

# MIRA- BHAINDAR MUNICIPAL CORPORATION

(WATER SUPPLY DEPARTMENT)

TENDER NOTICE NO. 01 ( 2026-27 )

*For*

**Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhayander Municipal corporation area.**

Executive Engineer

Water supply dept.

ChatrapatiShivajiMaharajmarg,

Bhaindar (w) Ph. 2819 2828

Mira -BhaindarMunicipal Corporation

*SAVE EVERY DROP OF WATER*

Issued to:.....

**MIRA - BHAINDAR MUNICIPAL CORPORATION**  
**WATER SUPPLY DEPARTMENT**

Name of Work :- **Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhyander Municipal corporation area.**

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TENDER NOTICE



## मिरा-भाईंदर महानगरपालिका

पाणी पुरवठा व मलनिसारण विभाग

स्व. इंदिरा गांधी भवन, छत्रपती शिवाजी महाराज मार्ग, भाईंदर(प)

ता. जि.ठाणे - 401 101

निविदा सुचना क्र. 01 (2026-27)



मिरा-भाईंदर महानगरपालिका हद्दीतील खालील कामांकरीता मोहोरबंद दर e-Tendering पद्धतीने मागविण्यात येत आहेत. सदर कामाचे कोरे निविदा फॉर्म दि.08/05/2026 ते दि.22/05/2026 रोजी 12.00 वाजेपर्यंत महानगरपालिकेच्या e-Tendering संकेतस्थळ <https://mahatenders.gov.in> येथे उपलब्ध होतील. निविदाधारकाने निविदा फॉर्म फी व इसारा रक्कम ऑनलाईन रिसीप्ट सिस्टीमद्वारे भरणा करावी. अन्यथा निविदा ग्राह्य समजण्यात येणार नाही. तसेच कामाची निविदा पूर्व बैठक दि.14/05/2026 रोजी ठिक 12.00 वाजता मा.शहर अभियंता, मिरा-भाईंदर महानगरपालिका यांचे दालनात राहिल. कामाचा अनुभव व अटीशर्ती निविदा फॉर्म मध्ये नमुद केल्याप्रमाणे असावीत.

सदर कामी मागविलेल्या मोहोरबंद निविदा दि.22/05/2026 रोजी दुपारी 1.00 वाजेपर्यंत वरील संकेतस्थळावर स्विकारण्यात येतील व दि.25/05/2026 रोजी दुपारी 12.30 वाजता उपस्थित ठेकेदार व त्यांचे प्रतिनिधी यांच्या उपस्थितीत / अनुपस्थितीत उघडण्यात येतील.

कोणतेही कारण न देता कोणतीही ऑनलाईन निविदा स्वीकारणे अथवा सर्वच निविदा नाकारणे याबाबतचा अंतिम अधिकार मा. आयुक्त, मिरा-भाईंदर महानगरपालिका यांनी राखून ठेवला आहे.

अ.क्र	कामाचे नाव	अंदाजित खर्च (GST वगळून)	निविदेचा प्रकार	कंत्राटदार चा वर्ग	इसारा रक्कम	सुरक्षा अनामत	निविदा फॉर्म फी	कामाची मुदत
1	मिरा भाईंदर महानगरपालिका क्षेत्रातील मलनिःसारण केंद्रांची व भूमिगत गटाराची वार्षिक देखभाल व सर्वसमावेशक दुरुस्ती करणे.	रु.25,01,12,690/-	B-1	वर्ग - अ (विद्युत/यांत्रिक)	रु.25,01,127/-	5%	रु.3000/- + रु.540/- GST = रु.3540/-	12 महिने

टीप :- लिफाफा क्र.1 मधील तांत्रिक कागदपत्रे (Hard Copy) निविदा भरल्यानंतर 72 तासांच्या आत पाणी पुरवठा व मलनिसारण विभागात सादर करण्यात यावी.

(दिपक खांबित)  
शहर अभियंता  
मिरा-भाईंदर महानगरपालिका

जा.क्र.मनपा/पा.पु.व मलनि/01/2026-27  
दि.06/05/2026



**MIRA-BHAINDAR MUNICIPAL CORPORATION**  
**Water Supply & Sewerage Department**  
**Indira Gandhi Bhavan, Chatrapati Shivaji Maharaj Marg,**  
**Bhayandar (W) 401101, Tal. Dist – Thane, 28192828**



**TENDER NOTICE No. 01 (2026-27)**

Mira Bhaingar Municipal Corporation invites sealed tenders for following works in MBMC area in the form of e-Tendering. The tender form and other relevant documents will be available for download on MBMC's e-Tendering website as <https://mahatenders.gov.in> from **Dt.08/05/2026 TO 22/05/2026** till 12.00 pm. Tender Form Fee & EMD should be submitted through online receipt system. Failing which the tender will be disqualified. There is no any concession to qualified unemployed Engineer for EMD/ Security Deposit. Tender Form Fee & EMD should be submitted through online receipt system. Prequalification criteria and other terms and conditions are mention in tender form the pre-tender conformance will be held on dt14/05/2026 at 12.00 hrs in the office of the Hon City Engineer MBMC.

The last date for submission of tenders completed in all respects on **Dt. 22/05/2026** up to 1.00 pm on the above mentioned website. Mira Bhaingar Municipal Corporation. The tenders shall be opened in the presence/absence of the bidders or their representatives on the **Dt.24/05/2026** at 12.30 pm at the Tender cell of Mira Bhaingar Municipal Corporation.

Hon. Commissioner of Mira Bhaingar Municipal Corporation has reserve right to accept or reject any or all bids without assigning any reasons.

Sr. No	Name of Work	Estimate Cost (Excluding GST)	Tender Type	Contractor's Class	Earnest Money Deposit (EMD) (In Rs.)	Security Deposit (SD)	Cost of Tender documents (In Rs.)	Period of Completion
1	Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhaingar Municipal Corporation area.	Rs.25,01,12,690/-	B-1	Class A (Electric/ Mechanic)	Rs.25,01,127/-	5%	Rs.3000/- + Rs.540/- = Rs.3540/-	12 Month

**Note :-** Hard Copy of Envelope No.1 of the same tender shall be submitted in office of Executive Engineer Water Supply Department within 72 hours after submission of online tender.

**(Deepak Khambit)**  
**City Engineer**  
**Mira Bhaingar Municipal Corporation**

**No :- MNP/WS & Sew/01/2026-27**  
**Date :- 06/05/2026.**

DETAIL TENDER NOTICE

**MIRA - BHAINDAR MUNICIPAL CORPORATION  
DETAILED TENDER NOTICE**

**Name of Work :- Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhyander Municipal corporation area.**

**TENDER PROGRAMME.**

- 1) The tender document are available at <https://mahatenders.gov.in> from 08/05/2026 to 22/05/2026.
- 2) The prequalification criteria , Terms and conditions are available on website.
- 3) The digital signature is mandatory. The bidder will have to purchase it from any government digital certificate authority.
- 4) For any other queries, bidder can contact Help Line No. 0120-4200462, 0120-4001002.
- 5) Blank Tender document can be download from above mentioned website. The tender document cost Rs.3,540/- (Rs Three Thousand Five hundred Forty Only) (Non-Refundable) shall be paid by online.
- 6) Earnest Money Deposit of Rs.25,01,127/- (Rs. Twenty five lac one thousand one hundred twenty seven Only) should be paid in the form of DD/PAYORDER/CASH-online.
- 7) Security Deposit :Initial Security deposit of 3 % in the form of D.D./ Pay order or Bank guarantee in the name of Commissioner, Mira Bhaindar Municipal Corporation drawn on any Scheduled Bank and balance 2 % will be deducted from R.A. bills.  
  
Balance 2% Security Deposit of estimated cost or contract value whichever is higher will be recovered at the rate of 5% of bill amount through each R.A. Bill to the extent that total required security deposit.
  - a) Additional Security Deposit: If the tender is proposed to be accepted at the rate quoted less than estimated cost put to tender, security deposit over and above 5.00% at the rate below shall have to be paid by the tenderer.
    - i) For offer up-to 10% below: 3% intial+2% through R.A.Bill.
    - ii) For offer from 10% and up to 15% below: 5% intial+2% through R.A.Bill.
    - iii) For offer more than 15% below: 7% intial+2% through R.A.Bill.
  - b) Stamp Duty - Stamp duty at 2.00% of total security deposit or at the rate in force on the date of agreement, in addition to Rs.100/- stamp paper.
  - c) There shall be no liability on the Mira Bhaindar Municipal Corporation, to pay any interest on the security deposited by or recovered from the Contractor.
  - d) The security deposit shall be refunded after completion of defect liability period prescribed for this contract in accordance with the provision in clause 1 and 20 of he contract.
- 8) The bidder has to submit the tender Documents and Financial Bid online only.
- 9) The tender will be Submission last dt.22/05/2026 day at 1.00 pm online only.

10) The tendered rates should be inclusive of all statutory duties and taxes GST levied by GOI & GOM in all respect

11) Validity of the Offer :

120 days from the date of opening of the tender.

12) Detail Tender Schedule

Sr. No.	Activities	Date & Time
1.	Tender publishing date	08/05/2026
2.	Document download start date	08/05/2026 at 12 noon
3.	Document download end date	22/05/2026 at 12 noon
4.	Pre-bid meeting date	14/05/2026 at 12 noon
5.	Bid submission start date	08/05/2026 at 12 noon
6.	Bid submission close date	22/05/2026 at 12 noon
7.	Bid opening date (Technical Bid)	25/05/2026 at 12.30 pm

13) ELIGIBILITY OF CONTRACTOR

**Technical Proposal. :**

**Technical Proposal work shall contain following documents.**

1)	Form Fee Receipt (Online Form fee Receipt - <b>Scan Copy</b> )		
2)	Earnest Money Deposit Receipt (Online Earnest Money Deposit Receipt ( <b>Scan Copy</b> ))		
3)	Balance Sheet of Last 3 Years. (C.A. certified copy of Balance sheet ( <b>Scan Copy</b> ). <b>(In Year of 2022-23, 2023-24,2024-25)</b> )		
4)	GST Registration Certificate. (GST Registration Certificate ( <b>Scan Copy</b> ))		
5)	A	Maximum Turnover of Bidder in last 05 years	- It should be minimum upto 75% of the annual amount of the cost of due contract (Annual Cost = Total Cost of Work / Period of work in years.)
	(C.A. Certified copy of last 5 year annual turnover. ( <b>Scan Copy</b> ) <b>(In Year of 2020-21, 2021-22, 2022-23, 2023-24, 2024-25)</b> )		
6)	Following works experience in Govt. / Semi Govt. organization		
	B	The minimum cost of the work of similar nature and value	- Three similar completed works, of which work wise costing should not be less than the amount equal to 40% of the estimated cost. In same work following

	<p>completed by the contractors in the last 5 years</p>	<p>work should be done by bidder.</p> <p style="text-align: center;"><b>OR</b></p> <p>Two similar completed works, of which work wise costing should not be less than the amount equal to 50% of the estimated cost. In same work following work should be done by bidder.</p> <p style="text-align: center;"><b>OR</b></p> <p>One similar completed work costing should not be less than the amount equal to 80% of the estimated cost. In same work following work should be done by bidder.</p>
<p>Similar Work shall mean any work related to Waste Water pumping or STP and its work completion certificate</p> <p>40 % 03 Works 50 % 02 Works 80% 01 Works</p> <p><b>(In Year of 2020-21, 2021-22, 2022-23, 2023-24, 2024-25)</b></p> <p>Note: The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 10% per annum</p>		
<p>7)</p>	<p>Bidder should have carried out following minimum quantities of Items of work</p> <p>1. Experience in O&amp;M/Construction of Sewage Treatment Plants (STP): The Bidder shall have successfully executed or be currently executing a Single Contract comprising Operation and Maintenance/Construction of Sewage Treatment Plants based on MBBR (Moving Bed Biofilm Reactor) or Aeration Technology, having a cumulative treatment capacity of not less than 50 MLD (Fifty Million Liters per Day) within the last 7 years ending on the last day of the month previous to the one in which the tenders are invited. (For ongoing O&amp;M At least 1 year of O&amp;M should be completed)</p> <p>2. Experience in O&amp;M for Sewage Pumping Machinery : The Bidder shall have successfully executed or under execution a contract involving Operation and Maintenance /SITC/ construction of experience in VFD (Variable Frequency Drive) driven Pumps having cumulative installed capacity shall not less than 1200HP (Horse Power) in a single contract. (For ongoing O&amp;M At least 1 year of O&amp;M should be completed)</p> <p>3. Experience in Mechanized underground Cleaning with : The Bidder shall have successfully executed Operation and Maintenance of an Underground drainage of a length not less than 60 Kms (Sixty Kilometers). (Documentary proof shall be uploaded ) <b>OR</b> In the event that the Bidder does not possess this specific experience, the Bidder must submit a valid Memorandum of Understanding (MoU) with Manufacturer/ Service Provider who possesses the aforementioned qualifying experience ( Documentary proof to be submitted )</p>	

8)	<p>Bid capacity of Bidders (Bid Capacity) Bidder should have qualified for Bid Capacity</p>	-	<p>(A x N x 2) - B where A = Maximum Annual Turnover during last 5 years (at current rate) N = Number of years prescribed for completion of the project/work B = Value of works in hand (during period of the due work)</p>
<p><b>(Tenderer's submission of bid capacity certificate certified by C.A (Scan Copy))</b></p>			
9)	<p>The Bidder Should Submit / Upload The Service Support Letter On The Letter Head Of Original Equipment Manufacturer Of Following Key &amp; Critical Equipment's 1.Truck Mounted High Flow Suction-cum-Jetting Machines of any OEM. 2.Submersible Sewage Pumps namely Aqua Pumps and Jasco</p>		
10)	<p>Affidavit on stamp paper of Rs.500/- stating authenticity of the documents enclosed/uploaded while submission of the tender to be enclosed in envelope no.1 as per Annexure No. 1 (It will be mandatory for the tenderer to submit an affidavit in the prescribed format as Annexure No. 1 on Rs. 500 stamp paper only dated after the date of publication of the tender. Otherwise, the said affidavit will not be considered )</p>		
11)	<p>The Bidder Shall not be Blacklisted in any other government / semi government / Urban Local bodies on contractors letter head. The Bidder organization shall upload an undertaking (Submission of declaration letter by the tenderer regarding non-blacklisting. (Scan Copy))</p>		

## Annexure - 1

Affidavit (on Rs.500/- Stamp Paper)

Name of Work :- -----  
-----  
-----  
-----

I ..... age ..... address .....  
..... (Authorized signatory to sign the contract), hereby submit, vide this affidavit in truth, that I am the owner of the contracting firm ..... / authorized signatory and I am submitting the documents in envelope no.1 for the purpose of scrutiny of the contract. I hereby agree to the conditions mentioned below :-

- a. I am liable for action under Indian Penal Code for submission of any false / fraudulent paper / information submitted in envelope no.1.
- b. I am liable for action under Indian Penal Code if during contract period and defect liability period, any false information, false bill of purchases supporting proof of purchase, proof of testing submitted by my staff, subletting company or by myself, I will be liable for action under Indian Penal Code.
- c. I am liable for action under Indian Penal Code if any paper are found false / fraudulent during contract period and even after the completion of contract (finalization of final bill).

(Signature of contractor)  
(seal of company)

### 14) SITE VISIT

Bidders shall mandatorily visit the site to assess the 'As-Is-Where-Is' operational condition of all Electro-Mechanical assets, STPs, and Network lines before quoting.

### 15) Manner of Submission of Tender and it's Accompaniments:

The Tenderer shall submit the tender and documents in two sealed envelopes as below online only

#### a) Envelope No.-1: Technical Bid

#### b) Envelope No.-2: Financial Bid

Financial Bid (Envelope No. 2 ) shall contain only main tender including unconditional covering letter.

The Tenderer should quote his offer on line in prescribed format as percentage of estimated rates in word and figure at the appropriated place of tender documents. The contractor shall quote for the work as per details given in the main tender. Offer shall be unconditional.

The tender document duly signed and sealed on all pages by authorized signatories should upload online.

**c) Submission of Tender: On line**

The contractor should quote his tender online. The contractor should deposit EMD and Tender fee online. The commissioner, Mira Bhayandar Municipal Corporation may at his discretion can extended the deadline for the submission of tenders by issuing an amendment to contractor in which case all rights and obligations are reserved by commissioner, Mira Bhayandar Municipal Corporation, Bhayandar.

If tenders have been submitted by multiple bidders from the same IP Address, those tenders will be rejected.

**16) Opening of Tender:**

The tenders will be opened on the date specified in the Tender Notice. i.e., on **25/05/2026 at 12.30hrs**, (If possible) in the presence of the intending bidders or their authorized representative to whom they may choose to remain present.

Following procedure will be adopted for opening of the Tender.

**Envelope No.-1(Technical Bid)**

First of all Envelope No.1 of the Tender will be opened to verify its contents as per requirements. If the various documents contained in this envelope do not meet the requirements of the MBMC a note will be recorded accordingly by the tender opening authority and the said Tenderer's Envelope No.2 will not be considered for further action and the same will be rejected.

**Envelope No.-2 (Financial Bid)**

This envelope shall be open online on the date specified in the tender schedule after opening of Envelop No .1 only if contents of Envelope No.1 are found to be acceptable to the Department and / or fulfill the Qualifying Criteria. The tendered rates percentage above or below the estimated rates quoted in price bid shall then be read out in the presence of bidders who remain present at the time of opening of Envelope No.2

- 16)** The tendered rates should be inclusive of all statutory duties and taxes Excluding GST.

- 17)** The EMD will be returned as promptly as possible, after award and signing of the Contract Agreement or expiration of the period of bid validity, whichever is earlier.
- 18)** In case of dispute or difference of opinion arising between Engineer in charge & Contractor matter will be refer to the Commissioner , Mira Bhayndar Municipal Corporation the decision of Commissioner will be final and binding.
- 19)** All other rules regarding insurance, workman's compensation, labour etc. shall be binding on the contractor. The contractor shall be responsible to pay compensation to his staff, labourers according to labour compensation rules, Labour laws, on account of any accident and loss of limb, or life, property due to accident, etc.
- 20)** Time of Contract :The contract period is **Twelve** months including monsoon.
- 21)** The tenderer whose tender is accepted is required to note that no foreign exchange will be released by the Mira Bhayndar Municipal Corporation.
- 22)** **Negotiations**  
The Commissioner MBMC may carry out negotiations with the lowest Bidder for modification of the bid by the calling the bidder in its office in which case the bidder shall remain present in the office for negotiations. The bidder may at his discretion give his revised bid in writing. The original bid shall then be treated as modified bid and modified shall be treated as a final bid.
- 23)** **Right Reserved:**
- 1) Conditional Tender will be rejected.
  - 2) Right to reject any or all tenders without assigning any reason thereof is reserved by the Commissioner, Mira Bhayndar Municipal Corporation whose decision will be final and binding on tenderers.
- 24)** **ENQUIRIES**  
Clarifications, if any, can be sought from:

Executive Engineer(Water Supply Dept.)  
Mira Bhayndar Municipal Corporation  
Indira Gandhi Bhavan, ChattrapatiShivajiMaharajMarg,  
Bhayndar  
Maharashtra State, INDIA  
0120-4200462, 0120-4001002

**Specimen  
Froms**

**PROFORMA OF BANK GUARANTEE**  
[ON STAMP PAPER OF REQUISITE VALUE]

**To,**  
The Commissioner,  
Mira Bhaindar Municipal Corporation,  
Bhaindar.

- 1 In consideration of the **MiraBhaindar Municipal Corporation**, (hereinafter referred as "**MBMC**" which expression shall include its legal representative, successors and assigns) having agreed under the terms and conditions of Contract No. \_\_\_\_\_ Dated \_\_\_\_\_ made between \_\_\_\_\_ (hereinafter called "the Contractor" which expression shall unless repugnant to the subject or context include his heirs, executors, administrators and assigns/its successors and assigns) and the **MBMC** in connection with \_\_\_\_\_ (hereinafter called "the said Contract") to accept a Deed of Guarantee as herein provided for Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) from a Scheduled Bank in lieu of the Security Deposit to be made by the Contractor for the due fulfilment by the Contractor of the terms and conditions contained in the said Contract, we the \_\_\_\_\_ Bank constituted and established under the Banking Companies (acquisition and Transfer of Undertaking Act. 1970 (hereinafter referred to as "the said Bank" and having our Head Office at \_\_\_\_\_ at the request of \_\_\_\_\_ (Contractor(s) do hereby undertake to pay to the **MBMC** amount not exceeding Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) against any loss or damage caused to or suffered or would be caused to or suffered by the **MBMC** by reason of any breach or breaches by the said Contractor(s) of any of the terms and conditions contained in the said Agreement, and to unconditionally pay the amount claimed by the **MBMC** on demand and without demur to the extent expressed.
- 2 We, \_\_\_\_\_ do hereby undertake to pay (Indicate the name of bank) the amounts due and payable under this Guarantee without any demur, merely on a demand from the **MBMC** stating that the amount claimed as due by way of loss or damage caused to or would be caused to or suffered by the **MBMC** by reason of breach by the said Contractor(s) of any of the terms or conditions contained in the said Agreement or by reason of the Contractor's failure to perform the said Agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_)
- 3 We, \_\_\_\_\_ further agree that (indicate the name of the bank) the **MBMC** shall be the sole judge of and as to whether the Contractor has committed any breach or breaches of any of the terms and conditions of the said contract and the extent of loss, damage, costs, charges and expenses caused to or suffered by or that may be caused to or suffered by the **MBMC** on account thereof and the decision of the **MBMC** that the Contractor has committed such breach or breaches and as to the amount or amounts of loss, damage, costs, charges and expenses caused to or suffered by or the may be caused to or suffered by the **MBMC** from time to time shall be final and binding on us."
- 4 We undertake to pay to the **MBMC** any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) / Supplier(s) in any suit or proceedings pending before any Court or Tribunal relating thereto; our liability under this present being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment thereunder and the Contractor(s)/Supplier(s) shall have no claim against us for making such payment.
- 5 We, \_\_\_\_\_ further agree that the (*indicate the name of Bank*) Guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the **MBMC** under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till the **MBMC** certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said Contractor(s) and accordingly

discharge this Guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the \_\_\_day of \_\_\_\_\_ we shall be discharged from all liability under this Guarantee thereafter.

