter (AF) consists of two chambers in series in which the wastewater flows baffled manner. Here, the suspended and dissolved solids available in the wastewater undergo anaerobic degradation. The activated sludge settles down at the bottom of each chamber and the influent wastewater is forced to flow through this sludge blanket where anaerobic bacteria make use of the pollutants for their metabolism. As wastewater flows through the filter, particles are trapped and organic matter is degraded by the biomass that is attached to the filter material. The size and specifications are provided in the drawings and please refer to section 2 of the technical bid document for the same.

### 8.6 Horizontal Planted Gravel Filter

The Planted Gravel Filter is used as an aerobic tertiary treatment unit where the pollutants (mostly nutrients) present in the wastewater are degraded aerobically.Organic load entering into the HPGF is already within the required effluent (BOD < 30mg/L) requirement. The size and specifications of HPGF are provided in the drawings.

Following plants can be used for the treatment purpose in the Planted Gravel Filter

- Canna indica
- Colacasia
- Reed Junacas
- Pappyrus
- Hedychium Canna

These plants have to be sourced locally within a radius of 100 kms and must be transported along the root/bulb and transplanted under the guidance of engineer.

## 8.7 Filter Media

All filter media such as sand, gravel and other coarse aggregates to be used in the treatment module such as sludge drying beds, anaerobic filter and planted gravel filter to be washed thoroughly to remove silt and flaks before installing. Further details are as follows:

Coarse aggregates to be sourced from a single mine after inspection and seive test carried out as per instruction of the engineer. The below would be the range of recommended fineness modulus for various aggregares used.

| Sizes | Fineness modulus |
|---|---|
| 6-8 mm aggregates | < 6 |
| 10-12 mm aggregates | < 7.2 |
| 50-70 mm aggregates | 8.5-9 |
| 16-20 mm aggregates | <6.8 |
| 90-120 mm aggregates | >8 |

The aggregates have to be cleaned and sampled for analysis of fineness modulus, only after the results are as per the requirement, would the aggregates be used for the desired purpose as per design.

Sand is to be sourced from natural sources such as river bed or ravines. The fineness modulus of sand to be used for sludge drying bed is to be between 3 - 4, with a majority of particles passing through seive opening of 2.36 mm but straining on a 0.6 mm seive. The sand has to be free from silt, this is to be ensured by washing of sand throughly and conducting onsite inspection as per directions of the engineer. Only seived and washed sand with no clay content is to be used in the drying beds.

Cinder is the preferred filter material to be used in anaerobic filter, any other material can also be preferred which is economical, easily available, inert in sewage and does not disintegrate under continuous submerged conditions. The filter media must have a specific surface area of at least 100 m2 per m3 with a void ratio of at least 45%.

## 8.8 Post-Treatment

The treated water from planted gravel filter is further treated using sand and carbon filter and disinfected using ultra violet radiation. Sand and carbon filters are pressurized vessels containing refined and cleaned sand in one and activated carbon in the other. Pressure Sand filter helps to reduce the suspended solids in the treated water to levels as prescribed by the CPCB, while carbon filter reduces any residual odour and colour by the mechanism of adsorption. These filters are to be back-flushed at regular intervals to prevent clogging and ensure efficient working of the system as per manufacturer's guidance.

Ultra violet radiation is a disinfection method to deactivate the growth and impact of harmful microorganism present in the treated water. Ultra violet radiation is measured in dosages which is intensity multiplied by the exposure time. Recommended dosage for 10 ppm is 27 mWs/cm2

**Pressure Sand and Carbon Filter Specification**

Sand and carbon filter to be used as post treatment for percolate water coming out of planted gravel filter. Sand and carbon filters are to be provided and installed with the following specification:

| Parameters | Specification |
|---|---|
| Inlet – BOD | 30 mg/litre |
| Inlet TSS | 50 mg/litre |
| Outlet BOD | 10 mg/litre |
| Outlet TSS | 10 mg/litre |
| **Sand Filter** | |
| Vessel MOC | FRV |
| Design pressure of vessel – minimum | 10 kg/cm2 |
| Operating pressure of the filter | 3.5 kg/cm2 |
| Flow rate | 5 m3/ hour |
| Operating temperature | 1 – 60 degree centigrade |
| Treatment efficiency: Reduction in total suspended solids | > 80% |
| Filter media | Natural Quartz |
| **Activated Carbon filter** | |
| Vessel MOC | FRV |
| Design pressure of vessel – minimum | 10 kg/cm2 |
| Operating pressure of the filter | 3.5 kg/cm2 |
| Flow rate | 5 m3/ hour |
| Operating temperature | 1 – 60 degree centigrade |
| Treatment efficiency: Reduction in COD | > 50% |
| Filter media | Activated carbon |

The sand and carbon filters operate using a pump of the desired flow capacity of 5 m3 per hour; the pump selection is to be based on the requirements of the sand and carbon filter, with a minimum NPSH of 3 meters. Pipes and fittings must be of U-PVC, pump and wetted parts of the pump must be of CI or stainless steel. Filters to be provided with multi-port valves for isolation and backwash. All connections and installations to be made based on recommendations of the OEM supplier including provision and installation of shed and freshwater arrangement for backwash.

**UV Treatment**

The treatment module to consist of UV lamp, quartz sleeve and a controller unit. The low pressure UV lamp is to be capable of reducing 99.999% of e-coli count in the wastewater. The UV lamp is to be designed for a flow rate of 5 m3 per hour and to be operational under submerged conditions of upto 5 metres. The installation to include providing necessary wiring and fixing arrangements to fix the sleeve in the concrete tank by means

of stainless steel clamps bolted in place at distances of 300 mm. The controller is to be placed inside an IP65 casing with necessary switches and circuit breakers for equipment protection. Installation to be made as per instruction of the OEM supplier and to conduct commissioning and testing under expert supervision.

Other design specifications for the above all is provided in the drawings section.

### 8.9 Electrical Use and Pump Details

Electricity use is driven by submersible sludge pump. The capacity of pump shall be adequate to meet the requirements of pumping sludge at 7 m head. A diesel standby unit (Generator) is to be provided to meet the pumping requirements during power failure.

- Street Lights need to be provided along the access road within the Treatment plant at intervals.
- Borewell pump is also to be included

### 8.10 Pump Details

| | From | Delivery | kW | Discharge | Head | Nos | Total Horizontal length, m | Total Vertical length, m |
|---|---|---|---|---|---|---|---|---|
| 1 | Stabilisa-tion Reactor | Sludge Drying Beds | 1.5 | 20 cum/ hr | 10m | 2W+1S | As per actual site condition | As per actual site condition |
| 2 | Collection Tank 1 | ISAF | 0.75 | 3 cum/ hr | 5m | 1W+1S | As per actual site condition | As per actual site condition |
| 3 | Collection tank 2 | SCF | 1.5 | 5 cum/ hr | 5m | 2W+1S | As per actual site condition | As per actual site condition |
| 4 | Borewell Pump | Over head tank | 3.78 | 20 cum/ hr | 10m | 1W | As per actual site condition | As per actual site condition |

### 8.11 Pipes and Fitting Details

This Section includes the information on all the pipe material and sizes, registers and their sizes, slope provided for conveying the sludge and Supernatant /filtrate. All the valves used in the treatment plant must be Ball valve of the respective diameter.

| | | | |
|---|---|---|---|
| 1 | HDPE/uPV | 110mm,160mm | None pressurized. i.e. gravity flow pipes |
| 2 | HDPE | 110mm, 65mm | All pressurized pipes – PN8 |

### 8.12 Registers

Registers are basically chamber units. The collected percolate from SDB are carried to collection tank and further to the DEWATS systems through a series of registers. The registers numbered R1 to R5 are for each of the five drying beds and registers R6 to R9 are installed before percolate reaches collection tank 1( refer master plan).

| Sl. No. | Depth of Sewer pipe from FGL | Size of Register |
|---|---|---|
| 1 | 0.3 to 0.9m | 0.6m x 0.6m |
| 2 | Above 1m | 0.7m x 0.7m |

### 8.13 Drainage

The FSTP Site is mostly flat and is at a low lying area near the lake therefore there is a high possibility of it flooding during rainy season due to impervious soil at the site. A drainage system has to be implemented to mitigate the risk of flooding.

Drains of width 600mm and depth of 400mm (minimum) at a slope of 1:200 will need be constructed at the periphery of the site and next to roads in FSTP premises where ever necessary. This water need to be conveyed to a ditch located at the north of the site at a distance of 32m.The design/plan of drainage

**Standard Slope of Pipe/Drain**

The minimum gradient for the pipes conveying faecal sludge and treated wastewater is provided in the table

| Sl. No. | Slope | Remarks |
|---|---|---|
| 1 | 1:100 | All pipes Conveying wastewater (if not mentioned) |
| 2 | 1: 50 | Bottom slope in sludge drying bed and HPGF |
| 3 | 1:300 | Storm water drain |

### 8.14 Construction of Cell

Windrow composting process consists of placing the pre-sorted feedstock in long narrow piles called windrows that are turned on a regular basis for boosting passive aeration. The turning operation mixes the composting materials and enhances passive aeration.

The following factors has been considered in the location and design of the composting yard:

- The base will be provided as a barrier to prevent the percolation of leachate and nutrients to the subsoil and groundwater.
- The surface will facilitate equipment movement even during wet weather conditions. The surface area will accommodate waste for 8 to 10 weeks, with sufficient room for equipment to maneuver and an area to establish a static pile for curing compost.
- Windrows will be trapezoidal in cross section.

The design specifications are provided in the drawings of technical section in volume 2 of the bid document.

### 8.15 Tiller

A tiller and trailer arrangement is to be provided for transportation of material inside the treatment premise. Following would be the specifications of the tiller

| Parameters - Tiller | Specifications |
|---|---|
| Engine | 4 stroke, water cooled diesel engine |

| | |
|---|---|
| Max. Hp | 15 HP |
| Max. torque | 5 kg-m |
| Specific fuel consumption | < 200 g/hp/hr |
| Width of the tiller | < 1000 mm |
| Parameters – Trailer | Specifications |
| Capacity | 1.5 tons |
| Type | Tipping with hydraulic lift arrangement |

# 9. OPERATION AND MAINTENANCE

## 9.1 General

This section applies to the specifications for the activities and materials to be used during the Operation and Maintenance (O&M) Period. The required degree of workmanship, the performance requirements for the acceptable quality of effluent, the keeping and maintenance of records, and the responsibilities during the O&M Period are described herein.

The Contractor shall operate and maintain the system for which he would be constructing and/or restoring and/or replacing the components, for the O&M Period specified in the Contract:

- Faecal Sludge Treatment plant
- Composting

This shall contain all components of treatment units/facilities and other ancillary structures/components within the project boundary.

## 9.2 Start of O&M Period

### 9.2.1 Trial Run and Pre-Commissioning Activities

After the completion of construction or installation/erection or execution of the works, trial run and pre-commission activities shall be carried out to make the plant ready for commissioning. All equipments, materials and provisions necessary for conducting site tests shall be provided by the Contractor at no additional cost to the Contract. Upon completion of the construction and installation Site Acceptance Tests shall be carried out by contractor.

After the completion of the site acceptance tests, preparations necessary for start-up of the plant. A continuous operation of each component for a period of **5 days** to the satisfaction of the Employer's Representative will be deemed to demonstrate satisfactory completion of the trial run for that individual component. The costs associated for the Contractor's and other operating personnel during the period of the trial run, along with costs of tools and spare parts, which are required for operation and maintenance of the plant and equipment during the trial run period shall also be borne by the Contractor and shall be deemed to be included in the Contract Price.

In the event that any system or facilities do not satisfactorily achieve the required performance standards during this period, the trial run period shall be extended until such time as the Contractor has satisfactorily rectified any deficiencies as may be necessary to satisfy the performance requirements, at the risk and cost to the Contractor.

### 9.2.2 Commissioning

On successful completion of all of the trial runs and pre-commissioning activities for the entire facility, the facility is deemed to be ready for commissioning.

After successful commissioning test, the Employer will take over control of the facilities, except that the Contractor shall operate and maintain these facilities. Employer shall issue Completion Certificate to the contractor.

A continuous operation of total plant for a period of **2 days** to the satisfaction of the Employer's Representative will be deemed to demonstrate satisfactory commissioning of the system. The costs associated for the Contractor's and other operating personnel during the period, along with costs of tools and spare parts, which are required for operation and maintenance of the plant and equipment during the commissioning period shall also be borne by the Contractor and shall be deemed to be included in the Contract Price.

It shall be deemed to be the Operational Acceptance by the Employer and the contract shall start the Operation and Maintenance activities.