6. We, \_\_\_\_\_ further agree with the **MBMC** that the **MBMC** shall have the fullest liberty without our consent and without affecting in any manner our obligations herein under to vary any of the terms and conditions of the said Agreement or to extend time of performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the **MBMC** against the said Contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor(so or for any forbearance act or omission on the part of the **MBMC** or any indulgence by the **MBMC** to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provisions have effect of so relieving us.
7. This Guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s)/Supplier(s).
8. We, \_\_\_\_\_ lastly undertake not to revoke this Guarantee during its currency except with the previous consent of the **MBMC** in writing.

Date the \_\_\_\_\_ day of \_\_\_\_\_ 2026

For and on behalf of the Bank

The above Guarantee is accepted by the **MBMC**.

For and on behalf of the **MBMC**.

Name and Designation

Date: \_\_\_\_\_

**MIRA BHYANDAR MUNICIAPL CORPORTION**

Name of Work : **Operation & Comprehensive maintenance of Sewarage treatment plants and under ground drainage system in Mira Bhyander Municipal corporation area.**

**UNDERTAKING FOR GUARANTEE BY THE CONTRACTOR**

I / we (name of the contracting firm / proprietor) \_\_\_\_\_  
\_\_\_\_\_ guarantee that:

All the work executed under the contract will be reliable.

All the work will be of the type, which has been proven in service to be suitable for the duty required by the specifications and will have been manufactured and tested in accordance with the appropriate standard specifications approved by the Engineer.

We will replace, repair and adjust free of all charges to the Corporation any part of the work, which fails to comply with the specifications or amendment to such specifications, covered in the tender documents, fair wear and tear excepted until the completion of Defect Liability period.

We will repair and maintain all the components of the storm water drainage syMBMC in the project area as in the scope of the tender and further modifications thereto until the completion of Repair and Maintenance period.

I / We accept & undertake to abide by the clauses relating to quality and guarantee the work.

Date

Signature of the Contractor

## **MIRA BHYANDAR MUNICIPAL CORPORATION**

Name of Work : **Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhyander Municipal corporation area.**

### **DECLARATION BY THE CONTRACTOR**

I hereby declare that I have personally visited and thoroughly inspected all sites related to the work, including all Sewage Treatment Plants (STPs), Sewage Pumping Stations, Rising Mains, Sewer Network, and associated installations under the jurisdiction of Mira Bhayandar Municipal Corporation. I have fully understood the existing condition, operational status, constraints, and all local factors affecting the work.

I further declare that I have carefully examined all tender documents, specifications, scope of work, and contract conditions, and I agree to execute the work in accordance with the same.

I hereby unequivocally agree and undertake that all STPs, Pumping Stations, and associated infrastructure shall be handed over to me on an "AS IS WHERE IS" basis, including all existing defects, deficiencies, non-functional equipment, leakages, damages, and operational issues. I shall not claim any extra cost, compensation, or extension of time on account of the present condition of these installations.

I undertake to immediately take over the facilities and commence the work of operation and comprehensive maintenance, and to restore, repair, rectify, and maintain all systems, equipment, and units in safe, efficient, and continuous working condition, meeting the prescribed performance standards and statutory norms at all times during the contract period.

I further agree that:

- Any breakdown, failure, or non-performance shall be my sole responsibility.
- I shall arrange all required manpower, tools, tackles, spares, consumables, and equipment at my own cost unless specifically provided in the contract.

Contractor/Agency

No. of Correction

Executive Engineer

- I shall ensure uninterrupted operation of STPs and Pumping Stations, without causing nuisance, overflow, pollution, or public inconvenience.
- I shall be fully responsible for compliance with all applicable environmental norms as per MPCB and CPCB, pollution control regulations, safety standards, and labour laws.

I understand and accept that any failure to meet performance standards, delay in repairs, negligence, or non-compliance shall attract penalties, risk and cost action, or termination of contract as per tender conditions.

I undertake to abide by all instructions issued by the Executive Engineer-In-Charge or his authorized representative and shall not deviate from the contract conditions under any circumstances.

Signature of the Contractor

**STATEMENT NO. I**

**STATEMENT OF LIST OF WORKS IN HAND AND WORK TENDERED FOR AS ON THE LAST DATE OF SUBMISSION OF THIS TENDER**

**Name of Contractor**

**(A) Works in Hand**

Sr.No	Name of Works	Agreement No	Tendered Amount	Date of Commencement	Stipulated date of completion	Value of work already Done	Value of Balance work to be executed in next 12 months	Probable Date of Completion	Remarks
1	2	3	4	5	6	7	8	9	10
				<b>SAMPLE</b>	<b>FORM</b>				

**(B) Works Tendered For**

Sr.No	Name of Works	Name and Address of Client	Tendered Amount	Time Limit	Probable Date when decision is expected	Other relevant details if any
1	2	3	4	5	6	7
			<b>SAMPLE</b>	<b>FORM</b>		

**Note :-**1) This is only a standard form. Details are to be furnished in this formate in the form of type written statements which shall be scanned and Enclosed in Envelope No.1 duly signed.

2) The documentary proof of work in hand work tendered for should be submitted iwht this statement duly attested by Gazetted Officer.

**Signature of Contractor**

Contractor/Agency

No. of Correction

Executive Engineer

**STATEMENT NO. II**

**DETAILS OF PLANTS AND MACHINERY IMMEDIATELY OWNED AND AVAILABLE WITH THE TENDERER FOR THIS WORK**

**Name of Contractor**

Sr No	Name of Equipment	No. of Units	Kind & make	Capacity	Age & Condition	Present Location	Remarks
1	2	3	4	5	6	7	8
			<b>SAMPLE</b>	<b>FORM</b>			

**Note :** 1) *This is only a standard form. Details are to be furnished in this formate in the form of type written statements which shall be Scanned and Enclosed in Envelope No.1 duly signed.*

**STATEMENT NO. III**

**DETAILS OF WORKS SIMILAR TYPE AND MAGNITUDE CARRIED OUT BY THE CONTRACTOR  
DURING LAST THREE YEARS  
(i.e.2022-23, 2023-24 & 2024-25)**

**NAME OF THE TENDERER**

Sr.No	Name of Works	Name and Address of the organization for whom the work was done	Place and Country	Agreement No	Date of Comerncement	Tendred Cost	Total Cost of Work Done	Date of Completion	Principle features in brief
1	2	3	4	5	6	7	8	9	10
<b>-----SAMPLE FORM-----</b>									

**Note :-** This is only a standard form ; details are to be furnished in this format in the form of type written statement which shall be Scanned and Enclosed in Envelope No.1 duly signed. The documentary proof of similar type and magnitude should be submitted with statement.

**STATEMENT NO. IV**

Sr No	Name of Person	Designation	Qualification	Whether working in field or in office	Professional Experience of work carries out	Which the person is working with the Tenderer	Remarks
1	2	3	4	5	6	7	8
			<b>SAMPLE</b>	<b>FORM</b>			

**Note :-** This is only a standard form ; details are to be furnished in this format in the form of type written statement which shall be Scanned and Enclosed in Envelope No.1 duly signed. The documentary proof of Technical persons should be submitted with statement.

**Signature of Contractor**

GENERAL CONDITIONS

## **MIRA BHAYNDER MUNICIPAL CORPORATION,**

**NAME OF WORK: Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhyander Municipal corporation area.**

### **GENERAL CONDITIONS OF CONTRACT**

#### **1. DEFINITIONS:**

1.1 In the contract, the following terms shall be interpreted as indicated -

- a) "The Contract" means the agreement entered into between the owner and the contractor as recorded in the contract form signed by the parties, includes all attachments and appendices there to and all documents incorporated by references therein. Contract is the deed of contract together with all its original accompaniments and those later incorporated in it by internal consent.
- b) "The Contract Price" means the price payable to the contractor under the contract for the full and proper performance of its contractual obligations.
- c) "The Goods" means all of the equipments, machinery and/or other materials which the" contractor is required to 'supply to the owner under the contract.
- d) "Services" means services ancillary to the contract such as transportation and insurance and any other incidental services, such as Provision of Technical staff and other such obligations of the contractor covered under the contract.
- e) The "Contractor" means successful tenderer that is the tenderer whose tender has been accepted and who has been authorised to proceed with the work.
- f) "Client" means Mira Bhaindar Municipal Corporation.
- g) "MBMC" means Mira Bhaindar Municipal Corporation
- h) "Tender" means the proposal of the contractor submitted in prescribed form setting forth the prices for the goods to be supplied and other related services to be rendered

and setting forth his acceptance of the terms and obligations of the conditions of contract and specifications.

i) "Contract Time" means period specified in the document for the entire execution of contracted works and other services to be rendered commencing from the date of notification of award including monsoon period.

j) "Month" means calendar months.

k) "Site" means location at which the contractor will have to execute the contracted work.

l) "The Engineer" shall mean the Executive Engineer in charge of the work.

## **2. SCOPE OF WORK**

Scope of work includes providing skilled, semiskilled and unskilled man power, and tools and equipment, required consumables and skilled expertise to operate maintain and carryout repairs to the MBMCs as mentioned in detailed item wise specifications and Schedule 'B'.

## **3. SPECIFICATIONS:**

The wording of items in Schedule - B shall be taken as guidelines for general provisions and coverage under the item. The detailed specification for relevant items shall be as per detailed specifications enclosed and as per P.W.D. Hand Book, Standard Specifications relevant and latest editions of I.S. & Green book of Maharashtra Jeevan Pradhikaran. The other standard, wherever quoted, shall be applicable.

## **4. LINE OUT: ( NOT APPLICABLE)**

All details and dimensions of existing structures, pipe line, etc. shall be obtained by the contractor before giving line out. The contractor shall himself carryout the line out of works in the presence of the representative of the MBMC, and the contractor shall be

responsible for accuracy of it. He shall employ a qualified Engineer for the purpose as well as for supervision of works.

## **5. INTENT AND INTERPRETATION OF CONTRACT DOCUMENTS:**

### **( NOT APPLICABLE)**

5.1 The contract documents are complementary and what is called for by one is as binding as if called for by all. Any work that may be reasonably inferred from the drawings or specifications as being required to produce the intended result shall be provided by the contractor whether or not it is specifically called for, in schedule – B.

The contractor shall furnish and pay for all labour, supervision, materials, equipment, transportation, construction, equipment and machinery tools, appliances, water, fuel, power energy, light, heat, utilities, telephone, storage, protections, safety provisions, and all other facilities, services and acceptable execution, testing initial operation and completion of the work in accordance with the contract documents, ready for use and operation by the owner. The cost of all these arrangements shall be deemed to be included in the contract offer and no separate payment shall be admissible therefore.

### 5.2 INTERPRETATIONS:

Written clarifications or interpretations necessary for the proper execution or progress of the work, in the form of drawings or otherwise, will be issued with reasonable promptness by the Engineer and in accordance with any schedule agreed upon. Such clarifications or interpretations shall be consistent with or reasonably inferable from the intent of the contract documents and shall become a part thereof. Where, there is a discrepancy between the drawings and the specifications, the contractor shall obtain the "Engineer" Interpretation which shall be binding on the contractor.

### 5.3 DRAWING:

Figured dimensions on drawings shall govern over scaled dimensions and detailed drawings shall govern over general drawings.

### 5.3.1 SIGNED DRAWINGS:

Signed drawings alone shall not be deemed to be in order for work unless it is entered in the agreement or schedule for drawings under proper attestation of the contractor and the Engineer or unless it has been sent to the contractor by the Engineer with a covering letter confirming that the drawing is and authority for work in the contract.

### 5.3.2 TECHNICAL WORDS:

Work, materials or equipment described in works which so applied have a well known trade or technical meaning shall be deemed to refer to such recognized meanings.

## **6.0 LINE OUT OF THE WORK:**

### 6.1 SURVEYS AND MEASUREMENTS:

The contractor shall carefully preserve all surveys as also setting out stakes, reference points, bench marks and monuments. Should any stakes, points or benches be removed or destroyed by any act of the contractor or his employees, they may be reset at the contractor's expense. Any expense incurred in replacing permanent monument which the contractor may have failed to preserve shall be borne by the contractor unless the removal of the monuments is required by the contract documents. The contractor shall supply without charge the requisite number of persons with the means and materials necessary for the purpose of working survey, setting out works, and counting, weighing and assisting in the measurement or examination at any time and from time to time of the work or materials.

### 6.2 CONTRACTOR'S VERIFICATION:

The contractor will establish at the work site a substantial B.M., and connect it to a permanent B.M. available in the area with known value. The contractor will then carry out necessary surveys and leveling, covering his work, in verification of the survey data on the working drawings furnished by the Engineer and he will be responsible for establishing the correct lines and levels and verification of the lines and level furnished on the working drawings.

If any error has erupted in the work due to non observance of this clause, the contractor will be responsible for the error and bear the cost of corrective work.

### 6.3 SITE OFFICE:

The Contractor shall construct a semi permanent nature site office if required with minimum six table, four almarie, twenty numbers of chairs and other facilities. The use of the site offices will be done by the departmental staff during their visits to site .

## **7. SECURITY DEPOSIT AND INDEMNITY BOND**

### 7.1 SECURITY DEPOSIT:

The Security Deposit shall be returned to the contractor without any interest when the contractor ceases to be under any obligation under the contract. This shall be read with Clause No.20 of B-1 Form, Defect Liability Clause.

### 7.2 LOSS OR DAMAGE INDENITY BOND:

The Contractor shall be responsible during the progress as well as maintenances for any liability imposed by law for any damage to the work or any part thereof or to any of the materials or other things used in performing the work or for injury to any person or persons or for any property damaged in or outside the work limit. The Contractor shall indemnify and hold the owner and the Engineer, harmless against any and all liability, claims, loss or injury, including costs, expenses, and attorney's fees incurred in the defense of same, arising from any allegation whether groundless or not, of damage or injury to any person or property resulting from the performance of the work or from any material used in. the work or from any condition of the work or work site, or from any cause whatsoever during the progress and maintenance of the work.

## **8. SUPERVISION AND SUPERINTENDENCE**

### 8.1 CONTRACTOR'S SUPERVISION:

The Contractor shall supervise and direct the works efficiently and with his best skill and attention. He shall be solely responsible for means, methods, techniques,

procedures and sequences of construction. The contractor shall co-ordinate all parts of the work and shall be responsible to see that the finished work complies fully with tile contract documents, and such instructions and variation orders as the Engineer may issue during the progress of the works.

#### 8.2 WORK ORDER BOOK:

a) The Contractor shall himself engage an authorized representative all the time on the work capable of managing and guiding the work and understanding the specifications and contract conditions. A qualified and experienced Engineer shall be provided by the Contractor as his representative for technical matters in case the Engineer-in-charge considers this as essential for the work and so he directs the contractor. He will take orders as will be given by the Executive Engineer or his representative and shall be responsible for carrying them out. This representative shall not be changed without prior intimation to the Executive Engineer and his representative on the work site. The Engineer-in-charge has unquestionable right to ask for changes in the quality and strength of contractor's supervisory staff and to order removal from work of any of such staff. The contractor shall comply with such orders and effect replacements to the satisfaction of the Engineer-in-charge.

b) A work order book shall be maintained on site and it shall be the property of MBMC and the contractor shall promptly sign orders given therein by the Executive Engineer or his representative or his superior officer and comply with them. The compliance shall be reported by contractor to the Engineer in good time so that it can be checked. The blank work order book with machine numbered pages should be provided by the contractor and he will be allowed to copy out the instruction therein from time to time.

#### **9. PROTECTION:**

The contractor shall take all precautions and furnish and maintain protection to prevent damage, injury or loss to other persons who may be affected thereby, all the works and all materials and equipment to be incorporated therein whether in storage on or off the site, under the care, custody or control of the contractor or any of his

sub-contractors and other improvements and property at the site or where work is to be performed including building, trees and plants, pole lines, fences, guard, rails, guide posts, culvert and project, markers sign, structures, conduits, pipelines and improvements within or adjacent to streets, right of way, or easements, except those items required to be removed by the contractor in the contract documents. The contractors protection shall include all the safety precautions and other necessary forms of protection, and the notification of the owners of utilities and adjacent property.

The contractor shall protect adjoining site against structural, decorative and other damages that could be caused by the execution of works and make good at his cost any such damages that could be caused by the execution of works and make good at his cost any such damages.

#### **10. UTILITIES AND SUB-STRUCTURES:**

Before commencing any excavations, the contractor shall investigate, determine the actual locations, and protect the indicated utilities and structures, shall determine the existence, position and ownership of other utilities and substructures in the site or before the work is performed by communication with such property owners, search of records, or otherwise and shall protect all such utilities and substructures.

Except for those improvements and facilities require to be permanently removed by the contractor, the contractor shall make satisfactory and acceptable arrangements with the appropriate owners, and at his expense, shall repair and restore all improvements, structures, private and public roads, property, utilities and facilities disturbed, disconnected, or damaged as a result or consequence of his work or the operations of those for whom he is responsible or liable, including that caused by trespass of any of a them, with or without his knowledge or consent, or by the transporting of workmen, material or equipment to or from the site.

## **11. WORKMEN:**

The contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the works any unfit person or anyone not skilled and experienced in the assigned task.

The Contractor shall in respect of labor employed by him comply with or cause to be complied with the provisions of various labour law and rules and regulations as applicable to them in regard to all matters provided therein and shall indemnify the owner in respect of all claims that may be made against the owner for noncompliance thereof by the contractor.

In the event of the contractor committing a default or breach of any provisions of labour laws and rules and regulations the contractor shall without prejudice to any other liability under the acts pay the owner a sum as decided by the Engineer.

### **12.1 WORK DURING NIGHT OR ON SUNDAYS AND HOLIDAYS:**

Unless otherwise provided, none of the permanent works shall be carried out during night, Sunday or authorized holidays without permission in writing. However, when work is unavoidable or necessary for the safety of life, priority of works, the contractors shall take necessary action immediately and advice the Engineer accordingly.

### **12.2 WORKMANSHIP:**

The quality of workmanship produced by skilled knowledgeable and experience workmen, machines and artisans shall be excellent. Particular attention shall be given to the strength appearance and finish of exposed work.

### **12.3 MATERIALS AND EQUIPMENT:**

All materials and equipment incorporated in the work shall be new. Materials and equipment not covered by detailed requirements in the contract documents shall be of the best commercial quality suitable for the purpose intended and approved by the owner prior to use in the work.

### **13.1 OPTIONAL MATERIALS;**

Only one brand, kind or make of material or equipment shall be used for each specific purpose throughout the works, notwithstanding that similar material or equipment of two or more manufactures or proprietary items may be specified for the same purpose.

### **14. LAWS AND REGULATIONS:**

a) Government Law:

The contract documents shall be governed by the laws and bylaws of India, the State of Maharashtra and the local bodies in this region.

b) Resolving the disputes:

In case of disputes, between a Contractor and the field officers, regarding this tender, the Municipal Commissioner MBMC shall be the sole arbitrator and no external arbitrator shall be appointed.

### **15. PERMITS, FEES AND TAXES:**

Unless otherwise provided in the contract documents, the contractor shall secure and pay for all permits, Govt. fees and licenses necessary for the execution and completion of the works. The contractor shall pay all duties, including excise duty, sales tax, local taxes, income tax, octroi and other taxes and any other taxes and any other levies required by law including sales taxes properly assessed against his equipment or property used in connection with the work and clearance certificate shall be shown to the Engineer. If the contractor is entitled for any refund / exemption of above taxes, necessary certificate regarding the issue of materials for MBMC works will be issued by the Commissioner MBMC however, the MBMC authorities will not take any responsibility of refund/exemption of such taxes fees and in case of disputes between authority refunding and the contractor, the MBMC and its officers shall be indemnified by the Contractor. Any violation, in the legal provisions of taxes, duties, permits and

fees, carried out by the contractor and detected subsequent shall be the sole responsibility of the contractor and his legal heirs.

#### **16. BURIED AND CONCEALED WORK:**

The contractor shall help in- recording the precise location of all piping, conduits, ducts, cables and like work that is buried, embedded in concrete or masonry, or concealed in wood or metal frame, walls and structures at the time such work is installed and prior to concealment. Should the contractor cover such work before such recording take place, he shall uncover the unrecorded work to the extent required by the Engineer and shall satisfactorily restore and reconstruct the removed work with no change in the contract price or the contract time.

#### **17. WARNINGS AND BARRICADES:**

The contractor shall provide and maintain barricades, guards, guard rails, temporary bridges and walkways, watchmen, headlights and danger signals illuminated from sunset to sunrise and all other necessary appliances and safeguards to protect the work, life property, the public, excavations, equipment's and materials. Barricades shall be of substantial construction and shall be painted such as to increase their visibility at night. For any accident arising out of the negligence of above instructions the contractor shall be bound to bear the expenses of defense of every suit, action or other legal proceedings, at law, that may be brought by any person for injury sustained owing to negligence of the above precautions and to pay all damages and costs which may be awarded in any such action or proceedings to any such person or which may with the consent of the contractor be paid in compromising any claim by any such person.

#### **18. PRECAUTIONS WHILE WORKING IN THE VICINITY OF ROAD**

- (a) When the work is required to be done along, below or near existing traffic road, the contractor(s) shall take steps as are necessary for the safety of the road, labour working at site. He/they will also be required to make program

of his/their work so as not to interfere with the movement of road traffic. No extra payment shall be allowed for these precautions and also for crossing road required during the execution of the work. It should be ensured that the main traffic road is not disturbed.

- (b) In addition to the precautions taken by the contractor for the safety of the road and labour, it may be necessary to post flagmen in some locations as an additional safety measure. The contractor(s) shall be fully responsible for any damage to or trespass caused by his/their men to surrounding structure, MBMC bears no liability whatsoever on this account.
- (c) Instructions given by Road Authority regarding safety shall be strictly followed during the execution of work.
- (d) There may be some service lines such as electrical cables, MGL gas line, S&T cables, and water pipe lines, CC drains crossing above and below the ground levels. These should be supported as per the satisfaction of the site in charge of Concern Authority (Reliance Power/Tata Power/ MGL / Water supply Department of MBMC / PWD Department of MBMC) and after the completion of the work these to be restored in their original alignment. There should not be any damage to these service lines during execution. Contractor is entirely responsible for any damages.

## **19. TRAFFIC MANAGEMENT**

The contractor has to plan his work including stacking of construction materials and placing of machinery such that it will in no way affect the traffic on existing. A board of size 1.0 m x 1.80 m indicating name of the work, name of the owner i.e. MBMC, name of the consultant, Cost of the work, name of the contractor shall be displayed at suitable location and blinkers at night if necessary. Traffic diversion/caution boards of suitable

size shall be provided as directed. All that is stated above is incidental to the work and no separate payment will be made to the contractor.

**20. ENGINEER'S STATUS DURING CONSTRUCTION AUTHORITY OF THE ENGINEER:**

The Engineer shall have the authority to enforce compliance with the contract documents. On all questions relating to quantities, the acceptability of materials, equipment, or works, the adequacy of the performance of the work and the interpretation of the drawings and specifications, the decision of the Engineer shall be final and binding and shall be precedent to any payment under the contract agreement unless otherwise provided in the contract documents. The Engineer shall have the authority to stop the work or any part thereof as may be necessary to ensure the proper execution of the work, disapprove or reject the works which is defective, to require the uncovering and inspection or testing of the works, to require reexamination of the works, to issue interpretations and clarifications, to order changes or alterations in the works and other authority as provided elsewhere in the contract document.

The Engineer shall not be liable for the results of any ruling, interpretation or decision rendered, or request, demand, instruction, or order issued by him in good faith. The contractor shall promptly comply with requests, demands, instructions and order from Engineer.

The whole of the works shall be under the directions of the Engineer, whose decision shall be final, conclusive and binding on all parties of the, contract, on all questions relating to the construction and meaning of plans, working drawings, sections and specifications connected with the work. The Engineer shall have the power and authority from time to time and at all times to make and issue such further instructions and directions as may appear to him necessary or proper for the guidance of the contractor and for good and sufficient execution of the works according to the terms of specifications. The contractor shall receive, execute, obey and be bound by the same according to the true intent and meaning thereof; fully and effectually. Engineer may

order any of the works contemplated thereby to be omitted, with or without the substitution of any other works in lieu thereof, or may order any works or any portion of works executed or partially executed, to be removed, changed or altered and if needful, may order that other works shall be substituted instead thereof and the difference of expenses occasioned by any such diminution or alteration so ordered and directed shall be deducted from or added to the amount of this contract.

In case the progress of the Contractor is found to be less than the programme given by him at any point of time and if the Engineer is convinced that the balance work cannot be executed within the balance period of time by the Contractor, a notice of 30 days will be issued to improve the progress. In case there is no improvement a further notice of seven days will be given and thereafter a part or whole of the work will be withdrawn from the Contractor and will be got done at the risk and cost of the Contractor. The right of Engineer in this respect shall be unquestionable in any court of law. On expiry of the seven days notice, as above, the Contractor shall remove his materials, men, equipments, plant and management from the site, within seven days so that the new agency can take over immediately. Failing to this, the Authority will remove the aforesaid things at the cost of the Contractor. This authority is in addition to the Clause 3 of the B-1 Form of the Contractor.

## **21. DEFECTS AND RECTIFICATION:**

For period specified in the Clause 20 of the defect liability period for the individual type of work from the date of issuance of the completion certificate in accordance with para "Final Inspection and Acceptance" contractor shall remain liable for any of the works or parts thereof or equipment and fittings supplied which in the opinion of the Engineer fail to comply with the requirements of the contract or are in any way unsatisfactory or defective (fair wear and tear excepted). The process of the assembly commissioning of all sections of pipe lines, tested hydraulically in patches, will involve some additional measures such as shaft of suitable height, fixing of air valves at more number of places on the alignment and all such measures shall be done by the contractor at his cost. MBMC wants the results of completion of pipelines, included in

the tender satisfactorily in time and no excuses or reasoning of the failures. Hence, the Contractor shall be conversant with the site limitations and restrictions of particular levels at the end and he should execute the work in accordance with exact specifications and requirements. To the intent that the works and each part thereof shall at or as soon practicable after the expiry of the above period be taken over by the Engineer in the condition required by the contract to the satisfaction of the Engineer, the contractor shall finish the work (if any) outstanding at the date of completion as soon as may be practicable after such date and shall execute all such work of repair, amendment, reconstruction, rectification and making good of defects, imperfections, shrinkages or other faults as may during the period of maintenance or after its expiry be required of the contractor in writing by the Engineer as a result of an inspection made by or on behalf of the Engineer prior to the expiry of the period. All such work shall be carried out by the contractor at his own expenses if the necessity thereof shall in the opinion of the Engineer be due to the use of materials or to the neglect or failure on the part of the contractor to comply with any obligation expressed or implied on the contractor's part under the contract. If the contractor fails to do any such work as entitled to carry out, such work in which the contractor should have carried out at the contractor's own cost, the Engineer shall be entitled to recover from the contractor the cost thereof or may deduct the same from the moneys that become due to the contractor. Notwithstanding the aforesaid, if the contractor remains in default, one calendar month after the Engineer has given written instructions in writing, the Security Deposit shall become payable to the MBMC who will deduct the cost plus overhead expenses of such works as have been necessary to rectify the contractor's default and the balance, if any, shall be disbursed. The Contractor shall submit the operation and maintenance manual for the fruitful operation of the works. The Contractor will have a liberty to visit the operating works during the defect liability period and satisfy himself about the on-going operations in case he do not visit and a defect is observed then the Engineer's opinion shall be final and binding as to the application of defect liability.

## **22. RIGHT TO WITHHOLD:**

The Engineer may refuse to approve any payment, or because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously approved and paid to such extent as may be necessary in the opinion of the Engineer to protect him from loss because (a) The work is defective, (b) Third party claims have been filed or there is reasonable evidence indicating probable filing of such claims, (c) of the Contractor's failure to make payment properly to sub-contractors or for labour, material or equipment (d) of damage to another Contractor, or to the property of other caused by the Contractor, (e) of reasonable doubt that the work cannot be completed for the unpaid balance of the contractor price, (f) of reasonable indication that the work will not be completed within the contract time, (g) of the Contractor's neglect or unsatisfactory prosecution of the work including failure to clean up. Once the provisions of law that enables or require the Engineer to with held such payments are removed, payment will be made for amounts withheld because of them to the extent the contractor is entitled to payment.

### **23. FINAL INSPECTION AND ACCEPTANCE:**

Upon written notice from the contractor, that the entire work required by the contract documents is complete and that all submittals required by him are made, and after the Contractor has delivered the bonds, certificates of inspection, guarantees, warranties, releases and other documents, as required by the contract documents or by law, the Engineer will make a final inspection, and he will notify the Contractor in writing of any particulars in which this inspection reveals that the work is defective, and will also notify the Contractor writing of any deficiencies in the submittals and the documents required by him.

The contractor shall promptly make such corrections as are necessary to rectify all defects or deficiencies. After the Contractor has completed any such corrections to the satisfaction of the owner, the engineer will issue a written completion certificate of the work and file any notice and completion required by law or otherwise.

### **24. CONTINUING OBLIGATION OF THE CONTRACTOR:**

Contractor/Agency

No. of Correction

Executive Engineer

The Contractor's obligation to perform and complete the work in accordance with the contract documents is and shall be absolute. Neither the observation during construction and final inspection of the work by the Engineer, nor any payment to the Contractor under the Contract documents, nor any use or occupancy of the work or any part thereof by the Engineer, nor any act of acceptance by the defective work by the Engineer shall constitute acceptance of work not in accordance with the contract documents.

**25. INCOME TAX:**

During the course of contract period the deduction of Income Tax will be made at 2% of the gross amount of each bill in excess of Rs.5000/- or as per the advice of the Income tax authority. Presently 8% surcharge over the tax is being levied, which constitutes the overall percentage as 2%.

**26. FORCE MAJEURE:**

Neither party shall be liable to the other for any loss or damage occasioned by or arising out of the acts of God and in particular unprecedented floods, volcanic eruptions, earthquake or other conclusion of nature and other acts such as, but not restricted to, invasion, act of foreign countries, hostilities or warlike operations before or after declaration of war, rebellion, military or usurped power which prevent performance of the contract and which could not have been foreseen or avoided by a present person I such as Earthquake of magnitude more than for which the structures are designed.

**27. WRITTEN NOTICE:**

Written notice shall be deemed to have been duly served or delivered in person to the individual or member of the firm or to an officer of the corporation for whom it was intended, or if delivered at or sent by registered or certified mail to the last business address known to him who gives the notice. The notice on the Fax Message / E-mail shall be deemed to have been duly served the address given in the contractor's tender

on which all notices, letters and other communications to the contractor shall be mailed or delivered, except that said address may be changed by the Contractor by notifying the owner in writing. This shall not preclude the service of any notice, letter of other communication upon the Contractor personally.

**28. USE OF COMPLETED PORTIONS:**

The owner shall have the right, upon written notice to the Contractor, to take possession or occupancy of, and use any completed or partially completed portions of the work, notwithstanding that the time for completing the entire work or such portions may not have expired but such taking possession or occupancy or a waiver or acceptance of any work not completed in accordance with the contract documents.

**29. CLEANING UP**

The contractor shall at all times during the work keep the site and premises, adjoining property and public property free from accumulations of waste materials, rubbish, and other debris resulting from the works, and at the completion of the work shall remove all waste materials, rubbish and debris from and about the site and premises as well as all tools, construction equipment and machinery and surplus materials, and shall leave the site and premises, clean, tidy and ready for occupancy by the owner. The Contractor shall restore to their original condition those portions of the site not designated for alteration by the contract documents. Paved ways, parking areas and roadways disturbed by the construction shall be redone by filling the excavation, if any, by sand compacted material and bringing it to its original shape as directed and approved by the Engineer. No waste material shall be buried or disposed off on the owner's property unless so approved in writing by the Engineer in charge. Before the Contractor applies for final inspection and acceptance of the work, all items of work shall be complete, ready to operate, and in a clean condition as determined by the Engineer.

**30. OWNER'S RIGHT TO CLEAN UP:**

If the Contractor fails to satisfactorily clean up or if a dispute arises between the Contractors or in several Contractors as to their responsibility or cleaning up, the Engineer may clean up and charge the cost thereof to the Contractor for his failure, or to the several contractors as the Engineer shall determine to be just.

### **31. FOSSILS ETC.**

All fossils, coins, articles of value of antiquity and structures or other remains or things of geological or archaeological interest discovered on the site shall be deemed to be the property of the owner and the Contractor shall take reasonable precautions to prevent his workmen or any other person from removing or damaging any such article or thing and shall immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out at the expenses of the Engineer's order as to the disposal of the same.

### **32. LABOUR RULES:**

If demanded by MBMC , the contractor will have to produce to the satisfaction of the accepting authority a valid and current licence issued in his favour under the provision of Contract Labour (Regulation and Abolition) Act 1970, before starting the work, otherwise the Contractor shall have to face the further consequences.

### **33. STATUTORY INCREASE IN DUTIES, TAXES ETC:**

All the taxes (except work contract tax) and duties levied by the State and Central Govt. and by Local Bodies shall be fully borne by the Contractor and shall not be reimbursed to him on any account.

### **34. INSPECTION, TESTING & FEES:**

All materials and equipment required for the work under this contract irrespective whether specified or not, shall be tested at manufacturer's works laboratory and the Test Certificate thereof shall be furnished.

The material/equipment of which makes are not expressly specified in the tender shall be of a make approved by the Engineer-in-charge. The OAP for the material and equipment shall be got approved from the Engineer-in-charge before placing the orders and the testing shall be carried out as per approved OAP. The cost required for inspection including the departmental inspection and conveyance of the officers shall be borne by the Contractor, the cost of which IS deemed to have been included in the quoted cost.

**35. MACHINERY REQUIRED:**

All machinery required for erection/ execution purposes such as cranes, trucks etc. shall be arranged by the Contractor. Department shall not take any responsibility for providing such machinery even on rental basis. No concreting shall be permitted unless centering and reinforcement is approved by the Engineer-in-charge.

**36. DISCREPANCIES AND OMISSIONS:**

The tender drawings and specifications shall be considered as explanatory of each other and together shall form the technical requirements and stipulations of tender documents. Detailed drawings shall have preference over small scale drawings. Similarly, detailed specifications shall have preference over general specifications. Should any discrepancy arise as to the meaning, intent or interpretation of any specification or drawing the decision of the Engineer-in-charge shall be final and binding on the Contractor.

**37. NO INTEREST ON DUES:**

No interest shall be payable by the MBMC on amounts, due to contractors pending final settlement of claim. Further, no interest shall be payable by MBMC on any amount / payment.

**38. CHANGE IN SITE:**

No claims shall be paid on account of reasonable change in site or orientation as the circumstances may call for.

**39. TOOLS AND PLANT:**

All tools, instruments and machinery and all other materials (not included in the Material Schedule 'A') shall be acquired by the Contractor at his cost. It is however, open to the Engineer to lend or supply to the Contractor implements, machinery or other service not covered by the tender document which he can be and may consider desirable. For such tools, instruments, machinery and service provided, the Contractor will have to sign an agreement and pay Security Deposit and rental charges as may be fixed by the Engineer.

**40. EXCAVATED MATERIALS:**

All excavated stuff shall be MBMC property and shall be disposed off by the Contractor in a manner as directed by the Engineer.

**41.** If there is any dispute between the contractor and the Engineer in Charge, the contractor is not allowed to go for Arbitration and in such cases the decision of Commissioner (MBMC) will be final. Even if the Contractor files a suit in the court, the MBMC may allot the work to the other agency to avoid delay in work.

**42. REFILLING PAYMENT:**

Though the contractor is required to do refilling before hydraulic testing to avoid traffic hurdle, no payment for refilling of the trenches of pipeline shall be payable till satisfactorily hydraulic testing is given. Re-excavation required if any during testing shall be done by the contractor at his own cost.

**43. EXTRA ITEMS:**

It is binding on the contractor to carryout such extra works as will be occurred when the same can be conveniently carried out by the contractor in the opinion of the Engineer-in-charge as internal part of the main work in addition, alteration or legitimate and reasonable extension.

Extra charges of claims in respect of extra works shall not be allowed unless the work to which they relate are clearly without the spirit and meaning the specifications or unless such works are ordered in writing by Executive Engineer or his representative and claimed for in specified manner before the work is taken in hand.

FORM B-1

**MIRA BHYANDAR MUNICIPAL CORPORATION**

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**FORM B-1**  
**PERCENTAGE RATE TENDER AND CONTRACT FOR WORKS**

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**Name of Work: Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhyander Municipal corporation area.**

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***GENERAL RULES & DIRECTIONS FOR THE GUIDANCE OF CONTRACTORS***

1. All works, proposed to be executed by Contract, shall be notified in a Form of invitation to tender, pasted on a Notice Board hung up in the office of the Executive Engineer, MBMC.

This form will state the works to be carried out as well as the date of submitting and opening tenders, and the time allowed for carrying out the work, also the amount of earnest money to be deposited with the tender, the amount of the security deposit to be deposited by the successful Tenderer and the percentage, if any, to be deducted from bills. It will also state whether refund of quarry fees, royalties and ground rents will be granted. Copies of any other documents required in connection with the work shall be signed by the Executive Engineer, MBMC for the purpose of identification and shall also open for Inspection by Contractors at the office of the Executive Engineer, MBMC during office hours.

Where the works are proposed to be executed according to the specifications recommended to a Contractor and approved by a competent authority on behalf of the Mira Bhyandar Municipal Corporation such specifications with designs and drawings shall form a part of the accepted tender.

2. In the event of the tender, being submitted by a firm, it must be signed by each Partner thereof, and in the event of the absence of any partner, it shall be signed on his behalf by a person holding a power of attorney authorizing him to do so.