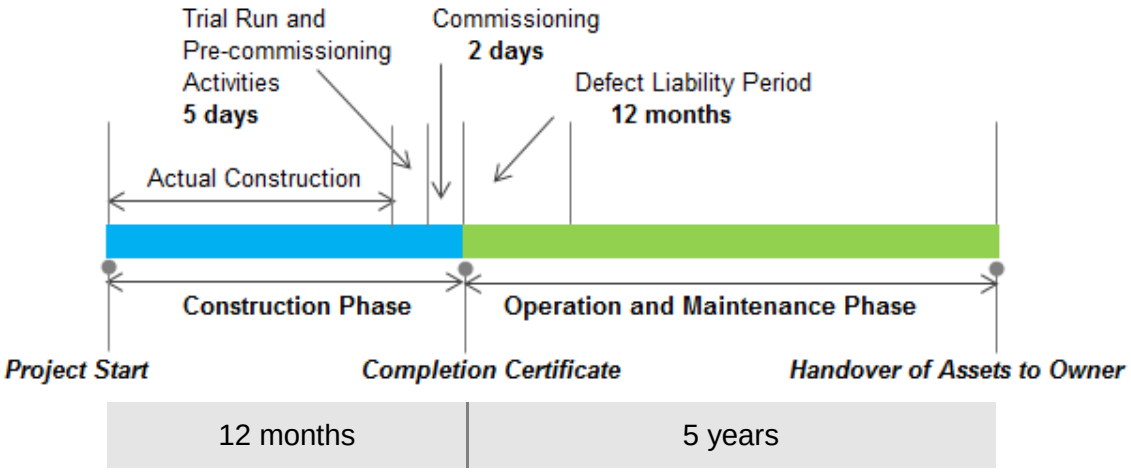
The total time allotted for the trial run and commissioning will be within the construction period. Cost of the Contractor's personnel, maintenance, chemicals, electricity and any consumables for operation and maintenance of the system during the period of trial run and pre-commissioning shall be borne by the Contractor.

### 9.2.3 Defect Liability Period

The Contractor shall be responsible for operation and maintenance of the system for the period specified in the Bid Documents. In first 12 months, the Contractor shall be required to rectify any deficiencies which are attributable to defects in the workmanship or quality of materials, plant or equipment during the Contract Period. All cost for the above shall be borne by the Contractor. This is Defect Liability Period.

After defect liability period and during remaining O&M period contractor will be paid for O&M activities as per BoQ items.

After O&M period, employer will take over the asserts and issue a Hand-over certificate to the Contractor.




## 9.3 Handholding Support

Employer will provide hand-holding support for 6 months of O&M period, where employer (or its representative) will give demonstration for operation of FSTP in line with the O&M Manual. In the first 2 months employer (or its representative) shall be present at site on continuous requirement basis. In the next two months employer (or its representative) will attend alternate days for hand holding support. For last 2 months hand-holding support will be available from employer (or its representative) for once a week.

Contractor shall clarify all queries and make ownself capable to operate the plant exclusively at its own capacity in line with the O&M manual.

## 9.4 Activities During O&M Period

Within the framework of the Contractor's general responsibilities given above, the Contractor shall carry out the following activities. These shall not limit the requirement for other activities which are required in accordance with the terms and conditions of the Contract or are essential as per good practices. The operator shall not cause damage to the infrastructure. The contractor shall not deviate from the operating procedure without the approval from the Engineer-In-Charge. The operators and operating staff shall be available in the site during operational hours. The Contractor shall not use the facility for purposes other than faecal sludge treatment and co-composting

The Contractor shall be responsible for, but not limited to, the following:

- Providing periodic routine maintenance of treatment units. Such maintenance shall ensure adequate cleanliness, ventilation, illumination and safety. In addition, the general hygienic standards shall be maintained and adequate planting shall be undertaken to maintain the total environment of the premises. Daily cleaning and maintain of treatment complex **once in a day**. It shall include all units, including walkway, open area, horticulture, drainage, etc. Biodegradable cleaners shall be used inside toilet and latrines of operators/office room. Water tanks and electrical fiitings/connections shall be cleaned and checked **once in a month** respectively.
- Treating the waste at the desired level at all the outlet where he has constructed the units, with the quality of the effluent as specified or as directed by the Engineer. Introduction or control mechanism of maintaining bacterial culture or microbial species at the required level, where necessary.
- The waste or end product of the treatment plant shall not be disposed in non-designated areas or areas outside the treatment facility without the approval of the local government.
- Monitoring the treated waste quality as per the monitoring schedule, stipulated elsewhere in the document, and taking proactive remedial action if it does not comply the effluent quality as stipulated in the specification.
- Providing the required qualified staff, but not less than the minimum specified numbers at the specified levels, during the O&M Period and providing additional staff as required during periodic maintenance activities and during emergency situations.
- Operation and maintenance of all electrical and mechanical units on bi-weekly basis or as on required whichever is minimum.
- Providing all consumables required (chemicals, chlorine powder, inoculums, fuel, etc.) and power for the functioning of the system.
- Operating and maintaining and providing proper disinfection mechanism to the effluent discharge by UV.
- The Employer will provide power for yard lighting and toilet lighting of the complex. The contractor should maintain and ensure that the lights should not be on when not required.
- Providing back up emergency power facility which would be used for running of the plant in case of power cut off from the power authority or its agencies.
- Providing back up emergency lighting facility for at night, which would be used in case of power cut off from the power authority or its agencies.
- Maintenance of the lighting fixtures and the lighting system of all and replacement of all non-functional lighting fixtures. Contractor shall have adequate standby fixture to ensure immediate replacement.
- Contractor has to analyses water for domestic purpose and distribute it to all requirement points/taps. Contractor shall ensure that no wastage or physical loss of water within the campus by proper monitoring and maintenance.
- Contractor has to ensure smooth function of FSTP by proper addressing issue on:
  - clogging of inter connected pipes, which can occur due to soli waste, dame of screen chamber;
  - irregular desludging of treatment modules where sludge may enter into subsequent modules resulting in reduced efficiency, clogging of the filter material in AF and SDB;
  - charging activated sludge into AF may cause clogging of the filter material

- clogging of filter media in SDB may occure due to leaves and solid waste entering the SDB;

- Providing required spares for pumps, motors, electrical fixtures, plumbing utilities, toilet components, sewers pipes and maintaining adequate inventory of required accessories for repair within the O&M period so that systems can work efficiently as per the guarantees or minimum required efficiencies stated in the Contract, without any additional costs to the Employer.
- The Contractor shall have adequate tools and tackles as required for O&M of the systems. However, at the end of the O&M Period the Contractor shall hand over the full spares, tools and tackles as supplied by him.
- Providing adequate manpower for the required repairs of all component facilities along with the materials for operation and maintenances.
- The Contractor shall be solely responsible for the safety and security of the O&M items in the stores and shall be responsible for any loss or damages occurring in the stores.
- Submission of monthly reports on performance of the system.
- Shall not modifying the infrastructure or the design without approval from the engineer.
- **Water consumption** – The project has estimated an average water consumption of 1050 Liter per capita per day. This includes drinking, bathing and toilet usage, hand washing, cleaning of flexible hose and Backwashing of filters. Flushing of toilets, cleaning of premises and watering for gardening, cleaning of pipes if chocked, preparation of chemicals/solution shall be done from effluent water. Contractor has to monitor the water usage properly and should ensure that no water wastage or misuse or malpractice is encouraged. He has to maintain data log book for water consumption.
- **Electricity consumption** – The project has estimated 25 KwH per day power consumption which includes power for running of plant, yard lighting and internal lighting arrangement. Contractor has to monitor the power usage properly. He has to maintain data log book for power consumption.

  **The Employer shall bear power charge for electricity during O&M period. . The Contractor shall have the provision of generator to operate the system on emergency power shut down condition within the O&M period.**
- Operator, labor and associated persons in the treatment facility shall always wear or operate with personal protective equipment.

### 9.5 Specification for Materials for Maintenance

The specifications for materials used for maintenance, repairs and renovation, replacement items shall be the same as those that have been used in the original work in compliance to as stipulated in the specification. Specifications for any materials which were not used during the construction phase (prior to Commissioning) shall be approved by the Engineer prior to usage and shall be incorporated in the updated O&M manual. During O&M period, without being limited by this clause, the Contractor shall use appropriate materials for repairs, even if the material required for such repairs has not been used earlier after duly approval from Engineer. No delay in making such repairs shall be subjected to any limitation and condition as far as the job is within the scope of O&M contract. However, subsequent to the use of such material, the Contractor shall submit proposals for the approval of the specifications for such material.

### 9.6 Tools & Tackles for O&M

Given elsewhere in the Bidding Document

## 9.7 Specific O&M Activities

### 9.7.1 FSTP

Operating procedures: It is essential to regularly operate and maintain the FSTP treatment system for its smooth function and improved life span. It is necessary that all sanitation officials/ engineers of Phulera Municipality have a copy of the O&M activities and familiarize themselves with the standard operating procedures. The operator must be familiar with the operating procedures before he starts to operate and maintain the fecal sludge treatment system. It is a must that the operator undergoes a training program dedicated to O&M of FSTP from the service provider.

Specific activities of the Contractor are illustrated, but not limited to the following, as given below:

1) Supply and supervise operator for monitoring and coordinating the activities mentioned in O&M manual of the treatment facility. Operator must be available at the treatment facility on all days of the week for at least 12 hours. Operator shall be provided with all the required personal safety equipments to carry out the task, he/she shall also be covered as per the labour act of the local, state and national governments with provisions for medical and accidental insurance. The qualification and skill set of the operator will be as described in the bid document and/or by the engineer. The operator must have had a total training of 5 mandays by experts of employer in the O&M of such treatment facility.

2) Supply and supervise labours for the purpose of maintaining and operating the treatment facility as per advice of the operator and engineer. Labours must be provided with personal safety equipments at all times and shall be covered as per local, state and national employment acts.

3) Maintain for the landscape consisting of grass turf and flowering/non flowering plants within the treatment premises.

4) Maintain, repair and restore sludge/water and wastewater pumps in the treatment facility for the O&M period to match performance standards as per design or instructions of the engineer. It includes cost of part/whole replacements where ever necessary, transportation and fee for expert supervision/site visits by OEM suppliers. All repairs and replacements shall be carried out by 83ompetent83 personnel of the OEM supplier or their representatives. It shall include repairs or malfunctions caused due to operations, accident or manufacturing defects.

5) Maintain, repair and restore sand and carbon filter for the O&M period as per requirements prescribed by the OEM supplier, including maintaining log of the activities carried out. Any repair or replacements must take place in the supervision of the OEM supplier or 83ompetent83 personnel. It shall Include repairs or 83ompetent8383s caused due to operations, accident or manufacturing defects.

6) Maintain, repair and restore ultra violet treatment system for O&M period as per requirements prescribed by the OEM supplier, including maintaining log of the activities carried out. Any repair or replacements must take place in the supervision of the OEM supplier or 83ompetent83 personnel. It shall include repairs or 83ompetent8383s caused due to operations, accident or manufacturing defects.

7) Cleaning and maintaining tidy the premises of the treatment plant including removal fo trash from dustbins/trash chambers, cleaning of roads and cleanage of spillage for O&M period.

8) Collection, analysis, reporting and documentation of wastewater/faecal sludge/treated water samples at times prescribed by the local government/pollution control boards or any competent authority. Testing

parameters and methods to be carried out as per standards mentioned by the design engineer/PCB in a NABL certified laboratory.

9) Maintain, replace, restore – sand/filter media in sludge drying beds/planted gravel filter to maintain treatment standards as per design and commissioning post restoration under expert supervision.

10) Monitor, making payment and documentation of electricity charges as billed by the 84ompetent84 agency.

11) Preparing, packaging and making arrangement for selling of biosolids/co-compost to buyers, including maintaining a log of sale quantity and proceeds and documenting the same for audit by local government/84ompetent84 personal as and when asked for.

12) Desludging of underground tanks and disposal of contents to drying beds to maintain desired liquid/treatment volumes as and when prescribed in the O&M manual or as directed by a 84ompetent authority

Below table shows a summary of O&M Steps for each unit to be followed.