2.A(I) The Contractor shall pay along with the tender the sum of Rs. 9,02,086/- (Rupees Nine Lacs Two Thousand Eighty Six Only) as and by way of Earnest Money (should be paid by online receipt say MBMC of MBMC). The said amount of Earnest Money shall not carry any interest whatsoever.

ii) DELETED

iii) If after submitting the tender, or if after the acceptance of his tender, the Contractor neglects to furnish the balance amount of Security Deposit without prejudice to any other rights and powers of the Corporation hereunder, or in law, Corporation shall be entitled to forfeit the full amount to the Earnest Money deposited by him.

iv) In the event of his tender not being accepted, the amount of Earnest Money deposited by the Contractor shall, unless it is prior thereto forfeited under the provisions of Sub-Clause (iii) above, be refunded to him on his passing receipt therefore.

3. Receipts for payments made on account of any work, when executed by a firm should also be signed by all the partners except where the contractors are described in their tender as firm, in which case the receipt shall be signed in the name of the firm by one of the partners, or by some other person having authority to give effectual receipts of the firm.

4. Any person who submits a tender shall fill up usual printed form stating to what percentage above or below the rates specified in Schedule-B (Memorandum showing Item of work to be carried out) he is willing to undertake the work. The percentage shall be stated only in the form of contract below the title "Tender for works" at the space provided there for. Only one percentage rate on all the rates included in Schedule B shall be named. Tenders, which propose any alterations in the works specified in the said form of invitation to tender or in the time allowed for carrying out the work or which contain separate percentage over Estimated Rates/Schedule rates for different sub-works or items, or, which contain any other conditions, of any sort or which are not filled with the percentage at the space provided for the purpose and not signed at proper places in the printed B-1 tender form will be liable for rejection. No printed form of tender shall include a tender for more than one work. But, if the contractors who wish to tender two or more works, they shall submit a tender for each work separately. Tenders shall have the name and number of the work to which they refer, written outside the Envelopes.

5. The Commissioner or his duly Authorized Assistant shall open tenders in the presence of contractors who have submitted tenders or their representatives who may be present at the time, and he will enter the amounts of the several tenders in a comparative statement in a suitable, form. In the event of a tender being accepted, the contractor shall for the purpose of identification, sign copies of the specification and other documents mentioned in Rule-1. In the event of tender being rejected, the Executive Engineer, MBMC shall authorize the MBMC officer to refund the amount of the earnest money deposited to the tenderer, on his giving a receipt for the return of the money.

6. The officer competent to dispose of the tenders shall have the right of rejecting all or any of the tenders without assigning any reason.

7. No receipt for any payment alleged to have been made by a contractor in regard to any matter relating to this tender or the contract shall be valid and binding on the Corporation unless it is signed by the appropriate officer of Mira Bhaindar Municipal Corporation.

8. Not Used.

9. All work shall be measured net by standard measure and according to the rules and customs of the Mira Bhaindar Municipal Corporation., without reference to any other custom.

10. Under no circumstances shall any contractor be entitled to claim enhanced rates for items in this contract.

11. Every registered contractor should produce along with his tender, valid certificate of registration as approved contractor in the appropriate class and renewal of such registration with date of expiry.

12. All corrections and additions or pasted slips should be signed.

13 The measurements of work shall be taken according to the usual methods in use in the Public Works Department / Maharashtra JeevanPradhikaran and no proposals to adopt alternative methods will be accepted. The decision of Executive Engineer, MBMC as to what is the usual method to be used in the Corporation, will be final.

14 The tendering Contractor shall furnish a declaration along with the

tender showing all works for which he has already entered into contract and the value of the work that remains to be executed in each case on the date of submitting the tender, ( with a copy of Certificate from the Head of the office concerned duly attested from gazette officer).

15 Every Tenderer shall furnish along with the tender information regarding the Income-tax Circle or Ward of the district in which he is assessed to Income-tax, the reference to the number of the assessment and the assessment year or a valid Income-tax clearance certificate.

16. No foreign exchange would be released by the Mira Bhaindar Municipal Corporation, for the purchase of plant and machinery or any other purpose for the execution of the work contracted for.

17. The contractor will have to construct shed, for storing controlled and valuable materials issued to him or purchased by him if any, at work site having double locking arrangement. The materials will be taken for use in the presence of the Departmental person. No materials will be allowed to be removed from the site of works without written permission of the Engineer-in-Charge.

18. The contractors shall also give a list of machineries in their possession and which they propose to use on the work in the form of statement as prescribed in this tender.

19. Every registered or unregistered contractor should furnish along with tender a statement showing previous experience and technical staff employed by him.

20. Successful Tenderer will have to produce to the satisfaction of the accepting authority a valid and current license issued in his favor under the provision of Contract Labour (Regulation and Abolition Act, 1973) before starting work failing which acceptance of the tender will be liable for withdrawal and Earnest Money/Security Deposit will be forfeited to Mira Bhaindar Municipal Corporation

21. The contractor shall comply with the provisions of the Apprentices Act 1961 and the rules and orders issued thereunder from time to time. If he fails to do so, his failure will be a breach of the contract and the Commissioner, MBMC may, in his discretion cancel the contract. The Contractor shall also be liable, for any pecuniary liability arising on account of any violation by him of the provisions of the Act.

22. The work order to the successful tenderer will be issued STP wise i.e. works under sr. no 4, 6, 8 & 9 will be issued immediately after finalization tender. And work order for remaining works i.e. sr. no 1, 2, 3, 5 & 7 will be issued as per requirement

FORMAT for Letter of Commercial Offer(Tender for works)(To be printed on letterhead of the firm and submitted in Envelope -2)

To,  
The Commissioner  
Mira Bhaindar Municipal Corporation, Bhaindar

**Sub: Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhyander Municipal corporation area.**

(Rs.25,01,12,690/-)

Dear Sir,

Bidder's Offer

<p>I/We hereby tender for the execution, for MIRA BHAINDAR MUNICIPAL CORPORATION (here-in-before and hereinafter referred to as Corporation or MBMC) of the work specified in such memorandum at ____ percent below/above the estimated rates entered in Schedule 'B' (Memorandum showing items of work to be carried out) and in accordance in all respects with the specifications, designs, drawings, and instructions in writing referred to in rule 1 hereof and in Clause 13 of the annexed conditions of contract and agree that when materials for the work are provided by the corporation, such materials and the rates to be paid for them shall be as provided in Schedule 'A' hereto.</p>	<p>In figures as well as in words</p>
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## Memorandum

### 1 A General Description

#### **Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhyander Municipal corporation area.**

Note: Contractor shall carry out necessary surveys for aligning the structures prior to construction.

A. Estimated Cost	Rs. 25,01,12,690.00
B. Earnest Money	Rs. 25,01,127.00
C. Security Deposit	Rs. 5% of Accepted Tender Cost.
i. Initial security deposit	At the time of agreement 3% of Accepted Tender Cost
ii.	Balance 2% Security Deposit will be Deducted from R.A. Bill at rate of 5% from each RA bill.

#### D. Additional Security Deposit:

If the tender is proposed to be accepted at the rate quoted less than estimated cost put to tender additional security deposit over and above 5% in at the below rate shall have to be paid by the tenderer.

- |                                    |       |
|------------------------------------|-------|
| a) For offer upto 10% below        | → Nil |
| b) For offer upto 10% to 15% below | → 2%  |
| c) For offer more than 15% below   | → 4%  |

(Additional Security deposit shall be based on estimated cost put to tender)

The Additional Security Deposit in full in the form of FDR/Bank Guarantee from Nationalized/Scheduled Bank will have to be deposited at the time of agreement along with 50% of original security deposit

- E) Time allowed for completion of the work from date of written order to commence 12 (Twelve months) Calendar months including monsoon.
- 2 I/We agree that this offer shall remain open for acceptance for a minimum period of 120 days from the date of opening the same and thereafter until it is withdrawn by me/us by notice in writing duly addressed to the authority opening the tenders and sent by registered post A.D. or otherwise delivered, at the office of such authority. The Earnest money deposited on-line only. The amount of Earnest Money shall not bear interest and shall be liable to be forfeited to the MBMC should I/We fail to (i) Abide by the stipulation to keep the offer open for the period mentioned above or (ii) sign and complete the contract documents as required by the Engineer and furnish the security deposit, as specified in item (d) of the memorandum contained in Para - I above within the time limit, laid down in clause, (1) of the annexed general conditions of the contract. The amount of earnest money may be refunded to me/us after work order if so desired by me/us in writing unless the same or any part thereof has been forfeited as aforesaid.
3. Should this tender be accepted I/We hereby agree to abide by and fulfill all the terms and provisions of the conditions of contract annexed hereto so far as applicable and in default thereof to forfeit and pay to Corporation, the sums of money mentioned in the said conditions (Earnest Money).

Contractor (\*\*)

Address

Dated the                      day of                      2026

(Witness)

(Witness)

Address

(Occupation)

Accepted For Rs. \_\_\_\_\_ Rs. \_\_\_\_\_

\_\_\_\_\_ ) \_\_\_\_\_ ) % Above/Below/ The  
estimated cost put to tender Rs.....

The above tender is hereby accepted by me for and on behalf of the  
Mira Bhayandar Municipal Corporation.

(\*)

Executive Engineer  
Mira Bhaindar Municipal

Corporation

Dated            day of            20

## **CONDITIONS OF CONTRACT**

### **CONDITIONS OF CONTRACT**

#### **CLAUSE -1:- Security Deposit**

The person / persons whose tender may be accepted (hereinafter called the Contractor, which expression shall unless excluded by or repugnant to the context include his heirs, executors, administrators and assignors) shall (A) within seven days (which may be extended by the Commissioner, MBMC. up to 15 days, if he decides fit to do so) of the receipt by him of the notification of the acceptance of his tender, deposit with the Commissioner, MBMC, a sum sufficient which will make up full initial security deposit specified in the tender (Initial security deposit of 3 % (Three percent) of accepted tender cost shall be submitted by successful bidder at the time of agreement in the form of cash/DD/Pay order/ Bank Guarantees from Nationalized Banks in the enclosed form in favor of the Commissioner, Mira Bhandar Municipal Corporation) & permit the Corporation at the time of making any payment to him for work done under the contract to deduct 2 % (Two percent) of contract sum each R.A. Bill at the rate of 5% of the gross amount to the extent that total required security deposit Such deductions shall be held by the Corporation by way of Security Deposit.

All compensation or other sums of money payable by the contractor to the Corporation under the terms of this contract may be deducted from, or paid by the sale of a sufficient part of the security deposit or from the interest arising there from, or from any sums which may be due or may become due by the Corporation to the contractor under any other contract or transaction of any nature on any account whatsoever, and in the event of his security deposit being reduced by reason of any such deduction or sale as aforesaid, the contractor shall within ten days thereafter, make good in cash or F. D. R. pledged to Commissioner, MC as aforesaid, any sum or sums which may have been deducted from, or raised by sale of security deposit or any part thereof. The Security Deposit referred to, when paid in cash may, at the cost of the depositor, be converted into interest bearing securities, provided that the depositor has expressly desired this in writing.

If the amount of the security deposit to be paid in a lump sum within the period specified at above, is not paid, the tender / contract already accepted, shall be considered as cancelled and legal steps taken against the contractor for recovery of the amounts.

The amount of the security deposit lodged by a contractor shall be refunded along with the payment of the final bill, if the date upto which the contractor has agreed to maintain the work in good order is over. If such date is not over only 90% amount of security deposit shall be refunded alongwith the payment of the final bill. The amount of security deposit retained by the MBMC shall be released after expiry of period upto which the contractor has agreed to maintain the work in good order is over.

In the event of the contractor failing or neglecting to complete rectification work within the period up to which the contractor has agreed to maintain the work in good order, then, subject to provisions of Clause 17 and 20 hereof, the amount of security deposit retained by the Corporation shall be adjusted towards cost incurred by the Corporation on such rectification work.

**CLAUSE 2:- Compensation for delay**

The time allowed for carrying out work as entered in the tender shall be strictly observed by the Contractor and shall be reckoned from the date on which the order to commence work is given to the Contractor. The work shall throughout the stipulated period of the contract, be proceeded with, all due delay hence (time being deemed to be of the essence of the contract on the part of the Contractor) and the Contractor shall pay a compensation as an amount equal to 0.1% (Point one percent), of the amount of the estimated cost of the whole work as shown by the tender for every day that the work remains uncompleted, or unfinished after the proper dates. The total amount of compensation to be paid under the provisions of this clause not exceeds 10 percent of the estimated cost of the work as shown in the tender And further to ensure good progress. during the executing of the work the Contractor shall be bound, in all case in which the time allowed for any work exceeds one month to complete. Commissioner should be the final authority in this respect.

for complete minimum quantum of work as compared to accepted tender cost as stated below :-

- |    |                  |                |
|----|------------------|----------------|
| 1. | ¼ of the work in | ¼ of the time  |
| 2. | ½ of the work in | ½ of the time. |
| 3. | ¾ of the work in | ¾ of the time. |

NOTE :- The quantity of the work to be done within particular time to be specified above shall be fixed by the Executive Engineer after taking into consideration the circumstances of each case. And abide by the program of detailed progress laid down by the Executive Engineer.

**CLAUSE 3:- Action when whole of the security deposit is forfeited**

In any case in which under any clause or clauses of this contract, the contractor shall have rendered himself liable to pay compensation amounting to the whole of his security deposit, (whether paid in one sum or deducted by installments) or in the case of abandonment of the work owing to serious illness or death of the contractor or any other cause, the Commissioner, MBMC on behalf of the

Corporation, shall have power to adopt any of the following courses, as he may deem best suited to the interest of Corporation.

a) To rescind the contract (for which rescission notice in writing to the contractor under the hand of Commissioner, MBMC shall be conclusive evidence) and in that case, the security deposit of the contractor shall stand forfeited and be absolutely at the disposal of the Corporation.

b) To carry out the work or any part of the work departmentally or through other contractor, debiting the original contractor with the cost of the work, expenditure incurred on tools and plants and charges for advertisement for fixing new contractor and those on additional supervisory staff including the cost of work charged establishment employed for getting the un-executed part of the work completed and crediting him with the value of the work done departmentally / through other contractor in all respects in the same manner and at the same rates, as if it had been carried out by the contractor under the terms of his contract. The certificate of the Commissioner, MBMC as to the costs and other allied expenses so incurred and as to the value of the work so done departmentally, shall be final and conclusive against the contractor.

c) To order that the work of the contractor be measured up and to take such part thereof as shall be unexecuted out of his hands and to give it to another contractor to complete, in which case, all expenses incurred on advertisement for fixing a new contracting contractor, additional supervisory staff including the cost of work charged establishment and the cost of the work executed by the new contract contractor will be debited to the contractor and the value of the work done or executed through the new contractor shall be credited to the contractor in all respects and in the same manner and at the same rates, as if it had been carried out by the contractor under terms of his contract. The certificate of the Commissioner, MBMC as to all the cost of the work and other expenses incurred as aforesaid for or in getting the unexecuted work done by the new contractor and as to the value of the work so done shall be final and conclusive against the contractor.

d) In case the contract shall be rescinded under clause (a) above, the contractor shall not be entitled to recover or be paid, any sum for any work therefore actually performed by him under this contract unless and until the Commissioner, MBMC shall have certified in writing the performance of the such work and the amount payable to him in respect thereof and he shall only be entitled to be paid the amount so certified.

e) In the event of either of the courses referred to the clause (b) or (c) being adopted and the cost of the work executed departmentally or through a new contractor and other allied expenses exceeding the value of such work credited to the contractor, the amount of excess shall be deducted from any money due to the contractor, by the Corporation under the contract or otherwise howsoever or from his security deposit or the sale proceeds thereof provided. However, the contractor shall have no claim against the Corporation even if the certified value of the work done departmentally or through a new contractor exceeds the certified cost of such work and allied expenses; provided always that whichever of the three courses mentioned in clauses, (a), (b) or (c) is adopted by the Commissioner, MBMC, the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials, or entered in to any engagements or made any advance payments on account of or with a view to the execution of the work or the performance of the contract.

**CLAUSE 4:- Action when the progress of any particulars portion of the work is unsatisfactory.**

If the progress of any particular portion of the work is unsatisfactory, the Commissioner, MBMC shall notwithstanding that the general progress of the work is in accordance with the conditions mentioned in Clause 2, be entitled to take action under Clause 3(b) after giving the contractor 10 days notice in writing. The contractor will have no claim for compensation, for any loss sustained by him owing to such action.

**CLAUSE 5:-Contractor liable to pay compensation If action not taken under clauses 3**

**& 4**

In any case in which any of the powers conferred upon the Commissioner, MBMC by Clauses-3 and 4 shall have become exercisable and the same shall not have been exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any future case of default by the contractor for which under any clause or clauses hereof, he is declared liable to pay compensation amounting to the whole of his security deposit and the liability of the contractor for past and future compensation shall remain unaffected.

**Power to take possession of or require removal of or sell Contractor's plant**

In the event of the Commissioner, MBMC taking action under sub-clause (a) or (c) of Clause 3, he may, if he so desires, take possession of all or any tools and plants, materials and stores, in or upon the work or the site thereof or belonging to the contractor, or procured by him and intended to be used for the execution of the work or any part thereof, paying or allowing for the same in account at the contract rates, or in the case of contract rates not being applicable at current market rates, to be certified by the Commissioner, MBMC whose certificate thereof shall be final.

In the alternative, the Commissioner, MBMC may, after giving notice in writing to the contractor or his clerk of the work, foreman or other authorized agent require him to remove such tools, plants, materials or stores from the premises within a time to be specified in such notice; and in the event of the contractor failing to comply with any such requisition, Commissioner, MBMC may remove them at the Contractor's expenses or sell them by auction or private sale on account of the Contractor and at his risk, in all respects, and the certificate of the Commissioner, MBMC as to the expenses of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the contractor.

**CLAUSE 6** :-

If the contractor shall desire an extension of the time for completion of the work on the ground of his having been unavoidably hindered in his execution or on any other ground, he shall apply in writing to the Executive Engineer before the expiration of the period stipulated in the tender or before the expiration of 30 days from the date to which he was hindered as aforesaid or on which the case for asking for extension occurred, whichever is earlier and the Executive Engineer may, if in his opinion there are reasonable grounds granting an extension, grant such extension as he thinks necessary or proper. The decision of the Executive Engineer in this matter be final.

**Clause 6 A** :- In the case of delay in handing over the land required for the work due to unforeseen cause, the contractor shall not be entitled for any compensation whatsoever from the MBMC on the ground that the machinery or labour was idle for certain period. Contractor may, however apply for extension of time limit which may be granted on the merit of the case.

**CLAUSE 7:- Final certificate**

On Completion of the work the Contractor shall be furnished with the certificate by the Executive Engineer hereinafter called the Engineer-in-charge of such completion but no such certificate shall be given nor shall the work be considered to be complete until the Contractor shall have been all scaffolding. Surplus material and Rubbish and shall have been cleaned, the dirt from all the wood work, doors, windows, walls, floor or other parts of the building in or up. On which the work has been executed or of which he may have has possession for the purpose of executing the work, nor until the works shall have been measured by the Engineer-in-Charge or where the measurements have been taken by his subordinates until they have received the approval of the Engineer-in-Charge the said measurements

being, binding and conclusive against the Contractor. If the Contractor shall fail to comply with the requirements of this clause as to the removal of scaffolding surplus material and Rubbish and cleaning off dirt on or before the date fixed for the completion of the work, the Engineer-in-charge may at the expenses of Contractor remove such scaffolding surplus materials and Rubbish and dispose of the same as he thinks fit and clean off such dirt as aforesaid and the Contractor shall for with the pay amount of all expenses so incurred but shall have no claim in respect of any such scaffolding or surplus materials as aforesaid except for any sum actually raised by the sale thereof

**CLAUSE 8:- Payment on intermediate certificate to be regarded as advance.**

No payment shall be made for any work, estimated to cost less than Rupees one thousand till the whole of work shall have been completed and a certificate of completion given. But in the case of works estimated to cost more than Rupees one thousand, the contractor shall on submitting a monthly bill therefor be entitled to receive payment proportionate to the part of the work then approved and passed by the Engineer-in-charge whose certificate of such approval and passing of the sum so payable shall be final and conclusive against the contractor. All such intermediate payments shall be regarded as payments by way of advance / on account bills against the final payments only and not as payments for work actually done and completed and shall not preclude the Engineer-in-charge from requiring any bad, unsound, imperfect or unskillful work to be removed or taken away and reconstructed, or re-erected, nor shall any such payment be considered as an admission of the due performance of the contract or any part thereof in any respect or the accruing of any claim, nor shall it conclude, determine or affect in any other way the powers of the Engineer-in-charge as to the final settlement and adjustment of the accounts or otherwise, or in any other way vary or effect the contract. The final bill shall be submitted by the contractor within one month of the date fixed for the completion of the work, otherwise the Engineer-in-charge's

certificate of the measurements and of the total amount payable for the work shall be final and binding on all parties.

**CLAUSE 9:- Payment At reduced rates on account of items of work not accepted as completed, to be at the discretion of the Engineer-in -charge.**

The rates for several items on work estimated to cost more than Rs. 1000/- agreed to within, shall be valid only when the item concerned is accepted as having been completed fully in accordance with the sanctioned specifications. In case where the items of work are not accepted as so completed the Engineer-in-charge may make payment on account of items at such reduced rates as he may consider reasonable in the preparation of final or on accounts bill.

**CLAUSE No. 10:- Bills to be submitted monthly**

A bill shall be submitted by the Contractor in each month on or before the date fixed by the Engineer- in-charge for all work executed in the previous month and the Engineer -in-charge shall take or cause to be taken requisite measurement for the purpose of having the same verified and the claim so far as it is admissible, shall be adjusted and paid if possible, within 10 days from the presentation of the bill. If the Contractor does not submit the bill within the time fixed as aforesaid, the Engineer- in-charge may depute a subordinate to measure the said work in the presence of the Contractor or his duty authorized agent whose counter signature to the measurement list shall be sufficient warrant, and the Engineer-in-charge may prepare a bill from such list which shall be binding on the Contractor in all respects.

**CLAUSE 11:- Bills to be on printed forms**

The Contractor shall submit all bills on the printed forms to be had on application at the office of the Engineer-in-charge. The charges to be made in the bills shall always be entered at the rates specified in the tender or in the case of any extra work ordered in pursuance of these conditions and not mentioned or provided for in the tender, at the rates hereinafter provided for such work.

**CLAUSE 12:- Stores supplied by Corporation**

Contractor has to make his own Store arrangement.

**CLAUSE 12 (A):- Storage of controlled material**

All stores of controlled materials such as cement, steel, etc. procured by the Contractor, should be kept by the Contractor under lock and key and they will be accessible for inspection by the Executive Engineer or his authorized agent at all the times.

**CLAUSE 13:- Works to be executed in accordance with specifications, drawings, orders, etc.**

The Contractor shall execute the whole and every part of the work in the most substantial and workman like manner, and both as regards material and in every other respect in strict accordance with specifications. The Contractor shall also confirm exactly, fully and faithfully to the designs, drawings and instructions in writing relating to the work signed by the Engineer-in-Charge and loaded in his office and to which the Contractor shall be entitled to have access for the purpose of inspections at such office or In the site of the work during office hours. The Contractor will be entitled to receive one sets of contract drawings and working drawings as well as one certified copy of the accepted tender along with the work order free of cost.

**CLAUSE 14 :- Alterations in specifications and designs not to invalidate contracts.**

The Engineer-in-charge shall have power to make any alterations in or additions to the original specifications, drawings, designs, and instructions that may appear to him to be necessary or advisable during the progress of the work and the contractor shall be bound to carry out the work in accordance with any instructions in this connection which may be given to him in writing, signed by the Engineer-in-charge and such alteration shall not invalidate the contract and any additional work which the contractor may be directed to do in the manner above specified as part of the work, shall be carried out by the contractor on the same conditions in all respects on which he agreed to do the main work, and at the same rates as are specified in the tender for the main work. And if the additional and altered work

includes any class of work for which no rate is specified in this contract, then such class of work shall be carried out at the rates entered in the Schedule of Rates of the Corporation or relevant Government departments, prevailing at the time when the extra items crop up or at the rates mutually agreed upon between the Engineer-in charge and the contractor, whichever are lower.

Rates for works not entered in estimate or Schedule of rates

If the additional or altered work for which no rate is entered in the Schedule of Rates, is ordered to be carried out before the rates are agreed upon then, the contractor shall within seven days of the date of receipt by him of the order to carry out the work, inform the Engineer-in-Charge of the rate which it is his intention to charge for such class of work, and if the Engineer-in-Charge does not agree to this rate, he shall by notice in writing be at liberty to cancel his order to carry out such class of work and arrange to carry it out in such manner as he may consider advisable, provided always that if the contractor shall commence work or incur any expenditure in regard thereto before the rates shall have been determined, as lastly hereinbefore mentioned, then in such case, he shall only be entitled to be paid in respect of the work carried out or expenditure incurred by him prior to the date of the determination of the rate as aforesaid according to such rate or rates as shall be fixed by the Engineer-in-Charge. In the event of a dispute, the decision of the Commissioner will be final.

Where, however, the work is to be executed according to the designs, drawings and specifications recommended by contractor and accepted by the competent authority, the alternation above referred to shall be within the scope of such designs, drawings and specifications appended to the tender.

Extensions of time in consequence of additions & alterations

The time limit for the completion of the work shall be extended in the proportion that the increase in its cost occasioned by alternations or additions bears to the cost of the original contract work, and the certificate of the Engineer-in-charge as to such proportion shall be conclusive.

**CLAUSE 15:- No claim to any payment or compensation for alteration in or restriction of work**

a) If at, any time after the execution of the contract documents, the Engineer shall for any reason what-so-ever (other than default on the part of the contractor for which the Corporation is entitled to rescind the contract) desire that the whole or any part of the work specified in the tender should be suspended for any period of that the whole or part of the work should not be carried out at all, he shall give to the contractor a notice in writing of such desire and upon the receipt of such notice the contractor shall forthwith suspend or stop the work wholly or in part as required, after having due regard to the appropriate stage at which the work should be stopped or suspended so as not to cause any damage or injury to the work already done or endanger the safety thereof, provided that, the decision of the Engineer as to the stage at which the work or any part of it could be or could have been safely stopped or suspended shall be final and conclusive against the contractor. The contractor shall have no claim to any payment or compensation whatsoever, by reason of or in pursuance of any notice as aforesaid, on account of any suspension, stoppage or curtailment except to the extent specified hereinafter.

b) Where the total suspension of work ordered as aforesaid continued for a continuous period exceeding 90 days, the contractor shall be at liberty to withdraw from the contractual obligations under the contract so far as it pertains to the unexecuted part of the work by giving a 10 days prior notice in writing to the Engineer, within 30 days of the expiry of the said period of 90 days, of such intention and requiring the Engineer to record the final measurements of the work already done and to pay the final bill. Upon giving such notice the contractor shall be deemed to have been discharged from his obligation to complete the remaining un-executed work under this contract. On receipt of such notice the Engineer shall proceed to complete the measurement and make such payment as may be finally due to the contractor within a period of 90 days from the receipt of such notice in respect of the work already done by the contractor. Such payment

shall not in any manner prejudice the right of the contractor to any further compensation under the remaining provisions of this Clause.

c) Where the Engineer requires the contractor to suspend the work for a period in excess of 30 days at any time or 60 days in the aggregate, the contractor shall be entitled to apply to the Engineer within 30 days of the resumption of work after such suspension, for payment of compensation to the extent of pecuniary loss suffered by him in respect of working machinery rendered idle on the site or on the account of his having had to pay the salary or wages of labour engaged by him during the said period of suspension, provided always that the contractor shall not be entitled to any claim in respect of any such working machinery, salary or wages for the first 30 days whether consecutive or in the aggregate of such suspension or in respect of any suspension what-so-ever occasioned by unsatisfactory work or any other default on his part. The decision of the Engineer in this regard shall be final and conclusive against the contractor.

d) In the event of

i. Any total stoppage of work on notice from the Engineer under Sub clause 1) in that behalf.

ii. Withdrawal by the Contractor from the contractual obligations to complete the remaining unexecuted work under sub-clause 2) on account of continued suspension of work for a period exceeding 90 days.

Curtailment in the quantity of item or items originally tendered on account of any alteration, omission or substitution in the specifications, drawings, designs, or instructions under Clause 14, where such curtailment exceeds 25 % in quantity and the value of the quantity curtailed beyond 25 % at the rates for the item Specified in the tender is more than Rs. 5,000.

It shall be open to the contractor, within 90 days from the service of (i) the notice of stoppage of work or (ii) the notice of withdrawal from the contractual obligations under the contract on account the continued suspension of work or (iii) notice under Clause 14 resulting in such curtailment, to produce to the Engineer

satisfactory documentary evidence that he had purchased or agreed to purchase material for use in the contracted work before receipt by him the notice of stoppage, suspension or curtailment and require the Corporation to take -over on payment such material at the rates determined by the Engineer provided, however, such rates shall in no case exceed the rates at which the same were acquired by the contractor. The Corporation shall thereafter take over the material so offered, provided the quantities offered are not in excess of the requirements of the unexecuted work as specified in the accepted tender and are of quality and specifications approved by the Engineer.

**CLAUSE 15 (A):- No claim to compensation on account of loss due to delay in supply of material by MBMC if any.**

Contractor shall not be entitled to claim any compensation from the MBMC for the loss suffered by him on account of delay by MBMC in the supply of materials entered in schedule "A" where such delay is caused by

- I) Difficulties relating to the supply of railway wagons.
- II) Force majeure.
- III) Act of God.
- IV) Act of enemies of the state or any other reasonable cause beyond control of Government.

In case of such delay in the supply of material, the MBMC shall grant such extension of time for the completion of the works as shall appear to the Executive Engineer to be reasonable in accordance with the circumstances of the case. The decision of the Executive Engineer as to the extension of time shall be accepted as final by the Contractor.

**CLAUSE 16:- Time limit for unforeseen claims.**

Under no circumstances whatsoever, shall the contractor be entitled to any compensation from Corporation on any account unless the contractor shall have submitted a claim in writing to the Engineer-in-Charge within one month of the case of such claim occurring.

**CLAUSE 17:- Action & compensation payable in case of bad work**

If at any time before the security deposit or any part thereof, is refunded to the contractor, it shall appear to the Engineer-in-Charge or his subordinate in charge of the work, that any work has been executed with unsound, imperfect or unskillful workmanship or with materials of inferior quality, or that any materials or articles provided by him for the execution of the work are unsound, or of a quality inferior to that contracted for or are otherwise not in accordance with contract, it shall be lawful for the Engineer-in-Charge to intimate this fact in writing to the contractor and then notwithstanding the fact that the work, materials or articles complained of may have been inadvertently passed, certified and paid for, the contractor shall be bound forthwith to rectify, or remove and reconstruct the work so specified in whole or in part, as the case may require, or if so required, shall remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost and in the event of his failing to do so within a period to be specified by the Engineer-in-Charge in the written intimation aforesaid, the contractor shall be liable to pay compensation at the rate of one percent of the amount of the estimate for every day not exceeding ten days during which the failure so continues and in the case of any such failure the Engineer-in-Charge may rectify or remove, and re-execute the work or remove and replace the materials or articles complained of as the case may be at the risk and expense in all respects of the contractor should the Engineer-in-Charge consider that any such inferior work or materials as described above may be accepted or made use of it shall be within his discretion to accept the same at such reduced rates as he may fix therefor.

**CLAUSE 18:- Work to be open inspection. Contractor or responsible agent to be present**

All works under or in course of execution or executed in pursuance of the contract shall at all times be open to the inspection and supervision of the Engineer-in-Charge and his subordinates, and the contractor shall at all times during the usual working hours, and at all other times at which reasonable notice of the intention of the Engineer-in-Charge and his subordinate to visit the work shall have been given to the Contractor, either himself be present to receive orders and instructions or have responsible agent duly authorized in writing present for that purpose. Orders given to the Contractor's duly authorized agent shall be considered to have the same force and effect as if they had been given to the contractor himself.

**CLAUSE 19:- Notice to be given before the work is covered.**

The contractor shall give not less than five days notice in writing to the Engineer-in-Charge or his subordinate in charge of the work before covering up or otherwise placing beyond the reach of measurement, any work in order that the same may be measured and correct dimensions thereof taken before the same is so covered up or place beyond the reach of measurement and shall not cover up or place beyond the reach of measurement any work without the consent in writing of the Engineer-in-charge or his subordinate in charge of the work and if any work shall be covered up or placed beyond the reach of measurement, without such notice having been given or consent obtained, the same shall be uncovered at the contractors expense and in default thereof no payment or allowance shall be made for such work or for the materials with which the same was executed.

**Clause 20: Contractor liable for damage done and for imperfection**

If during the period of 24 months from the date of completion as certified by the Engineer-in-Charge pursuant to Clause-7 of the Contract or 24 months after commissioning the work, whichever is earlier in the opinion of the Commissioner, MBMC., the said work is defective in any manner whatsoever, the contractor shall forthwith on receipt of notice in that behalf from the Commissioner, MBMC, duly

commence execution and completely carry out at his cost in every respect all the work that may be necessary for rectifying and setting right the defects specified there-in including dismantling and re-construction of un-safe portion strictly in accordance with and in the manner prescribed and under the supervision of the Commissioner, MBMC. In the event of the Contractor failing or neglecting to commence execution of the said rectification work within the period prescribed thereof in the said notice and / or to complete the same as aforesaid as required by the said notice, Commissioner, MBMC shall get the same executed and carried out departmentally or by any other contractor at the risk on account and at the cost of the Contractor. The Contractor shall forthwith on demand pay to the Corporation the amount of such costs, charges and expenses sustained or incurred by the Corporation of which the certificates of the Commissioner, MBMC shall be final and binding on the contractor. Such cost, charges and expenses shall be deemed to be arrears of land revenue and in the event of the Contractor failing or neglecting to pay the same on demand as aforesaid without prejudice to any other rights and remedies of the Corporation; the same may be recovered from the contractor as arrears of land revenue. The Corporation shall also be entitled to deduct the same from any amount which may then be payable or which may thereafter become payable by the Corporation to the Contractor either in respect of the said work or any other work whatsoever or from the amount of security deposit retained by the Corporation.

**ANNEXURE TO CLAUSE 20:**

**The defect liability period shall be as under**

(DELETED)

**Clause 21: Contractor to supply plant, ladder, scaffolding etc.**

The Contractor shall supply at his own cost all materials (except such special materials if any, as may in accordance with the contract, be supplied from the

Corporation stores), plant, tools, appliances, implements, ladders, cordage, tackle, scaffolding and temporary works requisite or proper for the proper execution of the work, whether, in the original, altered or substituted form and whether included in the specification or other documents forming part of the contract or referred to in these conditions or not and which may be necessary for the purpose of satisfying or complying with the requirements of the Engineer-in-Charge as to any matter as to which under these conditions he is entitled to be satisfied, or which he is entitled to require together with the carriage therefor to and from the work. The Contractor shall also supply without charge the requisite number of persons with means and materials necessary for the purpose of setting out works and counting, weighing and assisting in the measurement or examination at any time and from time to time of the work or the materials, failing which the same may be provided by the Engineer-in-Charge at the expense of the contractor and the expenses may be deducted from any money due to the contractor under the contract or from his security deposit or the proceeds of sale thereof, or of a sufficient portion thereof.

*And is liable for damages arising from non provision of lights, fencing etc.*

The contractor shall provide all necessary fencing and lights required to protect the public from accident and shall also be bound to bear the expenses of defense of every suit, action or other legal proceeding, that may be brought by any person for injury sustained owing to neglect of the above precautions, and to pay any damages and costs which may be awarded in any such suit, action or proceedings to any such persons, or which may with consent of the contractor be paid for compromising any claim by any such persons.

**Clause 21 (A): Scaffolds to comply with regulations**

The Contractor shall provide suitable scaffolds and working platforms, gangways and stairways and shall comply with the following regulations in connection therewith.

- a) Suitable scaffolds shall be provided for workmen for all works that cannot

be safely done from a ladder or by other means.

- b) A scaffold shall not be constructed, taken down or substantially altered except
  - i. Under the supervision of a competent and responsible person; and
  - ii. As far as possible by competent workers possessing adequate experience in this kind of work.
- c) All scaffolds and appliances connected therewith and ladders shall
  - i. Be of sound material,
  - ii. Be of adequate strength having regard to the loads and strains to which they will be subjected, and
  - iii. Be maintained proper completion.
- d) Scaffolds shall be so constructed that so part thereof can be displaced in consequence of normal use.
- e) Scaffold shall not be over-loaded and so far as practicable the load shall be evenly distributed.
- f) Before installing lifting gear on scaffolds special precautions shall be taken to ensure the strength and stability of the scaffolds.
- g) Scaffolds shall periodically inspected by a completed person.
- h) Before allowing a scaffold to be used by his workmen, the contractor shall whether the scaffold has been erected by his workmen or not, take steps to ensure that it complies fully with the regulation here-in specified
- i) Working platform, gangways and stairways shall:
  - i) Be so constructed that no part thereof can sag unduly or unequally.
  - ii) Be so constructed and maintained, having regard to the prevailing conditions as to reduce as far as practicable risks of persons tripping or slipping, and
  - iii) Be kept free from any unnecessary obstruction.
- j) In the case of working platform, gangways, working places and stairways at a height exceeding 3 Meters.
  - i) Every working platform and every gangway shall be closely boarded

unless other adequate measures are taken to ensure safety

- ii) Every working platform and gangway shall have adequate width and
- iii) Every working platform, gangway, working place and stairway shall be suitably fenced.
- k) Every opening in the floor of a building or in a working platform shall except for the time and to the extent required to allow the excess of persons or the transport or shifting of material, be provided with suitable means to prevent the fall of persons or materials.
- l) When persons are employed on roof where there is a danger of falling from a height exceeding 3 meters suitable precautions shall be taken to prevent fall of persons or materials.
- m) Suitable precautions shall be taken to prevent persons being struck by articles which might fall from scaffolds or other working places.
- n) Safe means of access shall be provided to all working platforms and other working places.

**Clause-21(B): Hoisting appliances to comply with regulations**

The contractor shall comply with the following regulations as regards the Hoisting Appliances to be used by him

- a) Hoisting machine and tackle, including their attachments, anchorages and supports shall
  - i. Be of good mechanical construction, sound material and adequate strength and free from patent defect and
  - ii. Be kept in good repair and in good working order.
- b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of suitable quality and adequate strength and free from patent defect.
- c) Hoisting machines and tackle shall be examined and adequately tested after erection on the site and before use and be re-examined in position at intervals to be prescribed by the Corporation.

- d) Every chain, ring, hook, shackle swivel and pulley block and in hoisting or lowering materials or as a means of suspension shall be periodically examined.
- e) Every crane driver or hoisting appliance operator shall be properly qualified.
- f) No person who is below the age of 18 years, shall be in control of any hoisting machine, including any scaffold, or shall give signals to the operator.
- g) In the case of every hoisting machine and of every chain, ring, hook, shackle, swivel and pulley block used in hoisting or lowering or as means of suspension, the safe working load shall be ascertained by adequate means.
- h) Every hoisting machine and all gear referred to in preceding regulation shall be plainly marked with the safe working load.
- i) In the case of a hoisting machine, having a variable safe working load, each safe working load and the conditions under which it is application, shall be clearly indicated.
- j) No part of any hoisting machine or of any gear referred to in regulation (g) above shall be loaded beyond the safe working load except for the purpose of testing.
- k) Motors, gearing transmissions, electric wiring and other dangerous part of hoisting appliance shall be provided with efficient safeguards.
- l) Hoisting appliances shall be provided with such means as will reduce to a minimum the risk of the accidental descent of the load.
- m) Adequate precautions shall be taken to reduce to a minimum the risk of any part of a suspended load becoming accidentally displaced.