**O&M activities with responsibility**

| Activities | Frequency | Details | Primary Responsibility |
|---|---|---|---|
| **Hand Holding Support** | As per contract | As per O&M Manual | Employer |
| **Daily monitoring and inspection procedures** | Daily | 1. Log the quantity, source and age of FS and the truck details<br>2. Inspect the quality of FS prior to discharge into the treatment plant to ensure hazardous or non biological waste are not being accepted<br>3. Inspect the levels of sludge and liquid in all underground tanks<br>4. Inspect for scum and trash in stabilization tank<br>5. Inspect the moisture content in the dried sludge manually | Operator |
| **Screen chamber** | Daily | 1. Remove trash from screen chamber after each loading from the truck into the stabilization reactor. Removed trash to be disposed into a trash bin located within the premises.<br>2. Grit chamber valve to be opened everyday at the end of shift and collected grit to be disposed in the | Operator |

| Activities | Frequency | Details | Primary Responsibility |
|---|---|---|---|
| **Stabilization Tank** | Daily<br><br><br><br><br>As per requirement | 1. Accumulated sludge from the final chamber to be pumped into drying bed after making appropriate hose connections.<br>2. Scum to be removed from the first chamber of the stabilization tank and disposed along with trash.<br>3. Accumulated sludge in the first three chambers to be desludged as and when the sludge accumulated height is in excess of 500 mm. The removed solids to be disposed directly into the drying bed. | Operator |

| Activities | Frequency | Details | Primary Responsibility |
|---|---|---|---|
| **Unplanted Drying Bed** | Once in 11 days per bed<br><br>As and when required<br><br><br>As and when required | 1. Sludge to be removed from the drying beds as and when they are dry ( ~ 50% moisture) and used for co-composting<br>2. Sand layer in the drying bed to be maintained at a minimum of 100 mm thickness. In case excess of sand is lost during sludge removal, fresh sand has to be applied in the beds.<br>3. Filter materials of the drying beds needs to be cleaned of clogs or replaced when the percolation rate reduces or drying time increases than usual | Operator<br><br>Operator<br><br><br>Operator |
| **Monitoring of sludge level in settler** | Monthly | 1. Monitor sludge level to predict and perform desludging at the correct time | Operator |
| **Desludging of the settler** | Once a year | 1. According to the fill up level of the settler compartments, desludging is determined<br>2. After desludging, the desludging area must be cleaned properly to ensure cleanliness and hygiene | Operator |
| **Desludging of AF**<br><br><br>**Filter Materials In AF** | Once a year (or as per O&M calendar)<br><br><br>Once in 3 years | 1. There should be no thick sludge layer or floating scum layer in AF<br>2. After desludging, the desludging area must be cleaned properly to ensure cleanliness and hygiene<br>3. Filter material in AF should be back washed properly | Operator |

| Activities | Frequency | Details | Primary Responsibility |
|---|---|---|---|
| **Horizontal Planted Gravel Filter** | Daily<br><br>Once in 2 | 1. Ensuring of treated wastewater disposal from HPGF<br>2. Cleaning of Filter Media | Operator<br><br>Operator |
| **Waste water analysis** | Half yearly (for raw)<br>As stipulated in frequency (for treated effluent) | 1. Regular sampling and analysis of chemical and biological parameters through a certified laboratory should be done (all parameters required by PCB should be tested and recorded)<br>2. Maintain a log of all test results with the dates to study the efficacy of the | Operator |
| **General maintenance of pipes** | Daily | 1. All sludge carrying pipes, such as outlet of screen chamber, outlet of stabilization tanks etc must be flushed with treated water<br>2. All pipes to be inspected for leakages or blockage by assessing the flow of water through pipes<br>3. Hoses and temporary connections to be washed thoroughly after usage and stored at designated areas | Operator |
| **General maintenance of Landscape** | Weekly thrice | 1. Grass, green belt and trees inside the treatment facility to be irrigated using treated water<br>2. Compost/bio solids from the facility to be used as a soil conditioner and nutrient provider. | Operator |
| **Sand – carbon filter and UV treatment** | Daily | 1. To perform the functions as prescribed by the OEM of the sand and carbon filter to achieve desired treatment efficiency. | Operator |

### 9.7.2 Co-composting

O&M of Co-composting :

The mixture must be carefully designed so that it has the proper C: N ratio, moisture and oxygen content. If facilities exist, it would be useful to monitor helminth egg inactivation as a proxy measure of sterilization.

A well-trained staff is necessary for the operation and maintenance of the facility. Maintenance staff must carefully monitor the quality of the input material, and keep track of the inflows, outflows, turning schedules, and maturing times to ensure a high quality product. Forced aeration systems must be carefully controlled and monitored.

Turning must be periodically done with either a front-end loader or by hand. Robust grinders for shredding large pieces of solid waste (i.e., small branches and coconut shells) and pile turners help to optimize the process, reduce manual labor, and ensure a more homogenous end product.

### 9.8 Effluent Quality Monitoring Schedule

Samples shall be taken from the outlet of final collection tank. Contractor shall make suitable arrangement to grab samples. If there are multiple outlets, representative sample shall be prepared by mixing equal proportion of samples from respective grab samples.

### 9.9 Experience and Qualification of Staff

Given elsewhere in the Bidding Document

### 9.10 Operation and Maintenance Manual

***A comprehensive Operation and Maintenance Manual has been prepared by Employer. Contractor shall follow the manual from start of the Period of Operation Services. Employer will provide hand-holding support for the period stipulated as mentioned in the document. Contractor shall operate and maintain the plant as per O&M Manual.***

Contractor shall be periodically suggest Employer to update the manual to incorporate the appropriateness in respect specific site condition and suitable practices experience gained while carrying out the O&M activities.

The O&M manual is generally based upon the points as listed below:

- Provision for suggesting in updation in any changes in the procedures set out in the O&M manual, as deemed necessary based on any limitations observed during the O&M Period, including incorporating additional procedures for the maintenance and/or repairs of other situations not incorporated in the original manual but faced during the O&M Period.
- Procedures for the functioning of treatment units with supporting drawings. The O&M manual must be updated if any variations in the procedures being observed during the O&M Period.
- Procedure for repair of different components. The frequency in the usage of spares used in the maintenance components/units installed shall be recorded for updating the schedules in the manual.
- Procedure for operating and maintaining Pressure filter and Carbon filter and UV unit. The frequency in the usage of spares used in the maintenance shall be recorded for updating the schedules in the manual.
- Procedure for records of trouble shooting situations and the details of events causing operational problems must be maintained and used for updating the contents of the manual.
- Procedure for repair of pipe lines and its appurtenances and records of locations and types of damages observed during the maintenance and if it is recurring nature it shall be noted in updating the manual.
- Records of inventory used must be maintained and the relevant portion of O&M manual must be updated to list out the inventory requirements for maintaining the system over a 12 month period.
- Procedure to handle the situation if the effluent quality does not support the required specification. Records of the effluent, as monitored during the O&M period, shall be maintained and handed over at the termination of the Contract Period.
- Periodic attention on potential clogging points and measures of its remediation.

The Contractor shall have adequate provisions to suggest and incorporate (on approval of employer) every aspect of good practices even if it is not elaborated here or in other parts of the Bid Documents/Manual.

The provisions in the approved Operation and Maintenance Manual shall be valid and binding for both the parties during the O&M Period along with the additions and deletions made.

The manual so prepared shall be updated by the contractor after the end of every year during the O&M Period, giving special attention to the experience gained and the observations made by the Contractor, the Employer and the Engineer.

### 9.10.1 Failure To Achieve Effluent Quality Standard

In case of failure to attaining the required quality of treated wastewater effluent and non-attending to comply with the O&M activities as stipulated in the document, liquidated damages shall be imposed for such failure to meet the performance criteria. The Employer will be entitled to recover any such non-compliance from the monthly progress payments to be made to the Contractor in the month in which the failure occurred, or at any time thereafter from the subsequent monthly progress payments.

If the Contractor does not meet the quality as directed by the Employer due to his operational limitations, liquidated damages (LD) (designated as LD in this chapter) shall be imposed on a daily basis or withheld from performance guarantee. The limit of LD shall not exceed the percentage/amount as given in the relevant section elsewhere in the bid document.

In case the permissible effluent quality limits for any of the parameters, as listed below, is not achieved it would be deemed to be non-conformance to qualitative guarantee. The effluent sampling and monitoring shall be done as per the monitoring schedule provided below:

| **Parameters** | **Frequency** | **Testing Lab** |
|---|---|---|
| Treated water – BOD | Once in a month | From laboratory outside |
| Treated water – COD | Once in a month | From laboratory outside |
| Treated water – E-coli | Once in a month | From laboratory outside |
| Treated water – $p^H$ | Everyday | Inside the Office (Contractor to establish facility for testing) |
| Treated water TSS | Once in a month | From laboratory outside |

Penalties (or LD) for non-conformance to qualitative guarantee is given in Particular Condition of Contract or elsewhere in the relevant section of the document.

# 6.3 DRAWINGS

All the drawings are attached in Part 1 – Volume 2

# 6.4 SUPPLEMENTARY INFORMATION

6.4.1 Geotechnical Information

6.4.2 Septage Quality Investigation

# 6.5 PERSONNEL REQUIREMENT

### 6.5.1 Personal Requirement of Contractor During Construction

The Employer places great importance on the quality and authority delegated to the Contractor's key staff deployed in the field to execute and supervise the works in construction phase. The Contractor is required to ensure deployment of qualified and experienced staff in sufficient numbers on site at his own cost to ensure quality and adhere to the schedule. The general requirements of key staff are given below.

| Position | Responsibilities | Minimum Qualification |
|---|---|---|
| Construction Manager - 1 no. | He/she shall be a person deployed by the Contractor as the overall In-charge for the Contract and shall be posted in the respective project town. | B.E. in Civil Engineering Minimum 3 years of general field supervision of Contracts OR Diploma Civil with Minimum 5 years of general field supervision of Contracts |

Manpower personal requirement for Operation and Maintenance stage, as applicable, is given in relevant section of the document.

### 6.5.2 Personal Requirement of Contractor During O&M Period

For all operations and maintenance work, the Contractor shall provide skilled staffs relevant to the scope of work. They should have adequate qualifications and sufficient experience of in performing similar work.

The Table below outlines the minimum levels (number) of staffing, and their minimum qualifications and experience on similar projects, that the Contractor shall be required deploy for carrying out the O&M functions. Contractor shall deploy more personnel and workers when required for proper functioning of the system.

| SL. No. | Designation | Qualification | Nature of Input |
|---|---|---|---|
| 1 | Operator | $12^{th}$ Pass | Full time |
| 2 | Helper cum gardener cum security guard | - | Full time |

In case the effluent fails to give desired quality, the services of Micro-biologist may require. Contractor shall keep provision of small input for this expert.

# 6.6 EQUIPMENT REQUIREMENT

## 6.6.1 Equipment Requirements

The Contractor is required to assign at least a minimum amount of equipment on site for ensuring quality and timely progress of works. The minimum equipment, including but not limited to the equipment described in Table below shall be mobilized by the Contractor to the Project Site in working condition.

The list in Table below may be reviewed by the Employer's Representative on justifications for any change that may be submitted by the Contractor in the Bid or later in the design stage. It may however be noted that the equipment requirement is keeping in view the period in which it is required to complete and also taking into account the avoidance of any delays resulting from equipment breakdowns.

The Contractor should submit the equipment mobilization program in reference to the list of equipment given below.

| Sl. No | Description of Equipment | Minimum No. |
|---|---|---|
| 1 | Concrete mixer | 1 |
| 2 | vibrator | 1 |
| 3 | Total station | 1 |
| 4 | | |
| 5 | Hand cart trolley | 1 |
| 6 | H&S equipment | 1 |
| 7 | Tractor | 1 |
| 8 | Dewatering pump | 1 |
| 9 | Slurry pump | 1 |
| 11 | Electric generator | 1 |
| 12 | Electric lighting equipment | 1 |

## 6.6.2 Tools & Tackles for O&M

Detail of tools and tackles required for operation and maintenance activities is given below.

| Items | Minimum Numbers |
|---|---|
| Gum boots | 4 |
| Plastic Drums | 2 |
| Rakes | 3 |

| **Items** | **Minimum Numbers** |
|---|---|
| Tarpaulin sheet (3mx3m) | 6 |
| Boom | 4 |
| Mask | 5 |
| Snapper | 1 |
| Gloves | 4 |
| Hose pipe (total 80m) | 1 |
| Shovel | 2 |
| Wheel barrow | 2 |
| Plant Trimmer | 1 |
| Tiller | 1 |
| **Safety Arrangement** | |
| First Aid Box (with all necessary medical arrangement) | 1 |
| Sign Board (1 for each unit in English and Hindi in each) | 1 |
| Safety arrangement | 1 |
| **Laboratory Equipment** | |
| pH Meter | 1 |

During O&M phase, the Contractor shall arrange for additional 50% standby, but not less than 1no., arrangement.

# Section 7 - General Conditions of Contract

## Table of Clauses

# General Conditions of Contract

## A. General

**1. Definitions**

1.1 Boldface type is used to identify defined terms.

(a) The **Accepted Contract Amount** means the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects.

(b) The **Activity Schedule** is a schedule of the activities comprising the construction, installation, testing, and commissioning of the Works in a lump sum contract. It includes a lump sum price for each activity, which is used for valuations and for assessing the effects of Variations and Compensation Events.

(c) The **Adjudicator** is the person appointed jointly by the Employer and the Contractor to resolve disputes in the first instance, as provided for in GCC 29.1 [Appointment of Adjudicator] hereunder.

(d) **Bank** means the financing institutions named in the **Particular Conditions of Contract (PCC)**.

(e) **Bill of Quantities** means the priced and completed Bill of Quantities forming part of the Bid.

(f) **Compensation Events** are those defined in GCC 51.1 [Compensation Events] hereunder.

(g) The **Completion Date** is the date of completion of the Works as certified by the Project Manager, in accordance with GCC 69.1 [Completion].

(h) The **Contract** is the Contract between the Employer and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in GCC 2.3 below.

(i) The **Contractor** is the party whose Bid to carry out the Works has been accepted by the Employer.

(j) The **Contractor's Bid** is the completed bidding document submitted by the Contractor to the Employer.

(k) The **Contract Price** is the Accepted Contract Amount stated in the Letter of Acceptance and thereafter as adjusted in accordance with the Contract.

(l) **Days** are calendar days; months are calendar months.

(m) **Dayworks** are varied work inputs subject to payment on a time basis for the Contractor's employees and Equipment, in addition to payments for associated Materials and Plant.

(n) A **Defect** is any part of the Works not completed in accordance with the Contract.

(o) The **Defects Liability Certificate** is the certificate issued by the Project Manager upon correction of defects by the Contractor.

(p) The **Defects Liability Period** is the period calculated from the Completion Date where the Contractor remains responsible for remedying defects.

(q) **Drawings** include calculations and other information provided or approved by the Project Manager for the execution of the Contract.

(r) The **Employer** is the party who employs the Contractor to carry out the Works, as specified in the **PCC.**

(s) **Equipment** is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

(t) **Force Majeure** means an exceptional event or circumstance: which is beyond a Party's control; which such Party could not reasonably have provided against before entering into the Contract; which, having arisen, such Party could not reasonably have avoided or overcome; and, which is not substantially attributable to the other Party.

(u) **In writing** or **written** means hand-written, type-written, printed or electronically made, and resulting in a permanent record.

(v) The **Initial Contract Price** is the Contract Price listed in the Employer's Letter of Acceptance.

(w) The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the **PCC**. The Intended Completion Date may be revised only by the Project Manager by issuing an extension of time or an acceleration order.

(x) **Letter of Acceptance** means the formal acceptance by the Employer of the Bid and denotes the formation of the Contract at the date of acceptance.

(y) **Materials** are all supplies, including consumables, used by the Contractor for incorporation in the Works.

(z) **Party** means the Employer or the Contractor, as the context requires.

(aa) **PCC** means Particular Conditions of Contract.

(bb) **Plant** is any integral part of the Works that shall have a mechanical, electrical, chemical, or biological function.

(cc) The **Project Manager** is the person named in the **PCC** (or any other competent person appointed by the Employer and notified to the Contractor, to act in replacement of the Project Manager) who is responsible for supervising the execution of the Works and administering the Contract.

(dd) **Retention Money** means the aggregate of all monies retained by the Employer pursuant to GCC 55.1 [Retention].

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

(ff) The **Site** is the area defined as such in the **PCC**.

(gg) **Site Investigation Reports** are those that were included in the bidding documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.

(hh) **Specification** means the Specification of the Works included in the Contract and any modification or addition made or approved by the Project Manager.

(ii) The **Start Date** is given in the **PCC**. It is the latest date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.

(jj) A **Subcontractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site.

(kk) **Temporary Works** are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works.

(ll) A **Variation** is an instruction given by the Project Manager which varies the Works.

(mm) The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as defined in the **PCC.**

**2. Interpretation**

2.1 In interpreting these GCC, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Project Manager shall provide instructions clarifying queries about these GCC.

2.2 If sectional completion is specified in the **PCC**, references in the GCC to the Works, the Completion Date, and the Intended Completion Date

apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).

2.3 The documents forming the Contract shall be interpreted in the following order of priority:

(a) Contract Agreement,

(b) Letter of Acceptance,

(c) Letter of Bid,

(d) Particular Conditions of Contract,

(e) the List of Eligible Countries that was specified in Section 5 of the bidding document,

(f) General Conditions of Contract,

(g) Specifications,

(h) Drawings,

(i) Completed Activity Schedules or Bill of Quantities, and

(j) any other document listed in the **PCC** as forming part of the Contract.

**3. Language and Law**

3.1 The language of the Contract and the law governing the Contract are stated in the **PCC**.

3.2 Throughout the execution of the Contract, the Contractor shall comply with the import of goods and services prohibitions in the Employer's country when

(a) by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, the Borrower's Country prohibits any import of goods from, or any payments to, a particular country, person, or entity. Where the borrower's country prohibits payments to a particular firm or for particular goods by such an act of compliance, that firm may be excluded.

**4. Contract Agreement**

4.1 The Parties shall enter into a Contract Agreement within 28 days after the Contractor receives the Letter of Acceptance, unless the Particular Conditions establish otherwise. The Contract Agreement shall be based upon the attached Contract forms in Section 8. The costs of stamp duties and similar charges (if any) imposed by law in connection with entry into the Contract Agreement shall be borne by the Employer.

**5. Assignment**

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

(a) may assign the whole or any part with the prior agreement of the other Party, at the sole discretion of such other Party; and

(b) may, as security in favor of a bank or financial institution, assign its right to any moneys due, or to become due, under the Contract.

**6. Care and Supply of Documents**

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

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

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

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

**7. Confidential Details**

7.1 The Contractor's and the Employer's Personnel shall disclose all such confidential and other information as may be reasonably required in order to verify the Contractor's compliance with the Contract and allow its proper implementation.

7.2 Each of them shall treat the details of the Contract as private and confidential, except to the extent necessary to carry out their respective obligations under the Contract or to comply with applicable Laws. Each of them shall not publish or disclose any particulars of the Works prepared by the other Party without the previous agreement of the other Party. However, the Contractor shall be permitted to disclose any publicly available information, or information otherwise required to establish his qualifications to compete for other projects.

7.3 Notwithstanding the above, the Contractor may furnish to its Subcontractor(s) such documents, data and other information it receives from the Employer to the extent required for the Subcontractor(s) to perform its work under the Contract, in which event the Contractor shall obtain from such Subcontractor(s) an undertaking of confidentiality similar to that imposed on the Contractor under this Clause.

**8. Compliance with Laws**

8.1 The Contractor shall, in performing the Contract, comply with applicable Laws.

8.2 Unless otherwise stated in the Particular Conditions,

(a) the Employer shall acquire and pay for all permits, approvals, and/or licenses from all local, state, or national government authorities or public service undertakings in the [Employer's Country or country where the Site is located] which (i) such authorities or undertakings require the Employer to obtain in the Employer's name, and (ii) are necessary for the execution of the Contract, including those required for the performance by both the Contractor and the Employer of their respective obligations under the Contract;

(b) the Contractor shall acquire and pay for all permits, approvals, and/or licenses from all local, state, or national government authorities or public service undertakings in the [Employer's Country or country where the Site is located] which such authorities or undertakings require the Contractor to obtain in its name and which are necessary for the performance of the Contract, including, without limitation, visas for the Contractor's and Subcontractor's personnel and entry permits for all imported Contractor's Equipment. The Contractor shall acquire all other permits, approvals, and/or licenses that are not the responsibility of the Employer under Subclause 8.2(a) hereof and that are necessary for the performance of the Contract. The Contractor shall indemnify and hold harmless the Employer from and against any and all liabilities, damages, claims, fines, penalties, and expenses of whatever nature arising or resulting from the violation of such laws by the Employer or its personnel, including the Subcontractors and their personnel, but without prejudice to Sub clause 8.1 hereof.

**9. Joint and Several Liability**

9.1 If the Contractor is a joint venture of two or more persons, all such persons shall be jointly and severally liable to the Employer for the fulfillment of the provisions of the Contract, and shall designate one of such persons to act as a leader with authority to bind the joint venture. The composition or the constitution of the joint venture shall not be altered without the prior consent of the Employer.

**10. Project Manager's Decisions**

10.1 Except where otherwise specifically stated, the Project Manager shall decide contractual matters between the Employer and the Contractor in the role representing the Employer.

**11. Delegation**

11.1 The Project Manager may delegate any of his duties and responsibilities to other people, except to the Adjudicator, after notifying the Contractor, and may cancel any delegation after notifying the Contractor.

**12. Communications**

12.1 Communications between parties that are referred to in the Conditions shall be effective only when in writing. A notice shall be effective only when it is delivered.

**13. Subcontracting**

13.1 The Contractor may subcontract with the approval of the Project Manager, but may not assign the Contract without the approval of the Employer in writing. Subcontracting shall not alter the Contractor's obligations.

**14. Other Contractors**

14.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Employer between the dates given in the Schedule of Other Contractors, as referred to in the **PCC.** The Contractor shall also provide facilities and services for them as described in the Schedule. The Employer may modify the Schedule of Other Contractors, and shall notify the Contractor of any such modification.

**15. Personnel and Equipment**

15.1 The Contractor shall employ the key personnel and use the equipment identified in its Bid to carry out the functions stated in the Schedule or other personnel and equipment approved by the Project Manager. The Project Manager shall approve any proposed replacement of key personnel and equipment only if their relevant qualifications or characteristics are substantially equal to or better than those proposed in the Bid.

15.2 If the Project Manager asks the Contractor to remove a person who is a member of the Contractor's staff or work force, stating the reasons, the Contractor shall ensure that the person leaves the Site within 7 days and has no further connection with the work in the Contract.

15.3 If the Employer, Project Manager, or Contractor determines, that any employee of the Contractor be determined to have engaged in corrupt, fraudulent, collusive, coercive, or other prohibited practices during the execution of the Works, then that employee shall be removed in accordance with Clause 15.2 above.

**16. Employer's and Contractor's Risks**

16.1 The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.

**17. Employer's Risks**

17.1 From the Start Date until the Defects Liability Certificate has been issued, the following are Employer's risks:

(a) The risk of personal injury, death, or loss of or damage to property (excluding the Works, Plant, Materials, and Equipment), which are due to

(i) use or occupation of the Site by the Works or for the purpose of the Works, which is the unavoidable result of the Works, or

(ii) negligence, breach of statutory duty, or interference with any legal right by the Employer or by any person employed by or contracted to him except the Contractor.

(b) The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Employer or in the Employer's design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed.

17.2 From the Completion Date until the Defects Liability Certificate has been issued, the risk of loss of or damage to the Works, Plant, and Materials is an Employer's risk except loss or damage due to

(a) a Defect which existed on the Completion Date,

(b) an event occurring before the Completion Date, which was not itself an Employer's risk, or

(c) the activities of the Contractor on the Site after the Completion Date.

**18. Contractor's Risks**

18.1 From the Starting Date until the Defects Liability Certificate has been issued, the risks of personal injury, death, and loss of or damage to property (including, without limitation, the Works, Plant, Materials, and Equipment) which are not Employer's risks, are Contractor's risks.

**19. Insurance**

19.1 The Contractor shall provide, in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the **PCC** for the following events, which are due to the Contractor's risks:

(a) loss of or damage to the Works, Plant, and Materials;

(b) loss of or damage to Equipment;

(c) loss of or damage to property (except the Works, Plant, Materials, and Equipment) in connection with the Contract; and

(d) personal injury or death.

19.2 Policies and certificates for insurance shall be delivered by the Contractor to the Project Manager for the Project Manager's approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.

19.3 If the Contractor does not provide any of the policies and certificates required, the Employer may effect the insurance, which the Contractor

should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.

19.4 Alterations to the terms of an insurance shall not be made without the approval of the Project Manager.

19.5 Both parties shall comply with any conditions of the insurance policies.

**20. Site Investigation Reports**

20.1 The Contractor, in preparing the Bid, shall rely on any Site Investigation Reports referred to in the **PCC,** supplemented by any information available to the Contractor.

**21. Contractor to Construct the Works**

21.1 The Contractor shall construct and install the Works in accordance with the Specifications and Drawings.

**22. The Works to Be Completed by the Intended Completion Date**

22.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Program submitted by the Contractor, as updated with the approval of the Project Manager, and complete them by the Intended Completion Date.

**23. Designs by Contractor and Approval by the Project Manager**

23.1 The Contractor shall carry out design to the extent specified in the **PCC**. The Contractor shall promptly submit to the Employer all designs prepared by him. Within 14 days of receipt, the Employer shall notify any comments. The Contractor shall not construct any element of the permanent work designed by him within 14 days after the design has been submitted to the Employer or where the design for that element has been rejected. Design that has been rejected shall be promptly amended and resubmitted. The Contractor shall resubmit all designs commented on, taking these comments into account as necessary.

23.2 The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Project Manager, who is to approve them if they comply with the Specifications and Drawings..

23.3 The Contractor shall be responsible for design of Temporary Works.

23.4 The Project Manager’s approval shall not alter the Contractor’s responsibility for design of the Temporary Works.

23.5 The Contractor shall obtain approval of third parties to the design of the Temporary Works, where required.

23.6 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Project Manager before this use.

**24. Safety**

24.1 The Contractor shall be responsible for the safety of all activities on the Site.

**25. Discoveries**

25.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the Employer. The Contractor shall notify the Project Manager of such discoveries and carry out the Project Manager's instructions for dealing with them.