**Clause-22: Measure for prevention of fire**

The Contractor shall not set fire to any standing jungle, trees, brushwood or grass without a written permit from the Engineer in Charge. When such permit is given and also in all cases when destroying cut or dug up trees, brushwood, grass etc. by fire; the contractor shall take necessary measure to prevent such fire spreading to or otherwise damaging surrounding property.

**Clause 23: Liability of contractor for any damage done in or outside work area**

Compensation for all damages done intentionally or unintentionally by Contractor's labour whether in or beyond the limits of Corporation property including any damage caused by the spreading of fire mentioned in clause 22, shall be estimated by the Engineer-in-charge or such other officer as he may appoint and the estimate of the Engineer-in-charge, subject to the decision of the Commissioner on appeal, shall be final and the contractor shall be bound to pay the amount of assessed compensation on demand, failing which, the same will be recovered from the contractor as damages in the manner prescribed in Clause-1 or deducted by the Engineer-in-charge from any sums that may be due or become due from Corporation to contractor under this contract or otherwise. The Contractor shall bear the expenses of defending any action or other legal proceeding that may be brought by any persons for injury sustained by him owing to neglect of precautions to prevent the spread of fire and he shall pay any damages and cost that may be awarded by the Court in consequence.

**Clause 24: Employment of female labour**

The employment of female labours on works in neighborhood of soldier's barracks should be avoided as far as possible.

**Clause 25 : Work on Sundays**

No work shall be done on a Sunday without the sanction in writing of the Engineer-in-charge.

**Clause 26: Rescission of contract for subletting work without approval or by Binding public officer**

The Contract shall not be assigned or sublet without the written approval of the Engineer-in-charge and if the contractor shall assign or sublet his contract, or attempt so to do, or become insolvent or commence any proceeding to get himself adjudicated and insolvent or make any composition with his creditors or attempt so to do or if possible bribe, gratuity, gift, loan perquisite, reward or advantage pecuniary or otherwise, shall either directly or indirectly be given, promised or offered by the Contractor or any of his servants or agents to any public officer or person in the employment of Corporation in anyway relating to his office or employment, or if anyway directly or indirectly interested in the contract, the Engineer-in-charge may thereupon by notice in Writing, rescind the contract and

security deposit of the contractor shall thereupon stand forfeited and be absolutely at the disposal of Corporation and the same consequences shall ensure, as if the contract had been rescinded under clause-3 hereof and in addition the contractor shall not be entitled to recover or be paid for any work therefor actually performed under the contract.

**Clause 27: Sum payable by way of compensation to be considered as reasonable compensation without reference to actual loss.**

All sums payable by a contractor by way of compensation under any of these conditions shall be considered as a reasonable compensation to be applied to the use of Corporation without reference to the actual loss or damage sustained, and whether any damage has or has not been sustained.

**Clause 28: Changes in the constitution of firm to be notified**

In the case of tender by partners, any changes in the constitution of a firm shall be forthwith notified by the Contractor to the Engineer-in-charge for his information.

**Clause 29: Works under direction and control of the Employer**

All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the Commissioner, MBMC, who shall be entitled to direct at what point or points and in what manner they are to be commenced and from time to time carried on.

**Clause 30: Decision of Engineer in charge to be final**

Except where otherwise specified in the contract and subject to the powers delegated to him by Corporation, the decision of the Engineer in charge shall be final, conclusive and binding on all parties to the contract, upon all questions relating to the meaning of the specifications, designs, drawings and instructions hereinbefore mentioned and as to the quality of workmanship, or materials used on the work, or as to any other question, claim, right, matter or thing whatsoever, if anyway arising out of, or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or other conditions or otherwise concerning the works, or the execution, or failure to execute the same, whether arising during the progress of the work or after the completion or abandonment thereof.

The Contractor may appeal to the Commissioner if the Contractor is not satisfied with the order passed by the Engineer in Charge as aforesaid, he may within thirty days of receipt by him of any such order, appeal against it to the Commissioner provided that

- a) The accepted value of the contract exceeds Rs.10.00 Lakh (*Rupees Ten Lakh*)
- b) Amount of claim is not less than Rs.1.00 Lakh (*Rupees One Lakh*)

The Commissioner's decision in the matter shall be conclusive, final and binding on the Contractor.

**Clause-31: Stores of European or American manufacture to be obtained from the**

**Corporation**

**Deleted.**

**Clause 32: Lump sum in estimates**

When the estimate on which a tender is made includes lump sums in respect of parts of the work, the contractor shall be entitled to payment in respect of the items of work involved or the part of work in question at the same rates as are payable under this contract for each item, or if the part of work in question is not in the opinion of the Engineer-in-charge capable of measurement, the Engineer-in-charge may at his discretion, pay the lump sum amount entered in the estimate and the certificate in writing of the Engineer-in-charge shall be final and conclusive against the contractor with regard to any sum or sums payable to him under the provision of this clause.

**Clause 33: Action where no specifications laid down**

In the case of any class of work for which there is no such specification as is mentioned in Rule 1 of Form B1, such work shall be carried out with the Corporation's specification & in the event of there being no Corporation's specification, then in such case the work shall be carried out in all respects in accordance with all instructions and requirements of the Engineer-in-charge.

**Clause 34: Definition of "work"**

The expression "Works" or "Work" where used in these conditions, shall, unless there be something in the subject or context repugnant to such construction, be construed to mean the works contracted to be executed under or in virtue of the contract, whether temporary or permanent and whether original, altered substituted or additional.

**Clause 35: Contractor's percentage whether applied to net or gross amount of bill**

The percentage referred to in the tender shall be deducted from / added to the gross amount of the bill before deducting the value of any stock issued.

**Clause 36: Payment of quarry fees, royalties etc.**

All quarry fees, royalties, octroi dues/cess and ground rent for stacking materials, if any, shall be paid by the contractor.

**Clause 37: Workmen related**

The contractor shall be responsible for and shall pay any compensation to his workmen payable under the Workman's Compensation Act 1923 (VIII of 1923) (hereinafter called the said Act) for injuries caused to the workmen. If such compensation is payable or paid by Corporation as Principal under Sub-section (1) of section 12 of the said Act on behalf of the contractor, it shall be recoverable by Corporation from the Contractor under sub-section (2) of the said section. Such Compensation shall be recovered in the manner laid down in the Act.

**Clause 37 (A): Compensation under Workmen's Compensation Act**

The Contractor shall be responsible for and shall pay the expenses of providing medical aid to any workmen who may suffer a bodily injury as a result of an accident. If such expenses are incurred by Corporation, the same shall be recoverable from the Contractor forthwith and be deducted without prejudice to any other remedy of Corporation, from any amount due or that may become due to the Contractor.

**Clause 37 (B): Medical Aid to workmen**

The Contractor shall provide all necessary personal safety equipment and first aid apparatus available for use of the persons employed on the site and shall maintain the same in condition suitable for immediate use at any time and shall comply with the following regulations in connection therewith.

- a) The workers shall be required to use the equipment so provided by the Contractor and the Contractor shall take adequate steps to ensure proper use of the equipment by those concerned.
- b) When work is carried on in proximity to any place where there is a risk of drowning, all necessary equipment shall be provided and kept ready for use and all necessary steps shall be taken for the prompt rescue of any person in danger.
- c) Adequate provision shall be made for prompt first-aid treatment of all Injuries likely to be sustained during the course of the work.

**Clause 37 (C): The Apprentices Act, 1961**

The contractor shall duly comply provision of "The Apprentices Act, 1961 (III)", the rules made there under and the orders that may be Issued from time to time under the said Act & the said rules and on his failure or neglect to do so, be subject to all the liabilities and penalties by the said Act and said Rules.

**CLAUSE 38:- Claim for quantities entered in the tender or estimates.**

1. Quantities in respect of the several items shown in the tender are approximate, and no revision in the tendered rate shall be permitted in respect of any of the items so long as, subject to any special provision contained in the specifications, prescribing different percentage of permissible variations, the quantity of the item does not exceed the tender quantity by more than 25 percent or so long as the value of the excess quantity beyond the limit of tender quantities at the rate of the item specified in the tender, is not more than Rs. 5,000/- (whichever is more)
2. The Contractor shall, if ordered in writing by the Executive Engineer so to do also carry out any quantities in excess of the limit mentioned in sub-clause (1) hereof on the same conditions as and in accordance with the specifications in the tender and at the rates (i) derived from the rates entered in the current schedule of rates and in the absence of such rates, (ii) at the rate prevailing in the market, the said rates being increased or decreased as the case may be by the percentage which the total

tendered amount bears to the estimated cost of the works as put to tender based upon the schedule of rates applicable to the year in which the tender were invited (For purpose of operation of this clause, this cost shall be taken to be RS.1,10,00,000/- (Rupees One Corers ten Lacs Only.) as per DSR 2016-17.

4. Claims arising, out of reduction in the tendered quantity, of any item beyond 25% will be governed by the provisions of clause 15 only when the amount of such reduction beyond 25% at the rate of item specified in the tender is more than Rs. 5,000/- This reduction is exclusively of the reduction mentioned in clause No 14 & 15 of work and site condition.
5. This Clause is not applicable to extra items.
6. There is no change in the rate if the excess is more than 25% of the tendered quantity, but the value of the excess work- at the tendered rates does not exceed Rs. 5,000/-
7. The quantities to be paid at tendered rate shall include :-  
Tendered quantity plus.  
25% excess of the tendered quantity or the excess quantity of the value of Rs.5000/- at the tendered rate whichever is more.
8. In the Schedule B any probable item is included without stating its quantity but by stating the rate for such item, then the tendered quantity for such item shall be treated as Zero for applicability of this clause.
9. Till approval for excess quantity is accorded by competent authority interim payment will only be released as under:-
  - a) At accepted tender rate or current schedule rate whichever is less for quantity exceeding Schedule-B quantity by 25% or of cost upto Rs.5000 (i.e. for entire quantity exceeding the quantity stated in the tender subject to condition that total expenditure on the tendered work shall not exceed sanctioned cost of the scheme.
  - b) The balance payment due as per provision of clause 38 will be released by the Engineer-in-Charge only after approval from the competent authority is received by him.

Note:

If the quantity stated in the tender exceeds the tender quantity, i.e. quantity under Clause 38 the Executive Engineer shall obtain approval for excess quantity involved from The Commissioner Mira Bhaindar Municipal Corporation authorities according to power delegated to them as the case may be.

**Clause – 38-A** : Till approval for excess quantity are accorded by competent authority interim 50% payment will be released as under :

- a) At accepted tender rate or current schedule rate whichever is less for (i.e. entire quantity exceeding quantity stated in the tender subject to condition that total expenditure on the tendered work shall not exceed accepted tender cost.

- b) The excess quantity beyond 25% will be paid at tendered rate of CSR rate whichever is minimum till approval of the competent authority is received subject to the condition that total expenditure shall not exceed accepted tender cost.
- c) The balance payment due as per provision of Clause-38 will be released by the Engineer-in-Charge only after approval from the competent authority is received by him.

**Clause – 38-B :Deleted.**

**Clause 39: Employment of famine labour etc.**

The Contractor shall employ any famine, convict or other labour of a particular kind or class if ordered in writing to do so by the Engineer-in-charge.

**Clause 40: Claim for compensation for delay in starting the work**

No compensation shall be allowed for any delay caused in the starting of the work on account of acquisition of land or in the case of clearance works on account of any delay accorded in sanction of estimates and release of any payments.

**Clause 41: Claims for compensation for delay in execution of work**

No compensation shall be allowed for any delays in the execution of the work on account of water, standing in borrow pits or compartments. The rates are inclusive for hard or cracked soil, excavation in mud, sub-soil water or water standing in borrow pits and no claim for an extra rate shall be entertained, unless otherwise expressly specified.

**Clause 42: Entering upon or commencing any portion of work**

The contractor shall not enter upon or commence any portion of work except with the written instructions of the Engineer-in-charge or his subordinate in charge of the work. Failing such authority, the contractor shall have no claim to ask for measurement of or payment for work.

**Clause 43 : Minimum age of persons employed and the payment**

- a) No contractor shall employ any person who is under age of 18 years.
- b) The Engineer-in-charge or his Agent is authorized to remove from the work any person found working which does not satisfy these conditions and no responsibility shall be accepted by Corporation for any delay caused in the completion of the work by such removal.
- c) The Contractor shall pay fair and reasonable wages exceeding those stipulated in Minimum Wages Act of 1918 and its subsequent amendments, applicable to the area in which the work of the contract is located to the workmen employed by him in the contract undertaken by him. In the event of any dispute arising between the Contractor and his workmen on the grounds that the wages paid are not fair and reasonable, the dispute shall be referred without delay to the Commissioner, MBMC. who shall decide the same. The decision of the Commissioner, MBMC shall be conclusive and binding on the Contractor, but such decision shall not in any way affect the conditions in the contract regarding the payment to be made by

- Corporation at the sanctioned tender rates.
- d) Contractor shall provide drinking water facilities to the workers. Similar amenities shall be provided to the workers engaged on large work in urban areas. Contractor to take precaution against accidents which take place on account of labour using loose garments while working near machinery.

**Clause 44: Method of payment**

Payment to contractors shall be made by cheque drawn on any Bank within the MiraBhaindar Municipal Corporation Limits.

**Clause 45: Acceptance of conditions compulsory before tendering the work.**

Any contractor who does not accept these conditions shall not be allowed to tender for works. Entering into contract by the contractor with Mira Bhaindar Municipal Corporation by the Contractor shall be considered as incontrovertible proof of acceptance of all conditions of the contract by the Contract.

**Clause 46: Employment of scarcity labour**

If Government declares a state of scarcity or famine to exist in any village situated within 16 Kilometer of the work, the Contractor shall employ upon such parts of the work, as are suitable for unskilled labour, any person certified to him by the Commissioner, MBMC. or be any person to whom the Commissioner MBMC may have delegated this duty in writing to be in need of relief and shall be bound to pay to such person wages not below the minimum which Government may have fixed in this behalf. Any disputes, which may arise in connection with the implementation of this clause, shall be decided by the Commissioner, MBMC whose decision shall be final and binding on the Contractor.

**Clause 47: Contractor's prices not to exceed controlled prices**

The price quoted by the Contractor shall not in any case exceed the control price, if any, fixed by Government or reasonable price which it is permissible for him to charge a private purchaser for the same class and description, the controlled price or the price permissible under Hoarding and Profiteering Prevention Ordinance, 1948, as amended from time to time. If the price quoted exceeds the controlled price or the price permissible under Hoarding and Profiteering Prevention Ordinance, the Contractor will specifically mention this fact in his tender along with the reasons for quoting such higher prices. The purchaser at his discretion will in such case exercise the right of revising the price at any stage so as to conform with the controlled price on the permissible under the Hoarding and Profiteering Prevention Ordinance. This discretion will be exercised without prejudice to any other action that may be taken against the Contractor.

**Clause 48: Rates inclusive of Sales Tax and other taxes**

1. Deleted

**Clause 49 : Local labour to be employed**

The Contractor shall employ at least 80 percent of the total number of unskilled

labour to be employed by him for the work under the contract, from out of the persons ordinarily residing in the district in which site of the said work is located. Provided, however; that if the required number of unskilled labour from that district is not available, the Contractor shall in the first instance employ such number of persons as is available and thereafter may with previous permission in writing of the Engineer-in-charge of the said work, obtain the rest of the requirement of unskilled labour from outside district.

**CLAUSE 50 : Wages to be paid to the skilled & unskilled labour**

Wages to be paid to the skilled and unskilled laborers engaged by the Contractor the Contractor shall pay the laborer skilled and unskilled according to the wages prescribed by the Minimum Wages Act, 1948 applicable to the area in which the work of the Contractor is in progress.

A Contractor shall comply with the provisions of the Apprentice Act, 1961 and the rules and the orders issued there under from time to time. If he fails to do so his failure will be breach of the contract and the Executive Engineer may, in this discretion, cancel the contract. The Contractor shall be liable for any pecuniary liability arising on account of any violation by him of the provision of the act. The Contractor shall pay the laborers skilled and unskilled according to the wages prescribed by the Minimum Wages Act of 1948 applicable to the area in Which the work of the Contractor is in progress.

**Clause 51: The dues from the Contractor deemed to be arrears of the Land Revenue**

All amounts whatsoever which the Contractor is liable to pay to the Corporation in connection with the execution of the work including the amount payable in respect of

- i) materials and or stores supplied / issued hereunder by the Corporation to the contractor
- ii) hire charges in respect of heavy plant, machinery and equipment given on hire by the Corporation to the contractor for execution by him of the work and / or on which advances have been given by the Corporation to the Contractor, shall be deemed to be arrears of the Land Revenue and the Corporation may without prejudice to any other rights and remedies of the Corporation, recover the same from the Contractor as arrears of revenue.

**Clause 52: Compliance with Contract Labour (Regulation and Abolition) Act**

The successful tenders will be required to produce to the satisfaction of the specified concerned authority a valid and consequent license issued in favour under the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 before starting the work. On failure to do so, the acceptance of tender should be liable to be withdrawn and also earnest money/Security Deposit forfeited.

The contractor shall duly comply with all the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 (37 of 1970) and the Maharashtra Contract

Labour (Regulation and Abolition) Rules, 1971, as amended from time to time and all other relevant statutes and statutory provisions, concerning payment of wages, particularly to workmen employed by the Contractor and working on the site of the work. In particular the Contractor shall pay wages to each worker employed by him on the site of the work at the rates prescribed under the Maharashtra Contract Labour (Regulation and Abolition) Rules 1971.

If the Contractor fails or neglects to pay wages at the said rates or makes short payment and the Corporation makes such payment of wages in full or part thereof less paid by the Contractor, as the case may be, the amount so paid by the Corporation to such workers shall be deemed to be arrears of Land Revenue and the Corporation shall be entitled to recover the same as such from the Contractor or deduct same from the amount payable by the Corporation to the Contractor hereunder or from any other amount payable to him by the Corporation.

As per regulation of Govt of Maharashtra Labour Welfare CESS 1% will deducted from each R.A. Bill.

**Clause 53: Engaging apprentices as per Apprenticeship Adviser's recommendations**

The Contractor shall engage apprentices such as bricks-layer, carpenters, wire-men, plumber as well as blacksmith as recommended by the State Apprenticeship Adviser, Directorate of Technical Education, Dhobi Talav, Mumbai on the construction work.

**Clause 54:** Where the work are required to work near Machine and are liable to accident they should not be allowed to wear loose clothes like Dhoti, Jhabba etc.

**Clause 55:** Provision of all applicable Indian Laws shall be treated as applicable for this contract.

**Clause 56:** In view of the difficult position regarding the availability of the Foreign exchange, no foreign exchange, will be released by the Department for the purchase of the Plant and Machinery required for the execution for the work concerned.

**Clause 57: Anti Malaria measures**

- a) The anti malaria and other health measures shall be as directed by the Joint Director (Malaria and Filariasis) of Health Services .
- b) Contractor shall see that mosquitogenic conditions are not created so as to keep vector population to minimum level.
- c) Contractors shall carry out anti malaria measures in the area as per guidelines prescribed under National Malaria Eradication Programme and as directed by the Joint Director (M & F) of Health Services, .
- d) In case of default in carrying out prescribed anti-malaria measure resulting in increase in Malaria incidence, Contractor shall be liable to pay to the Corporation

the amount spent by the Corporation, on anti-malaria measures to control the situation in addition to fine.

- e) Relation With Public Authorities :-The contractor shall make sufficient arrangement for draining Away the sewage, as well as, water coming from the bathing and washing places and shall dispose off this water in such a way as not to cause any nuisance. He shall also keep the premises clean by employing sufficient number of sweepers. The contractor shall comply with all rules, regulations, byelaws and directions given from time to time by any local or public authority in connection with this work and shall pay fees or charges, which are leviable on him without any extra cost to Govt.

**Clause 58: No claim in case of shelving the project**

If the project is shelved by the Corporation before commencement, the contractor will have no right to claim any losses or compensation due to the same and for whatsoever reasons.