**26. Possession of the Site**

26.1 The Employer shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date stated in the **PCC,** the Employer shall be deemed to have delayed the start of the relevant activities, and this shall be a Compensation Event.

**27. Access to the Site**

27.1 The Contractor shall allow the Project Manager and any person authorized by the Project Manager access to the Site and to any place where work in connection with the Contract is being carried out or is intended to be carried out.

**28. Instructions, Inspections, and Audits**

28.1 The Contractor shall carry out all instructions of the Project Manager, which comply with the applicable laws where the Site is located.

28.2 The Contractor shall keep, and shall make all reasonable efforts to cause its Subcontractors and sub consultants to keep accurate and systematic accounts and records in respect of the Works in such form and details as will clearly identify relevant time changes and costs.

28.3 The Contractor shall permit ADB to inspect the Contractor's accounts, records, and other documents relating to the submission of bids and contract performance and to have them audited by auditors appointed by ADB. The Contractor shall maintain all documents and records related to the Contract for a period of three (*3*) years after completion of the Works. The Contractor shall provide any documents necessary for the investigation of allegations of fraud, collusion, coercion, or corruption and require its employees or agents with knowledge of the Contract to respond to questions from ADB.

**29. Appointment of the Adjudicator**

29.1 The Adjudicator shall be appointed jointly by the Employer and the Contractor, at the time of the Employer's issuance of the Letter of Acceptance. If, in the Letter of Acceptance, the Employer does not agree on the appointment of the Adjudicator, the Employer will request the Appointing Authority designated in the **PCC**, to appoint the Adjudicator within 14 days of receipt of such request.

29.2 Should the Adjudicator resign or die, or should the Employer and the Contractor agree that the Adjudicator is not functioning in accordance with the provisions of the Contract, a new Adjudicator shall be jointly

appointed by the Employer and the Contractor. In case of disagreement between the Employer and the Contractor, within 30 days, the Adjudicator shall be designated by the Appointing Authority at the request of either party, within 14 days of receipt of such request.

**30. Procedure for Disputes**

30.1 If the Contractor believes that a decision taken by the Project Manager was either outside the authority given to the Project Manager by the Contract or that the decision was wrongly taken, the decision shall be referred to the Adjudicator within 14 days of the notification of the Project Manager's decision.

30.2 The Adjudicator shall give a decision in writing within 28 days of receipt of a notification of a dispute.

30.3 The Adjudicator shall be paid by the hour at the rate specified in the **PCC,** together with reimbursable expenses of the types specified in the **PCC**, and the cost shall be divided equally between the Employer and the Contractor, whatever decision is reached by the Adjudicator. Either party may refer a decision of the Adjudicator to an Arbitrator within 28 days of the Adjudicator's written decision. If neither party refers the dispute to arbitration within the above 28 days, the Adjudicator's decision shall be final and binding.

30.4 The arbitration shall be conducted in accordance with the arbitration procedures published by the institution named and in the place specified in the **PCC**.

**B. Staff and Labor**

**31. Forced Labor**

31.1 The Contractor shall not employ forced labor, which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labor, such as indentured labor, bonded labor, or similar labor–contracting arrangements.

**32. Child Labor**

32.1 The Contractor shall not employ children in a manner that is economically exploitative, or is likely to be hazardous, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. Where national laws have provisions for employment of minors, the Contractor shall follow those laws applicable to the Contractor. Children below the age of 18 years shall not be employed in dangerous work.

**33. Workers' Organizations**

33.1 In countries where national law recognizes workers' rights to form and to join workers' organizations of their choosing without interference and to bargain collectively, the Contractor shall comply with national law. Where national law substantially restricts workers' organizations, the Contractor shall enable alternative means for the Contractor's Personnel to express their grievances and protect their rights regarding working

conditions and terms of employment. In either case described above, and where national law is silent, the Contractor shall not discourage the Contractor's Personnel from forming or joining workers' organizations of their choosing or from bargaining collectively, and shall not discriminate or retaliate against the Contractor's Personnel who participate, or seek to participate, in such organizations and bargain collectively. The Contractor shall engage with such worker's representatives. Worker organizations are expected to fairly represent the workers in the workforce.

**34. Nondiscrimination and Equal Opportunity**

34.1 The Contractor shall not make employment decisions on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment relationship on the principle of equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. In countries where national law provides for non-discrimination in employment, the Contractor shall comply with national law. When national laws are silent on nondiscrimination in employment, the Contractor shall meet this Subclause's requirements. Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job shall not be deemed discrimination.

## C. Time Control

**35. Program**

35.1 Within the time stated in the **PCC**, after the date of the Letter of Acceptance, the Contractor shall submit to the Project Manager for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works. In the case of a lump sum contract, the activities in the Program shall be consistent with those in the Activity Schedule.

35.2 An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work, including any changes to the sequence of the activities.

35.3 The Contractor shall submit to the Project Manager for approval an updated Program at intervals no longer than the period stated in the **PCC.** If the Contractor does not submit an updated Program within this period, the Project Manager may withhold the amount stated in the **PCC** from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted. In the case of a lump sum contract, the Contractor shall

provide an updated Activity Schedule within 14 days of being instructed to by the Project Manager.

35.4 The Project Manager's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Project Manager again at any time. A revised Program shall show the effect of Variations and Compensation Events.

**36. Extension of the Intended Completion Date**

36.1 The Project Manager shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost.

36.2 The Project Manager shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Project Manager for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

**37. Acceleration**

37.1 When the Employer wants the Contractor to finish before the Intended Completion Date, the Project Manager shall obtain priced proposals for achieving the necessary acceleration from the Contractor. If the Employer accepts these proposals, the Intended Completion Date shall be adjusted accordingly and confirmed by both the Employer and the Contractor.

37.2 If the Contractor's priced proposals for an acceleration are accepted by the Employer, they are incorporated in the Contract Price and treated as a Variation.

**38. Delays Ordered by the Project Manager**

38.1 The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.

**39. Management Meetings**

39.1 Either the Project Manager or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.

39.2 The Project Manager shall record the business of management meetings and provide copies of the record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken shall be decided by the Project Manager either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.

**40. Early Warning**

40.1 The Contractor shall warn the Project Manager at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price, or delay the execution of the Works. The Project Manager may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate shall be provided by the Contractor as soon as reasonably possible.

40.2 The Contractor shall cooperate with the Project Manager in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Project Manager.

## D. Quality Control

**41. Identifying Defects**

41.1 The Project Manager shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Project Manager may instruct the Contractor to search for a Defect and to uncover and test any work that the Project Manager considers may have a Defect.

**42. Tests**

42.1 If the Project Manager instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect, the test shall be a Compensation Event.

**43. Correction of Defects**

43.1 The Project Manager shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion, and is defined in the **PCC.** The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

43.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Project Manager's notice.

**44. Uncorrected Defects**

44.1 If the Contractor has not corrected a Defect within the time specified in the Project Manager's notice, the Project Manager shall assess the cost of having the Defect corrected, and the Contractor shall pay this amount.

## E. Cost Control

**45. Contract Price**

45.1 In the case of an admeasurement contract, the Bill of Quantities shall contain priced items for the Works to be performed by the Contractor. The Bill of Quantities is used to calculate the Contract Price. The Contractor will be paid for the quantity of the work accomplished at the rate in the Bill of Quantities for each item.

45.2 In the case of a lump sum contract, the Activity Schedule shall contain the priced activities for the Works to be performed by the Contractor. The Activity Schedule is used to monitor and control the performance of activities on which basis the Contractor will be paid. If payment for Materials on Site shall be made separately, the Contractor shall show delivery of Materials to the Site separately on the Activity Schedule.

**46. Changes in the Contract Price**

46.1 In the case of an admeasurement contract:

(a) If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25%, provided the change exceeds 1% of the Initial Contract Price, the Project Manager shall adjust the rate to allow for the change.

(b) The Project Manager shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15%, except with the prior approval of the Employer.

(c) If requested by the Project Manager, the Contractor shall provide the Project Manager with a detailed cost breakdown of any rate in the Bill of Quantities.

46.2 In the case of a lump sum contract, the Activity Schedule shall be amended by the Contractor to accommodate changes of Program or method of working made at the Contractor's own discretion. Prices in the Activity Schedule shall not be altered when the Contractor makes such changes to the Activity Schedule.

**47. Variations**

47.1 All Variations shall be included in updated Programs, and, in the case of a lump sum contract, also in the Activity Schedule, produced by the Contractor.

47.2 The Contractor shall provide the Project Manager with a quotation for carrying out the Variation when requested to do so by the Project Manager. The Project Manager shall assess the quotation, which shall be given within seven (7) days of the request or within any longer period stated by the Project Manager and before the Variation is ordered.

47.3 If the Contractor's quotation is unreasonable, the Project Manager may order the Variation and make a change to the Contract Price, which shall be based on the Project Manager's own forecast of the effects of the Variation on the Contractor's costs.

47.4 If the Project Manager decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

47.5 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.

47.6 In the case of an admeasurement contract, if the work in the Variation corresponds to an item description in the Bill of Quantities and if, in the opinion of the Project Manager, the quantity of work above the limit stated in GCC 46.1 [Changes in the Contract Price] or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the Bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in the form of new rates for the relevant items of work.

**48. Cash Flow Forecasts**

48.1 When the Program, or, in the case of a lump sum contract, the Activity Schedule, is updated, the Contractor shall provide the Project Manager with an updated cash flow forecast. The cash flow forecast shall include different currencies, as defined in the Contract, converted as necessary using the Contract exchange rates.

**49. Payment Certificates**

49.1 The Contractor shall submit to the Project Manager monthly statements of the estimated value of the work executed less the cumulative amount certified previously.

49.2 The Project Manager shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor.

49.3 The value of work executed shall be determined by the Project Manager.

49.4 The value of work executed shall comprise,

(a) in the case of an admeasurement contract, the value of the quantities of work in the Bill of Quantities that have been completed; or

(b) in the case of a lump sum contract, the value of work executed shall comprise the value of completed activities in the Activity Schedule.

49.5 The value of work executed shall include the valuation of Variations and Compensation Events.

49.6 The Project Manager may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

**50. Payments**

50.1 Payments shall be adjusted for deductions for advance payments and retention. The Employer shall pay the Contractor the amounts certified by the Project Manager within 28 days of the date of each certificate. If the Employer makes a late payment, the Contractor shall be paid interest on the late payment in the next payment. Interest shall be calculated from the date by which the payment should have been made up to the date when the late payment is made at the prevailing rate of interest for commercial borrowing for each of the currencies in which payments are made.

50.2 If an amount certified is increased in a later certificate or as a result of an award by the Adjudicator or an Arbitrator, the Contractor shall be paid interest upon the delayed payment as set out in this clause. Interest shall be calculated from the date upon which the increased amount would have been certified in the absence of dispute.

50.3 Unless otherwise stated, all payments and deductions shall be paid or charged in the proportions of currencies comprising the Contract Price.

50.4 Items of the Works for which no rate or price has been entered in shall not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

**51. Compensation Events**

51.1 The following shall be Compensation Events:

(a) The Employer does not give access to a part of the Site by the Site Possession Date pursuant to GCC 26.1 [Possession of the Site].

(b) The Employer modifies the Schedule of Other Contractors in a way that affects the work of the Contractor under the Contract.

(c) The Project Manager orders a delay or does not issue Drawings, Specifications, or instructions required for execution of the Works on time.

(d) The Project Manager instructs the Contractor to uncover or to carry out additional tests upon work, which is then found to have no Defects.

(e) The Project Manager unreasonably does not approve a subcontract to be let.

(f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of the Letter of Acceptance from the information issued to Bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.

(g) The Project Manager gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.

(h) Other contractors, public authorities, utilities, or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.

(i) The advance payment is delayed.

(j) The effects on the Contractor of any of the Employer's Risks.

(k) The Project Manager unreasonably delays issuing a Certificate of Completion.

51.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date shall be extended. The Project Manager shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended.

51.3 As soon as information demonstrating the effect of each Compensation Event upon the Contractor's forecast cost has been provided by the Contractor, it shall be assessed by the Project Manager, and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Project Manager shall adjust the Contract Price based on the Project Manager's own forecast. The Project Manager shall assume that the Contractor shall react competently and promptly to the event.

51.4 The Contractor shall not be entitled to compensation to the extent that the Employer's interests are adversely affected by the Contractor's not having given early warning or not having cooperated with the Project Manager.

**52. Tax**

52.1 The Project Manager shall adjust the Contract Price if taxes, duties, and other levies are changed between the date 28 days before the submission of bids for the Contract and the date of the last Completion certificate. The adjustment shall be the change in the amount of tax payable by the Contractor, provided such changes are not already reflected in the Contract Price or are a result of GCC 54.1 [Price Adjustment].

**53. Currencies**

53.1 Where payments are made in currencies other than the currency of the Employer's country specified in the **PCC,** the exchange rates used for calculating the amounts to be paid shall be the exchange rates stated in the Contractor's Bid.