**Clause 59: Price Variation Clause ( This clause is not applicable)**

(deleted)

**Clause No. 60** : The contractor shall provide and maintain barricades, guards, guard rails, temporary bridges and walkways, watchmen, headlights and danger signals illuminated from sunset to sun rise and all other necessary applications and safeguards to protect the work, life, property, the public, excavations, equipment's and materials. Barricades shall be substantial construction and shall be painted such to increase their visibility at night. For any accident arising out of the neglect of above instructions, the contractor shall be bound to bear the expenses of defense of every suit, action or other legal proceedings, at law, that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay all damages and costs which may be awarded in any such suit, action or proceedings to any such person or which may with the consent of the contractor be paid in compromising any claim by any such person.

**Clause No. 61**: The contractor shall provide in the joint names of the Engineer-in-charge and the contractor, insurance cover only from the Government Insurance, Maharashtra State, 264, 1<sup>st</sup> Floor, MHADA, Opp. Kalanagar, Bandra (East), Mumbai-400 051. Insurance policy/policies taken out from any other Corporation will not be accepted. However, if the contractor desires to effect insurance with the local office of any insurance Corporation, the same should be made the Co-Insurance-cum-Insurance. If the policy taken by the contractor is not on Co-Insurance basis. (Director of Insurance 60% and Insurance Co. 40%) the same will not be accepted and the amount of premium calculated by the Director of Insurance will be recovered directly from the amount payable to the contractor. The policy shall cover from the date of work order for the following events which are due to the contractor's risks.

- a) Loss of or damage to the Civil and Mechanical and Electrical equipments supplied/installed including the materials such as pipes, valves, specials etc. brought on site.
- b) Loss of or damage to contractor's equipments including his vehicles.
- c) Loss of or damage to property (except the Works, Plant Material and Equipment) in connection with the contractor; and;
- d) Personal injury or death due to vehicles of the contractor and/or due to any accident that may arise at or around the site to the Contractor's personnel or to the MBMC, staff or to any other person not connected with MBMC /Contractor.

61.1 Policies and certificates for insurance shall be delivered by the Contractor to the Engineer for the Engineer's approval before the date of actual starting of work. All such insurance shall provide for compensation to be payable in the types of proportions of currencies required to rectify the loss or damage incurred.

61.2 If the Contractor does not produce any of the policies and certificates required, the Engineer may effect the insurance for which the contractor should have produced the policies and certificates and recover the premiums it has paid from payments otherwise due to the contractor or, if no payment is due, the payment of the premiums shall be of debt due.

61.3 Alterations to the terms of an insurance shall not be made without the approval of the Engineer.

61.4 The minimum insurance cover for loss and damages to physical property, injury and death shall be 40% of the contract cost per occurrence with number of occurrences as 4 (Four). After each occurrence the contractor shall pay additional premium necessary so as to keep the insurance policy valid always till the defect liability period is over.

61.5 No payment will be released to the contractor until the insurance coverage with the Govt. Insurance fund, Maharashtra State is provided and unless the proof of insurance coverage is produced by the Contractor to the Engineer-in-Charge.

**CLAUSE 62 :Deleted**

**CLAUSE 63:- Disputes**

All disputes and difference arising between Mira Bhaindar Municipal Commissioner and the party in any manner connected with this agreement shall be referred to the Commissioner; MBMC The decision of the Commissioner will be final, conclusive & binding on the parties.

**CLAUSE 64:- (PMC)** : If Mira Bhaindar Municipal Corporation appointed PMC as a construction supervision and management consultant for supervising / monitoring works under this contract. The civil/ mechanical/electrical shall be liable to execute the work under the supervision of PMC. All decisions regarding the work in such cases shall be taken jointly by Mira Bhaindar Municipal Corporation & PMC and in case of any dispute between the PMC and the contractor the decision taken by the Executive Engineer, Mira Bhaindar Municipal Corporation will be final and binding on both the parties. All the work measurements will be taken and recorded by MBMC Engineer.

**ADDITIONAL CLAUSES**

## **MIRA BHINDAR MUNICIPAL CORPORATION, BHAINDAR**

Name of Work : **Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhyander Municipal corporation area.**

### **INSTRUCTIONS TO TENDERER**

#### 1. AWARD CRITERIA:

The MBMC will award the contract to the successful bidder whose bid has been determined to be substantially responsive and has been determined as the lowest evaluated bid provided further that the Bidder is determined to be qualified to perform the contract satisfactorily.

#### 2. ACCEPTANCE OF THE TENDER:

The acceptance of the tender rests with MBMC. The right to reject any or all the tenders without assigning any reason thereof is reserved by MBMC. The tenderer whose tender is accepted will have to enter into regular agreement in the type and form prescribed by MBMC and abide by all the rules embodied therein.

2.10 No corrections, additions or alterations in the tender documents shall be made. No special stipulations in the tender document shall be permitted.

2.20 The Tender shall be liable to be rejected outright if while submitting the same.

i) The tenderer proposes any conditions and alterations in the obligatory conditions of the tender.

ii) If the offer in words and in figures is not filled in ink in appropriate page of B-1 Form or if there is discrimination.

iii) If the specified Earnest Money in specified form is not paid.

iv) Any erasures are made in the tender documents.

2.30 If the tendering contractors are a firm or company, they shall in their forwarding letter should mention the names of all the partners of the firm or the company as the case may be and the names of the partners who hold the power of attorney authorizing him to conduct transactions on behalf of the Company / Firm.

2.40 Rules and conditions of the contract are subject to amendment till the time of acceptance of tender.

2.50 The notes and conditions stipulated in this notice will form a part of the agreement.

3. SIGNING OF CONTRACT:

At the same time as the MBMC notifies the successful Bidder that the bid has been accepted, the MBMC will send the bidder an acceptance letter informing the further necessary line of action including signing of contract etc.

4. FOR SPECIAL ATTENTION OF TENDERER:

The tenderer is expected to visit the site before quoting the tender and get himself acquainted with the site conditions and site requirements.

There may be some local problems which will be required to be tackled by the tenderer. Local suppliers may create problems of supply of sand and metal during execution which shall have to be solved by the successful bidder. On this account no extension of time limit will be granted nor any compensation will be given.

Police Protection, if considered necessary will have to be arranged by the Tenderer at his own cost.

**SPECIAL CONDITION OF  
CONTRACT**

## **MIRA BHINDAR MUNICIPAL CORPORATION, BHAYANDAR**

Name of Work : **Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhayander Municipal corporation area.**

### **SPECIAL CONDITION OF CONTRACT**

#### **1. GENERAL**

These are to apply as additional specifications and conditions unless otherwise already provided for contradictorily elsewhere in this contract.

#### **2. ERRORS, OMISSIONS AND DISCREPANCIES**

- a) In case of errors, omissions, and/or disagreement between written and scaled dimensions on drawing or between drawing, -, and specifications etc. the following order of preference shall apply.
  - i) "Between act" and scaled dimension or descriptions on drawing the later shall be adopted.
  - ii) Between the written or shown description or dimension in the drawing and corresponding one in the specification, the latter shall apply.
  - iv) Between the written description of the item in the schedule of quantities and the detailed description in the specifications of the same items, the latter shall be adopted.
- b) In case of discrepancy between percentage rates quoted in figures and words, the lower of the two will be considered for acceptance of tender.
- c) In all cases of omissions and/or doubts or discrepancies in the dimensions or description or any item or specifications, a reference shall be made to the Executive Engineer, MBMC Bhayandar whose elucidation, elaboration or decision shall be considered as authentic. The Agency shall be held responsible for any errors that may occur in the work through lack of such reference and precaution.
- d) The special provision in detailed specifications and, wording of any item shall gain precedence over corresponding contradictory provision (if any) in the Standard Specifications of MBMC Bhayandar, Department Hand Book where reference to such specifications is given without reproducing the details in the contract.

#### **3. WORKING METHODS AND PROGRESS SCHEDULE:**

##### **3.1 PROGRAM OF WORK**

The work is required to be completed within a period of 12 (Twelve Months).

##### **3.2 a) METHODOLOGY OF CONSTRUCTION AND CONSTRUCTION EQUIPMENTS**

Agency shall furnish at least 15 days in advance his programme of commencement of item of work, the details of actual methods that would be adopted by the Agency for the execution of various items of work supported by necessary detailed drawing and sketches including those of the Plant and Machinery that would be used, their locations, arrangement for conveying and handling materials etc. and obtain prior approval of Engineer-in-charge well in advance of starting of such item of work the Engineer-in-charge reserves the right to suggest modifications or make complete changes in the method proposed by the Agency, whether accepted previously or not at any stage of the work, to obtain the desired accuracy, quantity and progress of the work which shall be binding on the Contactor, and no claim on account of such change in method of execution will be entertained by MBMC Bhayandar so long as specifications of the item remain unaltered. The sole responsibility for the safety and adequacy of the methods adopted by the Agency, will however, rest on the Agency, irrespective of any approval given by the Executive Engineer.

In case of slippage from the approved work programme at any stage, the Agency shall furnish revised programme to make up the slippage within the stipulated time schedule and obtain the approval of the Executive Engineer to the revised programme.

b) CONSTRUCTION EQUIPMENT

The Agency shall be required to give a trial run of the equipments for establishing their capability to achieve the laid down specifications and tolerance to the satisfaction of the Executive Engineer before commencement of the work. All equipment provided shall be of proven efficiency and, shall be operated and maintained at all times, in a manner acceptable to the Engineer and no equipment or personnel will be removed from site without permission of the Executive Engineer.

c) PROGRESS SCHEDULE

The Agency shall furnish. within the period of 15 days of the order to start the work, the programme of work-In CPM/PERT charts in quadruplicate indicating the date of actual start, the monthly progress expected to be achieved and the anticipated completion date of each major item of work to be done by him, also indicating dates of procurement and anticipated completion date of each major item of work to be done by him, also indicating dates to procurement and setting up of material And plant machinery The schedule is to be such as is practicable of achievement towards the completion of whole In the time limit, the particulars Items, If any, on the due dates specified in the contract and shall have the approval of the Engineer-In-charge No revised schedule shall be operative without such acceptance in writing. the Engineer is further empowered to ask for more detailed schedule or schedules say week by week for any item or item, in case of urgency of

work- as will be directed by him and the Agency shall supply the same as and when asked for.

The Agency shall furnish sufficient plant, equipment and labour as may be necessary to maintain the progress of the schedule. The working and shift hours restricted to one shift a day for operations to be done under the MBMC Bhayandar supervision shall be such as may be approved by the Engineer-in-charge. They shall not be varied without the prior approval of the Executive Engineer each time, if requested by the Agency. The Agency shall provide necessary lighting arrangements etc. for night work as directed by Executive Engineer without extra cost.

Further the Agency shall submit the progress report of work-in prescribed form and charts etc. at periodical intervals, as may be specified by the Engineer and submit periodically returns thereof as may be specified by the Engineer-in-charge.

#### **4 CO-ORDINATION**

When several agencies for different sub-work of the Project are to work simultaneously on the Project site, there must be full co-ordination and cooperation between different Agencies to ensure final completion of the whole Project smoothly. The scheduled dates for completion specified in each contract shall therefore, be strictly adhered to. Each Agency may make his independent arrangement for water, power, housing, etc. if they so desire. On the other hand the Agencies are at liberty to mutual agreement in this behalf and make joint arrangement with the approval of the Engineer. No single Agency shall take or cause to be taken by steps or action that may cause, disruption, discontent, or disturbance of work, labour or arrangements etc of other Agency in the Project localities. Any action by any Agency which the Engineer in unquestioned discretion may consider and shall be dealt with as such.

In case of any dispute, disagreement between the Contactors, the Engineer's decision regarding the coordination, co-operation and facilities to be provided by any of the Agencies shall be final and binding on the Agencies concerned and such a decision or decisions shall not vitiate any contract nor absolve the Agency(s) of his/their obligations under the contract nor consider for the grant for any claim or compensation.

#### **5. ASSISTANCE IN PROCURING PRIORITIES, PERMITS, ETC.**

The Executive Engineer, on a written request by the Agency, will if in his opinion, the request is reasonable and in the interest of work and its progress, assist the Agency in securing the priorities for deliveries transport permits for controlled materials etc. where such are needed. The MBMC Bhayandar will not, however, be responsible for the non availability of such facilities or delay in this behalf and no

claim on account of such failures or delay, in this behalf and no claims on account of such failures or delay, shall be allowed by the MBMC Bhayandar.

The Agency shall have to make his own arrangement for machinery required for the work. However, such machinery conveniently available with the Department may be spared as the rules in force on recovery of necessary Security Deposit and rent with agreement in the prescribed form. Such not form a ground for any claim or extension of time limit it for this work.

## **6. QUARRIES**

6.1 No quarries are available with MBMC-Bhayandar. The Agency (s) shall have to arrange the same himself/themselves.

## **7. TEMPORARY QUARTERS AND SITE OFFICE**

7.1 The Agency shall at his own expense maintain sufficient experienced supervisory staff etc. required for the work and shall make his own arrangement, provide housing for them with all Necessary arrangement, including fire preventing measures etc. as directed by the Engineer-in charge.

7.2 The Agency shall provide, furnish, maintain and remove on completion of the work, a suitable office on the work-site for the use of Executive Engineer's representative.

## **8. TREASURE – TROVE**

In the event of discovery-by the Agency or his employees, during the progress of the work of any treasure, fossils, minerals or any other articles of value or interest, the Agency shall give immediate intimation thereof to the Engineer and Forthwith hand over to the Executive Engineer such being property of MBMC, Bhayandar.

## **9. DAMAGE BY FLOODS OR ACCIDENTS.**

The Agency shall take all precautions against damage by floods or like or from accidents etc. No compensation will be paid to the Agency on this account or for correcting and repairing any such damages to the work during construction shall be liable to make good at his cost any plant or material belonging to the Government lostof damaged by floods or from any other clause which is in his charge.

## **10. POLICE PROTECTION**

For the Special protection of camp and of the Agency's works, the Department will help the Agency as far as possible, to arrange for such protection with the concerned authorities, if so required by the Agency in writing. The full cost of such protection shall be borne by the Agency.

## **11. TRAFFIC REGULATION DURING THE WORK**

- 11-1 Unless, Separately provided in the Contract the Contractor shall have to make all necessary arrangements for regulating Traffic, day to night during the period of construction to the entire satisfaction of the Executive Engineer. This includes the construction and maintenance to diversions, if necessary The Agency shall have to provide necessary caution boards Barricades, flags, lights and watchmen etc. so as to comply with the latest Motor Vehicles Rules and Regulator and for traffic safety and he shall be responsible for all claims fro accidents which may arise due to his negligence whether "in Regulation the traffic or in stacking material on the roads or due to any other reasons.
- 11.2 The Agency at all times carry out the work on the "road in a manner creating least interference to the flow of traffic, while consistent with the satisfactory - execution of the same. For all works involving improvements & to the existing road, the Agency shall, in accordance with the directives of the Engineer-in-charge, provide & and maintains during the executing of work a passage for traffic, either along, or part of the existing carriageway under improvement or along a temporary diversion constructed close to the road.

Traffic, safety and control shall be as per clause No. 112.4 of M.O.S.T. specifications for roads and bridges (2nd revision 1990)

## **12 INITIAL MEASUREMENTS FOR RECORD**

Where, for proper measurement of the work, it is necessary to have an initial set of levels or others - measurements taken, the same as recorded in the authorized field book or measurement book of MBMC Bhayandar by the Executive Engineer or his authorized representative will be signed by the Agency who will be entitled to have a true copy of the same made at his cost. Any failure on the part of the Agency to get such levels -etc. recorded before starting work will render him liable to accept the decision of the Executive Engineer as to the basis of taking measurement. Like wise the Agency will not cover any work which will render its subsequent measurements difficult or Impossible without first getting the same jointly measured by himself and the autopsied representative of the Executive Engineer. The record of such measurements on the MBMC Bhayandar side will be signed by the contactor and he will be entitled to have a true copy of the same made at his cost.

## **13 TESTING ETC.:**

The contractor shall make arrangements for testing of all materials for cement concrete, compression test etc. Necessary cubes of 15 cm x 15 cm. Size will be cast as per the directives of the Engineer in charge and as specified in I.S. which shall be tested in Govt. laboratory for compressive strength of mix. The Contractor shall bear all the expenses in this regard and get the cube testing done from approved govt. laboratory.

The weld tests required to be carried out as per the provision of IS shall be at the cost of the contractor and from the reputed Govt. laboratory.

#### **14 MISCELLANEOUS**

- 14.1 Item Quoted by Agency shall be inclusive of all Govt. Taxes e.g. Sales Tax GST etc.
- 14.2 For providing electrical wiring or water lines etc. recesses shall be provided if necessary through walls, slabs, beams etc and later on refilled up with bucks or cement moiled with out any extra cost,
- 14.3 In case it becomes necessary for the due fulfillment of Contract for the Agency to occupy land outside the MBMC Bhayandar limits the Agency will have to make his own arrangement with the land owners and to pay such rents if any are payable as mutually agreed between them.
- 14.4 The special provision, in detailed specification or working of any item shall main precedence over corresponding contradictory provision (if any) in the standard specifications or P. W. D Hand Book where reference to such specification-s is given without reproducing the details in contract.
- 14.5 Suitable separating barricades and enclosures shall be provided to separate material brought by Agency and material issued by MBMC Bhayandar to Agency tender Schedule 'A' same applies for the material obtained from different sources of supply.
- 14.6 The Stacking and storage of construction material at the site shall be in such a manner so as. to prevent deterioration or intrusion of foreign matter and to ensure the preservation of their quality, properties and fitness for the work Suitable precautions shall be taken by the Agency to protect the material against atmospheric actions, fire and other hazards. The materials likely to be carried away by wind shall be stored in suitable stores or with suitable barricades and where there is likely hood of subsidence of soil; such heavy materials shall be stored on approved platforms.
- 14.7 The Agency shall be responsible for making goods the damages done to the existing property during construction -by his men.
- 14.8 If it is found necessary from safety point of view to test any part of the structure, the test shall be carried out by the Agency with the help of the Department at his own cost.
- 14.9 Defective work is liable to be rejected at any stage. The Agency on no account can refuse to rectify the defects merely on reasons that further work has been earned out No extra payment shall be made for rectification.
- 14.10 General directions or detailed description of work, materials item coverage of rate given in the specification are not necessary repeated In the Bill of Quantities. Reference is, however, drawn to the appropriate section clause(s) of the General Specifications in accordance with which the work is to be carried out.

- 14.11 In the absence of specific directions to the contrary the rates prices inserted in the items are to be considered as the full inclusive rate and price for the finished work described there under and are to cover all lab our, materials, wastage, temporary work, plant, overhead charges and profits, as well as, the general liabilities, obligations and risks arising out of the General Conditions of contract.
- 14.12 The quantities set down against the item in the Schedule 'B" is only indicative in nature.
- 14.13 All measurements will be made in accordance with the methods indicated in the specification and read in conjunction with the General Conditions of contract.
- If there is any typographic mistake in units of the quantity or at any other places in such cases the stranded code of practices given in hand book / red book or stranded procedure in MJP will be followed and decision of Executive Engineer in this matter will be final & binding on contractor.
- 14.14 The details shown on drawings and all- other information pertaining to the work shall be treated as indicative and provisional only and are liable to variations as found necessary while preparing working drawings which will be supplied by the MBMC Bhayandar during execution. The Agency shall not on account of which variation be entitled to any increase over the ones quoted in the tender which are on quantity basis.
- 14.15 The, recoveries if any due from Agency will be affected as arrears of land revenue through the collector of the District.
- 14.16 Extraneous materials and steps to minimize dust nuisance during construction shall be as per clause II of M.O.S.T. specifications (Second Edition 1990)

**15 PROTECTION OF UNDERGROUND- TELEPHONE CABLE AND. AERIAL - TELEPHONE WIRES AND POLES, TRANSMISSION TOWERS, ELECTRICITY CABLE AND WATER SUPPLY LINES**

During the execution of work, it is likely that the Agency may meet with telephone cable, electrical, cable, water supply lines, etc. It will therefore, be the responsibility of the Agency to protect it carefully. All such cases should be brought to the notice of the Engineer-in-charge by the Agency and also to the concerned Department. Any damage whatsoever done to these cable and pipelines by the Agency shall be made good by him at his cost.