**54. Price Adjustment**

54.1 Prices shall be adjusted for fluctuations in the cost of inputs only if provided for in the **PCC.** If so provided, the amounts certified in each payment certificate, before deducting for Advance Payment, shall be adjusted by applying the respective price adjustment factor to the payment amounts due in each currency. A separate formula of the type indicated below applies to each Contract currency:

$$\mathbf{P_c = A_c + B_c\ Imc/Ioc}$$

where:

$P_c$ is the adjustment factor for the portion of the Contract Price payable in a specific currency "c."

$A_c$ and $B_c$ are coefficients[1] specified in the **PCC,** representing the nonadjustable and adjustable portions, respectively, of the Contract Price payable in that specific currency "c;" and

Imc is a consolidated index prevailing at the end of the month being invoiced and Ioc is the same consolidated index prevailing 28 days before Bid opening for inputs payable; both in the specific currency "c."

54.2 If the value of the index is changed after it has been used in a calculation, the calculation shall be corrected and an adjustment made in the next payment certificate. The index value shall be deemed to take account of all changes in cost due to fluctuations in costs.

[1] The sum of the two coefficients $A_c$ and $B_c$ should be 1 (one) in the formula for each currency. Normally, both coefficients shall be the same in the formulas for all currencies, since coefficient A, for the nonadjustable portion of the payments, is a very approximate figure (usually 0.10 ~ 0.20) to take account of fixed cost elements or other nonadjustable components. The sum of the adjustments for each currency is added to the Contract Price.

**55. Retention**

55.1 The Employer shall retain from each payment due to the Contractor the proportion stated in the **PCC** until Completion of the whole of the Works.

55.2 Upon the issue of a Certificate of Completion of the Works by the Project Manager, in accordance with GCC 69.1 [Completion], half the total amount retained shall be repaid to the Contractor and half when the Defects Liability Period has passed and the Project Manager has certified that all Defects notified by the Project Manager to the Contractor before the end of this period have been corrected. The Contractor may substitute retention money with an "on demand" bank guarantee.

**56. Liquidated Damages**

56.1 The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the **PCC** for each day that the Completion Date is later than the Intended Completion Date. The total amount of liquidated damages shall not exceed the amount defined in the **PCC.** The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities.

56.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Project Manager shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the overpayment, calculated from the date of payment to the date of repayment, at the rates specified in GCC 50.1 [Payments].

**57. Bonus**

57.1 The Contractor shall be paid a Bonus calculated at the rate per calendar day stated in the **PCC** for each day (less any days for which the Contractor is paid for acceleration) that the Completion is earlier than the Intended Completion Date. The Project Manager shall certify that the Works are complete, although they may not be due to be complete.

**58. Advance Payment**

58.1 The Employer shall make advance payment to the Contractor of the amounts stated in the **PCC** by the date stated in the **PCC,** against provision by the Contractor of an unconditional bank guarantee in a form and by a bank acceptable to the Employer in amounts and currencies equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest shall not be charged on the advance payment.

58.2 The Contractor is to use the advance payment only to pay for Equipment, Plant, Materials, and mobilization expenses required specifically for execution of the Contract. The Contractor shall

demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Project Manager.

58.3 The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done, Variations, price adjustments, Compensation Events, Bonuses, or Liquidated Damages.

**59. Securities**

59.1 The Performance Security shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount specified in the **PCC,** by a bank acceptable to the Employer, and denominated in the types and proportions of the currencies in which the Contract Price is payable. The Performance Security shall be valid until a date 28 days from the date of issue of the Certificate of Completion in the case of a bank guarantee.

**60. Dayworks**

60.1 If applicable, the Dayworks rates in the Contractor's Bid shall be used for small additional amounts of work only when the Project Manager has given written instructions in advance for additional work to be paid for in that way.

60.2 All work to be paid for as Dayworks shall be recorded by the Contractor on forms approved by the Project Manager. Each completed form shall be verified and signed by the Project Manager within 2 days of the work being done.

60.3 The Contractor shall be paid for Dayworks subject to obtaining signed Dayworks forms.

**61. Cost of Repairs**

61.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

## F. Force Majeure

**62. Definition of Force Majeure**

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

(a) which is beyond a Party's control;

(b) which such Party could not reasonably have provided against before entering into the Contract;

(c) which, having arisen, such Party could not reasonably have avoided or overcome; and

(d) which is not substantially attributable to the other Party.

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

(a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies;

(b) rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war;

(c) riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel;

(d) munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity; and

(e) natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.

**63. Notice of Force Majeure**

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

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

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

**64. Duty to Minimize Delay**

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

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

**65. Consequences of Force Majeure**

65.1 If the Contractor is prevented from performing its substantial obligations under the Contract by Force Majeure of which notice has been given under GCC Sub clause 63 [Notice of Force Majeure], and suffers delay and/or incurs Cost by reason of such Force Majeure, the Contractor shall be entitled subject to GCC Sub clause 30.1 [Procedure for Disputes] to

(a) an extension of time for any such delay, if completion is or will be delayed, under GCC Sub clause 36 [Extension of the Intended Completion Date]; and

(b) if the event or circumstance is of the kind described in sub-paragraphs (a) to (d) of GCC Sub clause 62.2 [Definition of Force Majeure] and, in the case of subparagraphs (b) to (d), occurs in the Country, payment of any such Cost, including the costs of rectifying or replacing the Works and/or Goods damaged or destructed by Force Majeure, to the extent they are not indemnified through the insurance policy referred to in GCC Sub clause 19 [Insurance].

65.2 After receiving this notice, the Project Manager shall proceed in accordance with GCC Sub clause 10 [Project Manager's Decisions] to agree or determine these matters.

**66. Force Majeure Affecting Subcontractor**

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

**67. Optional Termination, Payment and Release**

67.1 If the execution of substantially all the Works in progress is prevented for a continuous period of 84 days by reason of Force Majeure of which notice has been given under GCC Sub clause 63 [Notice of Force Majeure], or for multiple periods which total more than 140 days due to the same notified Force Majeure, then either Party may give to the other Party a notice of termination of the Contract. In this event, the termination shall take effect 7 days after the notice is given, and the Contractor shall proceed in accordance with GCC Sub clause 73.5 [Termination].

67.2 Upon such termination, the Project Manager shall determine the value of the work done and issue a Payment Certificate, which shall include

(a) the amounts payable for any work carried out for which a price is stated in the Contract;

(b) the Cost of Plant and Materials ordered for the Works which have been delivered to the Contractor, or of which the Contractor is liable to accept delivery: this Plant and Materials shall become the

property of (and be at the risk of) the Employer when paid for by the Employer, and the Contractor shall place the same at the Employer's disposal;

(c) other Costs or liabilities which in the circumstances were reasonably and necessarily incurred by the Contractor in the expectation of completing the Works;

(d) the Cost of removal of Temporary Works and Contractor's Equipment from the Site and the return of these items to the Contractor's works in his country (or to any other destination at no greater cost); and

(e) the Cost of repatriation of the Contractor's staff and labor employed wholly in connection with the Works at the date of termination.

**68. Release from Performance**

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

(a) the Parties shall be discharged from further performance, without prejudice to the rights of either Party in respect of any previous breach of the Contract; and

(b) the sum payable by the Employer to the Contractor shall be the same as would have been payable under GCC Sub clause 67 [Optional Termination, Payment and Release] if the Contract had been terminated under GCC Sub clause 67.

## G. Finishing the Contract

**69. Completion**

69.1 The Contractor shall request the Project Manager to issue a certificate of Completion of the Works, and the Project Manager shall do so upon deciding that the work is completed.

**70. Taking Over**

70.1 The Employer shall take over the Site and the Works within 7 days of the Project Manager's issuing a certificate of Completion.

**71. Final Account**

71.1 The Contractor shall supply the Project Manager with a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Project Manager shall issue a Defects Liability Certificate and certify any final payment that is due to the Contractor within 56 days of receiving the

Contractor's account if it is correct and complete. If it is not, the Project Manager shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Project Manager shall decide on the amount payable to the Contractor and issue a payment certificate.

**72. Operating and Maintenance Manuals**

72.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the **PCC.**

72.2 If the Contractor does not supply the Drawings and/or manuals by the dates stated in the **PCC** pursuant to GCC 72.1**,** or they do not receive the Project Manager's approval, the Project Manager shall withhold the amount stated in the **PCC** from payments due to the Contractor.

**73. Termination**

73.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

73.2 Fundamental breaches of Contract shall include, but shall not be limited to, the following:

(a) the Contractor stops work for 28 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Project Manager;

(b) the Project Manager instructs the Contractor to delay the progress of the Works, and the instruction is not withdrawn within 28 days;

(c) the Employer or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

(d) a payment certified by the Project Manager is not paid by the Employer to the Contractor within 84 days of the date of the Project Manager's certificate;

(e) the Project Manager gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Project Manager;

(f) the Project Manager gives two consecutive Notices to update the Program and accelerate the works to ensure compliance with GCC Sub clause 22.1 [The Works to be Completed by the Intended Completion Date] and the Contractor fails to update the Program and demonstrate acceleration of the works within a reasonable period of time determined by the Project Manager;

(g) the Contractor does not maintain a Security, which is required;

(h) the Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, as defined in the **PCC**; and

(i) if the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in executing the Contract, pursuant to GCC 74.1 [Fraud and Corruption].

73.3 When either party to the Contract gives notice of a breach of Contract to the Project Manager for a cause other than those listed under GCC 73.2 above, the Project Manager shall decide whether the breach is fundamental or not.

73.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

73.5 If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible.

**74. Fraud and Corruption**

74.1 ADB's Anticorruption Policy requires that Borrowers (including beneficiaries of ADB-financed activity), as well as Contractors, Subcontractors, Manufacturers, and Consultants under ADB-financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, the ADB

(a) defines, for the purposes of this provision, the terms set forth below as follows:

(i) “corrupt practice” means the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party;

(ii) “fraudulent practice” means any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

(iii) “coercive practice” means impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

(iv) “collusive practice” means an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party;

(v) “obstructive practice” means (a) deliberately destroying, falsifying, altering, or concealing of evidence material to an ADB investigation; (b) making false statements to investigators in order to materially impede an ADB investigation; (c) failing to comply with requests to provide information, documents or records in connection with an Office of Anticorruption and Integrity (OAI) investigation; (d) threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation, or (e) materially impeding ADB’s contractual rights of audit or access to information; and

(vi) “integrity violation" is any act which violates ADB’s Anticorruption Policy, including (i) to (v) above and the following: abuse, conflict of interest, violations of ADB sanctions, retaliation against whistleblowers or witnesses, and other violations of ADB's Anticorruption Policy, including failure to adhere to the highest ethical standard.

(b) will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations in competing for the Contract;

(c) will cancel the portion of the financing allocated to a contract if it determines at any time that representatives of the borrower or of a beneficiary of ADB-financing engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations during the procurement or the execution of that contract, without the borrower having taken timely and

appropriate action satisfactory to ADB to remedy the situation; and

(d) will impose remedial actions on a firm or an individual, at any time, in accordance with ADB's Anticorruption Policy and Integrity Principles and Guidelines (both as amended from time to time), including declaring ineligible, either indefinitely or for a stated period of time, to participate2 in ADB-financed, administered, or supported activities or to benefit from an ADB-financed, administered, or supported contract, financially or otherwise, if it at any time determines that the firm or individual has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations.

**75. Payment upon Termination**

75.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Project Manager shall issue a certificate for the value of the work done and Materials ordered less advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work not completed, as indicated in the **PCC**. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer.

75.2 If the Contract is terminated for the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Project Manager shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate.

**76. Property**

76.1 All Materials on the Site, Plant, Equipment, Temporary Works, and Works shall be deemed to be the property of the Employer if the Contract is terminated because of the Contractor's default.

**77. Release from Performance**

77.1 If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer or the Contractor, the Project Manager shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible

[2] Whether as a Contractor, Nominated Subcontractor, Consultant, Manufacturer or Supplier, or Service Provider; or in any other capacity (different names are used depending on the particular Bidding Document). A Nominated Subcontractor is one which either has been: (i) included by the Bidder in its prequalification application or bid because it brings specific and critical experience and know-how that are accounted for in the evaluation of the Bidder's prequalification application or the bid; or (ii) appointed by the Employer.

after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterward to which a commitment was made.

**78. Suspension of ADB Loan or Credit**

78.1 In the event that ADB suspends the Loan or Credit to the Employer, from which part of the payments to the Contractor are being made,

(a) the Employer is obligated to notify the Contractor, with copy to the Project Manager, of such suspension within 7 days of having received ADB's suspension notice.

(b) if the Contractor has not received sums due it within the 28 days for payment provided for in GCC 50.1 [Payments], the Contractor may immediately issue a 14-day termination notice.

**79. Eligibility**

79.1 The Contractor shall have the nationality of an eligible country as specified in Section 5 [Eligible Countries] of the bidding document. The Contractor shall be deemed to have the nationality of a country if the Contractor is a citizen or is constituted, or incorporated, and operates in conformity with the provisions of the laws of that country. This criterion shall also apply to the determination of the nationality of proposed subcontractors or suppliers for any part of the Contract including related services.

79.2 The materials, equipment, and services to be supplied under the Contract shall have their origin in eligible source countries as specified in Section 5 [Eligible Countries] of the bidding document and all expenditures under the Contract will be limited to such materials, equipment, and services. At the Employer's request, the Contractor may be required to provide evidence of the origin of materials, equipment, and services.

79.3 For purposes of GCC 79.2, "origin" means the place where the materials and equipment are mined, grown, produced, or manufactured, and from which the services are provided. Materials and equipment are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that differs substantially in its basic characteristics or in purpose or utility from its components.

# Section 8 - Particular Conditions of Contract

# Section 8 - Particular Conditions of Contract

The following Particular Conditions of Contract shall supplement the GCC. Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

# Particular Conditions of Contract

| A. General | |
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| **GCC 1.1 (a)** | Add the following to GCC 1.1(a):<br>The **Accepted Contract Amount Operation Services** means the amount accepted in the Letter of Acceptance for the provision of Operation Services. |
| **GCC 1.1 (d)** | The financing institution is Bill and Melinda Gates Foundation (BMGF). |
| **GCC 1.1 (g)** | Add the following to GCC 1.1(g):<br>The **Completion Date Operation Services** is the date of completion of the Operation Services as certified by the Project Manager, in accordance with GCC 69.1 [Completion] as modified by PCC (GCC 69.1) [Completion]. |
| **GCC 1.1 (h)** | Amend the definition to read as follows:<br>"The Contract is the contract between the Employer and the Contractor to execute, complete, and maintain the Works and the Operation Services. It consists of the documents listed in GCC 2.3 " |
| **GCC 1.1 (i)** | Amend the definition to read as follows:<br>"The Contractor is the party who's Bid to carry out the Works and Operation Services has been accepted by the Employer". |
| **GCC 1.1 (k)** | Add the following at the end of GCC 1.1 (k):<br>The **Contract Price Operation Services** is the Accepted Contract Amount Operation Services stated in the Letter of Acceptance and thereafter as adjusted in accordance with the Contract. |
| **GCC 1.1 (r)** | The Employer/Client is<br>**(i)** **During Works**: Local Self Government Department (LSGD), Government of Rajasthan represented by Project Director, Rajasthan Urban Infrastructure Development Project (RUIDP) or its successor agency, AVS Building, JLN Marg, Malviya Nagar, JAIPUR, State of Rajasthan, India.<br>**(ii)** **During Operation Services:** Phulera Municipal Board, Phulera, State of Rajasthan, India.<br>It is to be noted that the terms Employer and Client are synonyms and used interchangeably in the Bidding Document. |
| **GCC 1.1 (y)** | Add at the end of GCC 1.1 (y):<br>"and Operation Services". |
| **GCC 1.1 (w)** | The Intended Completion period for the construction and commissioning of Plant shall be 18 month from Start Date.<br>Plant will be operated and maintained for a period of 5 years after completion of works which can be further extended for next 5 years on mutually agreed terms. |

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| **GCC 1.1 (cc)** | The Project Manager:<br>(i) During Works is: Project Manager, Representative of RUIDP, Jaipur, Rajasthan.<br>**Office Address**: Office of the Project Manager, Rajasthan Urban Infrastructure Development Project (RUIDP), Phulera<br>(ii) During Operation Services is: Executive Officer, Phulera Municipal Board,<br>**Office Address:** Phulera Municipal Board<br>It is to be noted that the terms Project Manager, Employer's Representative, Engineer-In-Chief and Engineer are synonyms and used interchangeably in the Bidding Document. |
| **GCC 1.1 (ff)** | The Site is located at Ward 2, Phulera, Rajasthan, Pin 303338 as shown in map in Section 6; Employer's requirement |
| **GCC 1.1 (ii)** | The Start Date shall be 14 days from the issuance of the Notice to Proceed. |
| **GCC 1.1 (ii)** | The following shall be added at the end of GCC 1.1 (ii): Notice to Proceed is a written communication from the Employer to the Contractor in which the Contractor is authorized to proceed with the Works on a specified date. |
| **GCC 1.1 (mm)** | The Works consist of: **Construction, Commissioning and Operation of Fecal Sludge Treatment Plant of capacity 20 m3/day at Phulera town (Rajasthan)**<br>In addition, Operation Services defined as the operation and maintenance of Works, as defined in the PCC, are what the Contract Agreement (Operation Services) requires the Contractor to operate, maintain and turn over to the Employer at the End of the Period of Operations Service. |
| **GCC 1.1** | The **Period of Operation Services** shall commence from the Completion Date stated in the Certificate of Completion of the Works, till 5 years after the Completion Date. |
| **GCC 2.2** | Sectional Completions are: not applicable. |
| **GCC 2.3 (a)** | Replace GCC 2.3 (a) with: "Contract Agreement (Works) and Contract Agreement (Operation Services)," |
| **GCC 2.3(j)** | The following documents also form part of the Contract: Nil. |
| **GCC 3.1** | The language of the contract is English.<br>The law that applies to the Contract is the law of India. |
| **GCC 11.1** | The Project Manager may delegate any of his duties and responsibilities. |
| **GCC 14.1** | Schedule of other contractors: Not Applicable |
| **GCC 19.1** | The minimum insurance amounts and deductibles shall be:<br>(a) for loss or damage to the Works, Plant and Materials: INR 10 million, Minimum Deductibles – Nil.<br>(b) for loss or damage to property (except the Works, Plant, Materials, and Equipment) in connection with Contract - Shall be a minimum of INR 500,000 |

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| | (INR Five Lacs).<br>(c) for personal injury or death:<br>(i) Of the Contractor's employees: Contractor shall procure and maintain Workmen's Compensation Insurance as per Employee's Compensation (Amendment) Act, 2009, such that the Employer is absolved of all liabilities under the Act.<br>(ii) Of other people/third party: Shall be a minimum of INR 700,000 (Indian Rupees Seven Lacs). |
| **GCC 19.1** | For the Period of Operation Services, the minimum insurance amounts and deductibles shall be:<br>i. Employees of Contractor: Contractor shall procure and maintain Workmen's Compensation Insurance as per Employee's Compensation (Amendment) Act, 2009, such that the Employer is absolved of all liabilities under the Act.<br>ii. Third Party Liability for Personal Injury or Death: INR 500,000 (Indian Rupees Five Lacs). |
| **GCC 20.1** | Site Investigation Reports are: Site investigation reports are topographic survey and geo-technical investigation survey attached in the Supplementary Information Regarding Works to be Procured as per Section 6 (Employer's Requirements) of the Bidding Document. This information shall not be a part of the Contract. |
| **GCC 23.1** | The following shall be designed by the Contractor: As per scope of work given in Section 6 (Employer's Requirements). |
| **GCC 26.1** | The Site Possession Date(s) shall be: 14 days from the Notice to Proceed. |
| **GCC 29.1** | Appointing Authority for the Adjudicator: The President, Institution of Engineers, India Jaipur Chapter |
| **GCC 30.3** | The Adjudicator shall be paid by the hour at the rate of: INR 1000/- (Indian Rupees One Thousand Only).<br>The reimbursable expenses are: cost of travelling in connection with the duty under contract, local conveyance, lodging, board (per diem) and cost of preparation of the report. |
| **GCC 30.4** | Institution whose arbitration procedures shall be used:<br>Arbitration shall be conducted in accordance with the laws of the Employer's country i.e. as per Rules of arbitration of the Indian Arbitration Act. The place of arbitration shall be Jaipur, Rajasthan, India. |
| **C. Time Control** | |
| **GCC 35.1** | The Contractor shall submit for approval a Program for the Works within 15 (Fifteen) days from the date of the Signing of Contract Agreement (Works). |
| **GCC 35.3** | The period between Program updates is 30 (Thirty) days.<br>The amount to be withheld for late submission (beyond 10 days of the due date) of an updated Program is INR 20,000 (Indian Rupees Twenty Thousand). |

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| **D. Quality Control** | |
| **GCC 43.1** | The Defects Liability Period is: 365 (Three Hundred and Sixty-Five) days. |
| **E. Cost Control** | |
| **GCC 45.1** | Add to GCC 45.1:<br>In the case of an operation services contract, the Bill of Quantities for Operation and Maintenance (O&M) shall contain priced items for the Operation Services to be performed by the Contractor. The Bill of Quantities for O&M is used to calculate the Contract Price Operation Services. The Contractor shall be paid on quarterly basis for services delivered, as per the operations and maintenance specifications in Section 6, at the rate in the Bill of Quantities for O&M for the plant. |
| **GCC 46.1 (a)** | GCC 46.1 (a) shall be replaced by:<br>If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 100%, provided the change exceeds 5% of the Initial Contract Price, the Project Manager shall adjust the rate to allow for the change. This change will be derived from Market rate. |
| **GCC 49.1** | Add to GCC 49.1:<br>The Contractor shall submit to the Project Manager quarterly statements of the cost of Operation Services undertaken during the month. |
| **GCC 49.2** | Add to GCC 49.2:<br>The Project Manager shall check the Contractor's quarterly statement of the cost of Operation Services and certify the amount to be paid to the Contractor. |
| **GCC 53.1** | The currency of the Employer's country is: Indian Rupees (INR) |
| **GCC 54.1** | The Contract is not subject to price adjustment in accordance with GCC Clause 54, and the information regarding coefficients does not apply. The Contract is a fixed price contract. |
| **GCC 55.1** | The proportion of payments retained is: Nil |
| **GCC 55.2** | GCC 55.2 is replaced by the following: NA |
| **GCC 56.1** | The liquidated damages for the whole of the construction Works are 0.05% per day of delay.<br>The maximum amount of liquidated damages for the whole of the Works is 10% of the final Contract Price of construction work. |
| **GCC 56.1** | For Operation Services liquidated damages for non -performance are as follows:<br>Effluent Quality Standard – for non-compliance with any effluent quality parameter stated in Section 6 (Employer Requirements), liquidated damages of INR 4000/- per event of non-compliance shall be charged.<br>Liquidated damages shall be applicable for the operational fault. Operator shall not be responsible for design fault.<br>Payments for Operation Services shall be adjusted for deductions for liquidated |

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| | damages for poor / non-performance of Operation Services. The Employer shall pay the Contractor the amounts certified by the Project Manager within 30 days of the date of each certificate.<br><br>The cumulative liquidated damages (maximum liquidated damages) in above shall not exceed 50% percent of monthly operations and maintenance payments.<br><br>In case non-conformance due to above results in cumulative liquidated damages in excess of 40% of monthly O&M payments for a period of 90 days (3 months) in a year, the Employer reserves the right to terminate the Contractor and the Contractor shall forfeit its Performance Security and Retention Money. |
| **GCC 57.1** | The Bonus for the whole of the construction Works is 0.05% per day. The maximum amount of Bonus for the whole of the Works is 5% of the final Contract Price of construction work. |
| **GCC 58.1** | The Advance Payments shall be 10% of the Initial Contract Price and shall be paid to the Contractor no later than 15 days after submission of the required unconditional bank guarantee. |
| **GCC 58.3** | Repayment of the Advance Payments shall be: @12.5%of each payment certificate such that the entire amount is recovered by the time 80 percent of the Contract Price has been certified for payment. |
| **GCC 59.1** | The Performance Security amount is 10% of the Contract Price. |
| **GCC 59.1** | The Employer shall return 50% of the Performance Security on expiry of the Defects Liability Period of one year and the Project Manager has certified that all defects notified by the Project Manager to the Contractor before the end of the Defects Liability Period have been corrected. The remaining 50% of the Performance Security shall be released @ 10% each in next 5 years of Operation Services as certified by the Project Manager. The Performance Security shall be valid until a date 28 days from the date of issue of the Certificate of Completion of Operation Services in the case of a bank guarantee. |
| **G. Finishing the Contract** | |
| **GCC 69.1** | Add to the end of GCC 69.1:<br><br>The Contractor shall request the Project Manager to issue a certificate of Completion of the Operation Services, and the Project Manager shall do so upon deciding that the Operation Services are completed. |
| **GCC 71.1** | Add to the end of GCC 71.1:<br><br>The Contractor shall supply the Project Manager with a detailed account of the total amount that the Contractor considers payable under the Contract within 28 days after receiving the Certificate of Completion of the Operation Services. The Project Manager shall certify any final payment that is due to the Contractor within 56 days of receiving the Contractor's account if it is correct and complete. If it is not, the Project Manager shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Project Manager shall decide on the amount payable to the Contractor and issue a payment certificate. |
| **GCC 72.1** | The date by which operating and maintenance manuals are required is 28 days |

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| | prior to commencement of Operation Services.<br>The date by which “as built” drawings are required is 7working days prior to issue of Certificate of Completion of the works. |
| **GCC 72.2** | The amount to be withheld for failing to produce “as built” drawings by the date required in GCC 72.1 is INR 30,000/- (Indian Rupees Thirty Thousand Only). |
| **GCC 73.2 (h)** | The maximum number of days is: 200 |
| **GCC 75.1** | The percentage to apply to the value of the work not completed, representing the Employer’s additional cost for completing the Works, is 50%. |

# Section 9 - Contract Forms

# Section 9 - 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.

# Table of Forms

# 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 . . . .*date*. . . . for execution of the . . . . . .*name of the contract and identification number, as given in the Bid Data Sheet* . . . . . for the Accepted Contract Amount of the equivalent of . . . . . .*amount in numbers and words and name of currency* . . . . . and for the Accepted Contract Amount Operation Services of the equivalent of . . . . . .*amount in numbers and words and name of currency* . . . . . ., as corrected and modified in accordance with the Instructions to Bidders is hereby accepted by our Agency.

You are requested to furnish the Performance Security within 28 days in accordance with the Conditions of Contract, using for that purpose the Performance Security Form included in Section 9 (Contract Forms) of the Bidding Document.

*[Choose one of the following statements:]*

We accept that _____*[insert the name of adjudicator proposed by the bidder]* be appointed as the Adjudicator.

*[or]*

We do not accept that _____*[insert the name of the adjudicator proposed by the bidder]*be appointed as the Adjudicator, and by sending a copy of this Letter of Acceptance to _____*[insert name of the appointing authority]*, the Appointing Authority, we are hereby requesting such Authority to appoint the Adjudicator in accordance with GCC 29.1.

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 " **Construction, Commissioning and Operation of Fecal Sludge treatment plant of capacity 20 m3/day at Phulera** should be constructed, operated and maintained including 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 Contract Agreement,

   (b) the Letters of Acceptance,

   (c) Technical Bid and Price Bid including priced bill of quantity,

   (d) Addendums

   (e) the Particular Conditions of Contract,

   (f) the General Conditions of Contract,

   (g) the Specification,

   (h) the Drawings, and

   (i) any other documents shall be added here.[1]

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 *India* on the day, month and year indicated above.

[1] Tables of Adjustment Data may be added if the contract provides for price adjustment (see GCC 54.1).

Signed by .....
for and on behalf of the Employer

in the presence of:

Witness, Name, Signature, Address, Date

Signed by.....
for and on behalf the Contractor

in the presence of:

Witness, Name, Signature, Address, Date

# Performance Security

*Bank's name, and address of issuing branch or office*[1]

**Beneficiary:** ..... *Name and address of employer* .....

**Date:** .....

**Performance Guarantee No.:** .....

We have been informed that . . . . . *name of the contractor. . . . .* (hereinafter called "the Contractor") has entered into Contract No. . . . . *reference number of the contract. . . . .* dated . . . . . ..with you, for the execution of . . . . . *name of contract and brief description of works. . . . .* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Contractor, we . . . . . *name of the bank. . . . .* 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*[2]*. . . . . .* (. . . . . *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, no later than the . . . . . Day of . . . . . , . . . . . [3], and any demand for payment under it must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458, except that subparagraph (ii) of Sub-article 20(a) is hereby excluded.[4]

. . . . . .
*Seal of Bank and Signature(s)*

Note to Bidder --

*If the institution issuing the performance security is located outside the country of the Employer, it shall have a correspondent financia linstitution located in the country of the Employer to make it enforceable.*

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

2 The guarantor shall insert an amount representing the percentage of the contract price specified in the contract and denominated either in the currency(ies) of the contract or a freely convertible currency acceptable to the employer. If the bank issuing the performance security is located outside the country of the employer, it shall have a correspondent financial institution located in the country of the employer.

3 Insert the date 28 days after the expected completion date. 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 [6 months][1 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."

4 Or the same or similar to this clause specified in the Uniform Rules for Demand Guarantees, ICC Publication No. 758 where applicable.

# Advance Payment Security

*Bank's name, and address of issuing branch or office*[1]

**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*[2]*. . . . . .* (. . . . . *amount in words. . . . .* ) is to be made against an advance payment guarantee.

At the request of the Contractor, we . . . . . *name of the bank. . . . .* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of . . . . . *name of the currency and amount in figures*[3]*. . . . . .* (. . . . . *amount in words. . . . .* ) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation under the Contract because the Contractor used the advance payment for purposes other than the costs of mobilization in respect of the Works.

It is a condition for any claim and payment under this guarantee to be made that the advance payment referred to above must have been received by the Contractor on its account number . . . . . *contractor's account number. . . . .* at . . . . . *name and address of the bank. . . . .* .

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Contractor as indicated in copies of interim statements or payment certificates which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of a copy of the interim payment certificate indicating that eighty percent (80%) of the Contract Price has been certified for payment, or on the . . . day of . . . . . , . . . . .[4], whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458 (*or ICC Publication No. 758 as applicable*).

. . . . . .
*Seal of Bank and Signature(s)*

-- Note to Bidder --

*If the institution issuing the advance payment security is located outside the country of the employer, it shall have a correspondent financial institution located in the country of the employer to make it enforceable.*

---

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

2 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.

3 Footnote 2.

4 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 [6 months][1 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."

# Draft Format for Memorandum of Understanding for JOINT VENTURE

This Memorandum of Understanding (hereinafter referred to as "MOU") is made and entered into this ---------- ("Effective Date").

**BETWEEN**

**M/s.** _____**,**a company incorporated, and having its registered office at _____. (Hereinafter referred to as the **"First Party"/"One Partner");**

**M/s.** _____**)**a company incorporated, and having Registered office at _____. (Hereinafter referred to as the **"Second Party"/ "Each Partner"**);

**M/s.** _____**)**a company incorporated, and having Registered office at _____. (Hereinafter referred to as the **"Third Party"/ "Each Partner"**);

Hereinafter jointly referred to as the **"Parties"** and individually as **"Each Party"** or **"a Party"** as the case may be.

WHEREAS,

A) The **Government of Rajasthan, Rajasthan Urban Infrastructure Development Project, Rajasthan** (hereinafter referred to as the **RUIDP** or **"Employer**") invited bid for _____ _____,

(B) The **Parties** hereto formed a Joint Venture or will form a joint venture (hereinafter referred to as the **"JV")** to jointly execute the above project in all respect

**NOW THEREFORE IT IS HEREBY AGREED** as follows

**ARTICLE 1: JOINT VENTURE:**

1.1. The Parties hereto agree to form the Joint Venture with _____ designated as the **One Partner and First Partner**.

1.2. _____ **shall be the Second Member – or Second Partner**

*1.3.* _____ **shall be the Third Member – or Third Partner *(insert more lines if more partners)***

**ARTICLE 2: JOINT VENTURE NAME:**

2. The JV shall do business in the name of **"_____ Joint Venture".**

**ARTICLE 3: JOINT AND SEVERAL LIABILITY:**

3 The **Parties** hereto shall, for the above-referred **Projects**, be jointly and severally liable to the **Employer** for the execution of the Projects in accordance with the **Contract** till the actual completion of Contract including defect liability period and operation & maintenance as per bid conditions.

**ARTICLE 4: PROPORTIONATE SHARE:**

4.1 Each member of the Joint Venture agrees to place at the disposal of the Joint Venture, the benefit of all its experience, technical knowledge and skill, and shall in all respects bear its share of responsibility and burden of completing the contract. The parties herein shall be responsible for physical and financial distribution of work as under.

**Lead Partner** : Financial responsibility : **----------**

Physical responsibility :**----------**

**Other Partners** : Financial responsibility : **----------(not less than 25%)-**

Physical responsibility :**----------(not less than equal to 20%)**

4.2 All rights, interests, liabilities, obligations, risks, costs, expenses and pecuniary obligations and all net profits or net losses arising out of the **Contract** shall be shared or borne by the **Parties** in the above **Proportions**.

4.3 The members in the proportion as mention in article 4.1, shall contribute sufficient Initial fixed capital for timely execution of the project including commissioning & operating period as per the contract.

**ARTICLE 5: JOINT EFFORT AND MANAGEMENT:**

5.1 The **Parties** shall participate as a **JV** in the submission of bids and further negotiations with the **Employer** and shall co-operate and contribute their respective expertise and resources to secure and execute the **Projects**.

5.2 On award of **Projects**, the **First Partner** in consultation with the other members of JV will decide on the final management structure for the successful execution of the **Projects** as per the terms of **Contract**.

5.3 All the **Parties** hereby agree to pool in their financial, administrative, managerial, technical and material resources for execution of the **Projects**, including commissioning & operation for the period as stipulated in the contract. The share of interest of the **JV** shall be as per the mutual understanding for the successful completion of the project.

**ARTICLE 6: EXCLUSIVITY:**

6.1 The co-operation between the **Parties** hereto shall be mutually exclusive i.e. none of them shall without the other **Party's** consent & prior approval of **RUIDP**, approach or cooperate with any other parties in respect of the Project.

6.2 In the course of working as associates, the parties to the JV will be sharing information with each other which may be proprietary /confidential information /knowledge acquired by each other. It is hereby agreed that the parties will maintain complete secrecy regarding such information / knowledge and will not divulge to any party for any other purpose except for the success of the joint execution of the contract. All parties will also indemnify each other against any claim that may arise out of using information, which are being claimed proprietary.

**ARTICLE 7: Memorandum of Understanding:**

7.1 This **Memorandum of Understanding** shall be terminated:-

a. if the **Parties** mutually confirm that the **JV's** bid proposal has not been finally accepted by **Employer** and all rights and obligations of the **Parties** under or in connection with this **Memorandum of Understanding** have ceased, or

b. after successful completion of the project including commissioning & operation and defect liability period from the date of this **Memorandum of Understanding** unless extended for a further period on demand of **RUIDP**& mutual consent of the Parties, or

7.2 The **Memorandum of Understanding** can be modified by mutual consent of the Parties to suit the efficient and expeditious execution of Projects including commissioning & operation of Plant or to make this agreement more meaningful to suit the requirements of Employer **after the consent of the Employer**.

**ARTICLE 8: ARBITRATION:**

8.1 Any dispute resulting from this Agreement shall be settled amicably by mutual Consultation by the Managing Directors/Chairman of _____&_____. In the event that an amicable settlement is not reached within 60 days in any particular case, the dispute shall be referred to arbitration and shall be resolved in accordance with and subject to the provisions of the _____ and any statutory modifications and enactment hereof for the time being in force. The decision of the arbitrators shall be final and binding upon both parties. The venue of arbitration will be _____.

**ARTICLE 9: GOVERNING LAWS:**

9.1 This Agreement shall in all respects be governed by and interpreted in accordance with the _____ Laws.

**ARTICLE 10: CONFIDENTIALITY:**

10.1 No Party hereto shall disclose to any other party any information of a confidential nature including but not limited to trade secrets, know-how acquired from any Party in connection with the subject matter of this Agreement.

**ARTICLE 11: ADDRESS OF CONSORTIUM:**

- Any and all correspondence from the Employer to the **JV** shall be addressed to **(name of JV)** at the address stated herein below–(any one of the partners). The address of the Consortium office of the partner companies will be deemed to be the address for the purpose of communication.
- The notice, if any required to be served on the party by the other party, will be deemed to be served, if the said notice / communication is delivered by Registered Post at the respective address

**(name of JV)**

_____

**ARTICLE 12: Authorized Representative:**

- the JV shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the parties of the JV during the bidding process and, in the event the JV is

awarded the Contract, during contract execution.

- Authorized Representative of JV :_____

**ARTICLE 13: ASSIGN ABILITY:**

13.1 The interests and rights of a Party in the Contract and as a Party of the Joint Venture shall not be transferable or assignable without the written consent of the Employer & other party.

**ARTICLE14: INTERPRETATION OF HEADINGS:**

14. The headings of each of the Articles herein contained are inserted merely for convenience of reference and shall be ignored in the interpretation and construction of any of the provisions herein contained.

**ARTICLE 15: OTHERS**

15.1 Any other matters not contained in this Agreement shall be discussed and amicably agreed upon by the Parties in the spirit of mutual trust and cooperation for timely completion of project including commissioning & operation of project. Notwithstanding anything above all the Parties are severally and jointly responsible to the Employer for execution of the Contract:

**IN WITNESS WHEREOF** the Parties hereto have caused this Agreement to be executed by each of the duly authorized representatives as appearing below:-

| | |
|---|---|
| Signed by )<br>For and on behalf of<br>_____ **)** | _____ |
| in the presence of: )<br>_____<br>Name:<br>Designation: | **Name:**<br>**Designation:** |
| Signed by )<br>For and on behalf of )<br>_____**.** | _____ |
| in the presence of: )<br>_____ )<br>**Name:**<br>**Designation:** | **Name:**<br>**Designation**: |