**16 MEDICAL AND SANITARY ARRANGEMENTS TO BE PROVIDED FOR LABOUR EMPLOYED IN THE CONSTRUCTION BY THE AGENCY.**

- a) The Agency shall provide an adequate supply of potable water for daily use of laborers on works and in camps.
- b) The Agency shall construct trench or semi permanent latrines for the use of the Labours. Separate latrines shall be provided for men and women.

- c) The Agency shall build sufficient number of huts on a suitable plot of land for use of the lab ours according to the following specifications.
  - 1. The Agency must find his own land.
  - 2. The Agency shall construct a sufficient number of bathing places. Washing places should also be provided for the purpose of washing clothes.
  - 3. The Agency shall construct sufficient arrangements for draining away the surface and sewage water as well as water from the bathing and washing places and shall. Dispose off this waste in. such a way as not to cause any nuisance.
- d) The Agency shall engage a medical officer with a traveling dispensary for a camp containing 500 or more persons if there is no Government or other private dispensary situated within 8 kilometer from the camp. In case of emergency the Agency shall arrange at his own cost for transport for quick medical help to his sick worker.
- e) The Agency shall provide the necessary staff for affecting a satisfactory drainage syMBMC and cleanliness of the camp to the satisfaction of the Engineer At least one sweeper per 200 people should be engaged.

## **17 SAFETY CODE**

Suitable scaffolds shall be provided for all workmen that firmly supported on ground or from solid construction except such short period works as can be done safely from ladder. When ladder is used an extra labours shall be engaged for holding the ladder and if the ladder is use for carrying materials as well, suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper - than 1 to 4 (1 horizontal and 4 vertical).

Scaffolding or staging more than 3.25m above the ground or Roofs, swain or suspended from an overhead' support or erected with stationary supports or shall have a guard rail properly attached, bolted, brace' and otherwise assured at least In high above the floor or platform of such scaffolding or staging an extending along the entire length of the outside and ends thereof with only such opening as may h necessary for the delivery of materials. Such scaffolding or Staging shall be so fastened as to prefer it from swaying from the building of structure.

Working platform gangways, and stairways shall he so constructed that they do so sag unduly or i more than 3,25 m above ground level or floor level, it shall be closely boarded, have adequate width and suitably fenced as described in 2 above.

Every opening In floor of the building or in a Working platform shall be provided with suitable protection to prevent fall of persons or material by providing suitable fencing or railing with minimum height of 1 meter -

Safe means of access shall be, provided to all working platform and other working places. Ever ladder shall be securely fixed. No portable single ladder shall be over 9m in length; width between side rails in a sung ladder shall in no case less than 30

cm for ladders up to and including 3 m. in length. For longer ladder this width shall be increased at least 6 mm for each additional 30 cm of length. Uniform step spacing shall not-exceed) 30cm.

Adequate precautions shall be taken to prevent danger from electrical equipments. No material on any' of the site shall he stacked or placed as to cause danger or inconvenience to any person or the public. The Agency shall provide all necessary fencing and Lights to protect public from accidents and shall be bound to bear expenses of defense of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to the neglect of the above precaution and to pay any damages and costs which may be awarded in any such suit action or proceedings to any such person or which may with the consent of the Agency to be paid to comprise any claim by any such person.

## **18 EXCAVATION AND-TRENCHING**

All trenches, 1.5 meters or more in depth, Shall at all times be supplied ladder for each 30 meters in length or fraction thereof. Ladder shall be extended from bottom of trench to at least 1 meter above surface of the ground, sides of a trench which is 1.5 meters or more in depth shall be stepped back to give suitable slope, or security held by timber bracing, so as to avoid the danger of sides collapsing. Excavated materials shall not be placed within 1.3 meters of edge of trench or half of depth of trench whichever is more. Cutting shall be done from top to bottom under no circumstances shall undermining or undercutting be done.

## **19 DEMOLITION**

Before any demolition work is Commenced and also during the, processor the work.

- a) All roads and open areas adjacent to the work- site shall either be closed of suitably protected.
- b) No electric cable or apparatus which is liable to be a source of danger or a cable or apparatus used by operator shall remain electrically charged.
- c) All practical steps shall be taken to prevent danger to person employed, from risk or Fire explosion of holding. No floor, roof or other Part of a building shall be so overloaded with debris of materials as to render it unsafe.

All necessary personal safety equipments as considered adequate by the Engineer-in-charge shall b available for use of persons employed on the site and maintained In a condition suitable for immediate use and Agency shall take adequate step to ensure proper use of equipment by those concerned,

- a) Workers employed on mixing asphalted materials cement and time mortars concrete shall be provided with protective footwear and protective goggles.
- b) Those engaged in handling any materials which is injurious to eyes shall be provided with protective goggles.

- c) Those engaged in handling any works shall be provided 'with welder's protective eyes hoids.
- d) Stone breakers shall be provided with protection goggles and protective clotting and seated at sufficiently safe internals.
- e) When workers are employed in sewer and manholes which are in use. The Agency shall ensure that manhole covers are opened and tm hold are ventilated at least for an hour before workers are allowed to get into them, Manhole opened shall be cordoned off- with suitable tailing and provided with warning single or boards to prevent accident to public.
- t) The Agency shall not employ, men below the age of 18 and women on the work- of painting with. products containing- lead in any form wherever men above the age of 18 are employed on the work of lead painting the following precautions shall he taken.
  - i) No paint containing lead or lead product shall be used except in the form of pastor or ready made paint.
  - ii) Suitable face masks shall be supplied for use by workers when paint is applied in the form of spray or a surface having lead paint dry, Rubbed and scrapped
  - iii) Overalls shall be supplied by the Agency to workmen and adequate facilities shall be provided to enable working painters to wash during on cessation of work
- g) When work, is done near any place where there is risk of drowning all necessary equipment shall be provided and kept ready for use and all necessary steps, taken for prompt rescue of any person in danger and adequate provision made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

**20 Use of hoisting machines and shackles including the attachments, anchorage supports shall con firm to the following**

- a)
  - i) These shall be of good mechanical- construction, round materials and adequate strength and free from potent defects and shall be kept in good repair and in good working order.
  - ii) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and of adequate strength and free from potent defects
- b) Every crane driver or hoisting appliance operator shall be properly qualified and no person under the area of 21 years shall he in charge of any hoisting machine including any scaffolding.
- c) Incase of every hoisting machine and of every chain ring hook. Shackle own and pulley block used in hoisting or lowering or as means of suspension safe working load shall be ascertained by adequate means. Every hosting machines and all gear referred to above shall be mainly marked with safe working loads. In case of hoisting machine having a variable safe working load and the conditions under which it is applicable shall be clearly indicated No part of any machine or of gear

referred to above in this paragraph shall be loaded beyond safe working load except for the purpose of testing.

- d) In case of departmental machine safe working load shall be notified by the Engineer-in-charge. As regards Agency's machine the Agency's shall modify safe working load of each machine to- the Engineer in-charge whenever he brings, it to site of work and get it verified by the Engineer In-charge.

Motors, gearing transmission, electric wiring and other dangerous parts of hoisting appliances shall be provided with such means as will reduce to the minimum risk of accidental descent of load. Adequate precaution shall be taken to reduce to the minimum the risk of any of a suspended-load becoming accidentally displaced, when work are employed. On electrical installations, which are already energized insulating materials wearing approved such as glove, sleeved and coats as may be necessary shall be provided. Workers shall nor wear any rings, watches and carry keys or other materials which are good- conductors of electricity.

All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in a safe condition and no scaffold ladder equipment shall be altered or removed while it is in use Adequate washing facilities shall be provided at or near places of Work.

These safety provisions shall be brought to the notice of all concerned by display on a notice board at a prominent place at the work spot persons responsible ensuring compliance with the safety code shall be named there & by the Agency.

- i) To ensure effective enforcement of the rules and regulations reading to safety precautions arrangements made by the Agency shall be open to inspection by the Engineer in charge o his representatives and the inspecting officers,
- ii) Failure to comply with the provision hereunder shall make the Agency liable to pay to the Department as penalty an amount not exceeding Rs. 500/- for each default and decision of the Engineer-in charge shall be final and binding.

Not with standing the above conditions 110 14 the Agency is not exempted from the operation o any other Act or rules enforce.

## **21 SCOPE OF RATES FOR DIFFERENT ITEMS OF WORK:**

For item rate contract, the contract unit rates for different items of work shall be payment in full for completing the work to the requirements of the specifications including full compensation for all the operations detailed in the item wise specifications given in relevant section. In the subsequence of any directions to the Agency the rates are to be considered as the full inclusive rate for finished work covering all labour materials, wastage, temporary work plant, equipment, overhead charges and profit as well as the general, liabilities obligations and risks arising out of the General Conditions of Contract.

The item rates quoted by the Agency shall unless otherwise specified also include compliance with supply of the following.

- i) General works such as setting out, clearance of site before setting out and clearance of works after completion.
- ii) A detailed program for the construction and completion of works (using CPM/PERT techniques) giving in addition. to construction activities, detailed network activities for the submission and approval of materials, procurement of critical materials and, equipment, fabrication of special products equipments and their installations and testing and for all activities of the employer that are likely to elects the progress of the work, etc. including updating of all such activities on the basis of the decisions taken at the periodic site review meeting or as Directed by the Engineers
- iii.) Samples of various materials proposed to be used on the work for conducting tests thereon as required as per the provision of the contract.
- iv). Design, of mixes as per relevant clauses of the- specifications giving proportions of ingredients, sources of aggregates and binder along with accompanying trial mixes as per the relevant clauses of these specifications to be submitted to the Engineer for his approval before use of the works.
- v) Detailed design calculations and drawings for all temporary works (such as form work, staging, centering, specialized constructional handling and launching equipment and the like)
- vi) Detailed drawing for template, support and end anchorage, details for prescreening cable profiles, bar bending and cutting schedule for reinforcement material for fabrication of structural steel etc.
- vii) Mill test reports for all mild and high tensile steel and cast steel as per the relevant provisions of the specifications.  
  
Testing of various finished items and materials including bitumen, cement concrete bearings as required under these specifications and furnishing test report/certificates these specifications and furnishing test report/certificates.
- ix) Inspections Reports in respect of form work, staging reinforcement and other items of works as per the relevant specifications.
- x) Any other data which may be required as per these specifications or the conditions of contract or any other annexure/schedules forming part of the contract.
- xi) Any other item of work which is not specifically provided in the Bill of Quantities, but which is necessary for complying with the provision of the contract and
- xii) All temporary works, form work and false works.  
  
Portions of road works beyond the limits and or any other work may be constructed by the employee directly through other agencies, Accordingly, other agencies employed by the Employers may b working in the vicinity of the work being executed by the Agency The Agency shall liaise with such agencies and adjust his construction program for the completion of the work accordingly and no claim or compensation due to any reason whatsoever will be entertained, on this

account. The employer will be indemnified by the Agency for any claims from other agencies on this account.

## **22. PAYMENTS**

### **A) Running Bills:**

One payments in the months will be, granted by the Engineer-in-charge if the progress is satisfactory. Agency should submit it bills to the Engineer-in-charge in appropriate forms.

### **B) Final Bill**

The Agency should submit it final bill within one month after completion of the work and the same will be paid within 3 months if it is in order. Disputed, item and claims if any shall be excluded from the final bill and settled. separately later on.

## **23 HANDING OVER OF WORK**

All the work and materials before finally taken over, by MBMC, Bhayandar will be the entire liability of the Agency for guarding Maintaining and making good any magnitude Interim payments made for such work will not alter this position. The handing over by the Agency and taking over by the Executive Engineer or his authorized representative will be always in writing of which copies will go to the Executive Engineer or his authorized representative and the. contract for, it is However understood that before taking over such work MBMC Bhayandar will not put into regular use as distinct from causal, or incidental one. Except as specifically mentioned elsewhere in this contract, or as mutually agree to.

**24** The testing of materials used in the work, like material, concrete cube, etc. will be carried out by the Agency at his own cost.

**25** The sign boards required at the work site viz., 'work in progress', 'Diversion', etc. should provided by the Agency at his cost. where ever necessary and as ordered out by site Engineer.

**26** It is necessary to keep the record like cement consumption work, progress report, Laboratory test, monthly progress always on site.

**27** The excavation should be done carefully in case of damages by the Agency to water supply Pipes, electric or telephone cables, gas pipeline or any other utility services will be made good at the cost of the Agency.

**28** Agency should give the power of attorney to his representative who attends the Municipal Office for letter correspondence signing of MB Etc.

## **29 SPECIAL CONDITION (TECHNICAL)**

**29.1** The construction material brought at site shall be as per the relevant ISS/BIS standard and offered to the site Engineer for his approval before use. It will be entirely at the discretion of the site Engineer whether to accept or reject the

materials brought at site after the prima facie inspection. In case any lot is rejected the same shall be removed by the contractor at his own cost.

- 29.2 The test certificate of material shall be produced by the contractor as per the directions of Engineer-in-charge.
- 29.3 In spite of the production of above test certificate, it shall be at the discretion of the Engineer-in-charge to take random samples. The contractor will have to make all arrangements for taking the sample as instructed by Engineer-in-charge and get the samples of cement/steel and other material tested from the Govt. approved lab/reputed lab at his own cost.
- 29.6 The tendered rates should be inclusive of all statutory duties and taxes excluding GST
- 29.7 Procurement of required machinery and plants, other specialized machineries etc. should be done by contractor at his own cost and no extra payment will be made. For reduction of friction between soil and MS Pipe during pushing, suitable arrangement will have to be made to reduce the disturbance of road to the minimum.
- 29.9 The contractors should use only potable water for construction purpose including curing and they should make their own arrangement for potable water and power supply at their own cost. MBMC will not provide water and electric connection for execution purpose.

30. **INSPECTION, REGISTER AND RECORDS**

The contractor/s shall maintain accurate records, plan and charts showing the dates and progress of all main operations and the Engineer shall have access to this information at all reasonable times. Records of tests made shall be handed over to the Engineer's representative after carrying out the tests. The following registers will be maintains at site by the Contractor(s).

(i) Work order Register

The Contractor/s shall promptly sign orders given therein by the Engineer or his representative or his superior offices and comply with them. The compliance shall be reported by the contractor/s to the Engineer in good time so that it can be checked.

(ii) Cement Register

This register will be maintained to record daily receipt and issue of the cement duly indicating the balance quantity. The quantum of the work done for the cement issued on a particular date will also be maintained.

(iii) Steel Register

The register will record the receipts of steel items and details of reinforcements and members wherever steel is used.

(iv) Pipe Stock register (MSA)

This register will be maintained to record daily receipt and issue of the MS pipes duly indicating the balance quantity.

(v) Pipe laying register

This register will be maintained to record daily Chainage wise pipe laying.

(vi) Labour Register

This register will be maintained to show daily strength of labour in different categories employed by the Contractor/s.

(vii) Log book of events

All events are required to be chronologically logged in this book shift wise and data wise.

(viii) Inspection Register / Work order book

An inspection register shall be maintained at the site of work by the agency where to instructions regarding the working etc. shall be record by the Engineer or his executive subordinates. It is the liability of the contractor or his representative at the site to note such instructions wherever asked upon to do so and take action accordingly and comply with these instructions strictly, within reasonable time and without any delay.

(vii) Program and Progress Register

In this register programme as per bar chart submitted by contractor and actual progress achieved will be shown.

ADDITIONAL CONDITIONS  
OF CONTRACT

## **MIRA BHINDAR MUNICIPAL CORPORATION, BHAYANDAR**

Name of Work : **Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhayander Municipal corporation area.**

### **ADDITIONAL CONDITIONS OF CONTRACT**

#### **1) General:**

The contract under execution is of operation and maintenance of STP'S and under ground drainage system in Mira Bhayander Region and is to be let the contract to contractor in consolidated responsibility as a special case. If performance is not found satisfactory in contract period then contract will be terminated by 15 days notice. Hence following special conditions are imposed and specifically highlighted.

- 1) The Contractor should Construct Temporary site office The site office should be well furnished with 2 tables, 5 chairs, 1 cupboard etc. for keeping all relevant records. The Contractor will have to make his own arrangement for obtaining Telephone facility from Telephone authorities. The Contractor shall bear all charges deposits, monthly rental etc. as levied by Telephone dept.
- 2) Maintenance work covered under this Contract is an essential service hence o&m should be Un-interrupted even on holidays & 24 hours. If Contractor shows disinterest / negligence / lithergy in maintenance of proper & timely maintance a notice of 8 days will be given & work shall be get done at risk & cost of Contractor.

#### **2) SCOPE OF WORK**

- i. The Contractor shall operate and maintain the entire plant within its Contract price for a total operation and maintenance period
- ii. All necessary repairs, maintenance minor, replacements etc., shall be made during the O & M to maintain the plant at the status of formal handing over. Contractor shall be responsible for preventive repair, breakdown repair, , for operation and maintenance during the period of O&M.

- iii. At the end of O & M period the plant shall be handed over to the MBMC in fully functional condition except normal wear and tear expected during the period of operation and maintenance.
- iv. During O & M period cost of power consumed shall not be in the Contractor price and bills of electric power shall be paid by the MBMC as per actual consumption.
- v. The scope shall but not limited to the following items:
  1. Operation and Maintenance including Mechanical, Electrical, Civil, and all allied works.
  2. Sampling and testing of influent wastewater based on the tests and frequency desired by the MBMC'S representative and in general in accordance with the CPHEEO manual on Sewerage and Sewage Treatment.
  3. Sampling and testing of additional samples for the day to day O & M of the STP and as mutually agreed from time to time between the Contractor and the MBMC representative.
  4. MPCB or any other laboratory effluent treatment charges shall be borne by the Tenderer.
  5. 5. Sampling of final treated sewage to ensure that the guarantee Parameters are as stipulated in the Bid document.
  6. The sampling frequency to be as per relevant norms of Maharashtra pollution Control Board or higher as decided by MBMC representative. The MBMC reserves right to collect samples at random at the will of the MBMC through any agency nominated by him.
  7. The MBMC shall have right to seek part of sample collected by the Contractor without any prior intimation to cross check the result on random basis, however the analysis charges of such samples shall be borne by Contractor.
  8. 10. Maintenance of Proper records of sampling as per approved Performa.
  9. 11. Loading, Unloading and Transportation of screening, dewatered sludge and wet grit out of treatment plant site as directed by MBMC representative.
  10. Maintenance of log books of all the equipments/instruments connected to the PLC/SCADA shall forwarded at monthly intervals in the form of a hard copy

as monitored by the PLC. Such records are given regularly to the MBMC in the form of hard copy at monthly intervals.

11. The reports shall contain sufficient appropriate and adequate data to make the records meaningful and amenable to analysis for evaluating the performance of the plant as well as to help in O & M decisions.
12. Security of the campus and contents therein shall be Contractor's responsibility.
13. The records maintained by the Contractor shall be produced periodically to the MBMC representative for proper monitoring. The MBMC representative's remarks shall be attended to on next submission. Consolidated summary report shall be furnished to the MBMC monthly, quarterly and yearly containing salient features.
14. The Contractor shall also maintain history sheets of overhauling, maintenance, replacement of all the important electrical and mechanical equipment.
15. The O & M shall include the appropriate preventive maintenance of equipment as per the Manufacturer's recommendation.
16. All the equipment even standby supplied, installed and commissioned by the Contractor should be in operational/ functional condition throughout the O & M period. The Contractor shall take all preventive measures to maintain them in working condition.
17. The frequency of break downs of various equipments shall be the least as far as possible. The total number of such re-occurrences shall not exceed three times per annum otherwise penalty shall be levied on the Contractor at the discretion of Engineer-in-charge.
18. The operation, maintenance and repairs services shall be performed according to the following.
  - (a) Down time:
    - The plant shall never be operated at less than 50% of its design capacity due to maintenance and repair reasons, if adequate quantity of sewage is available.

- The period of such exceptional operation shall not exceed two consecutive days and shall not be more than three days a week otherwise penalty shall be levied on the Contractor at the discretion of Engineer-in-charge.
- The maximum downtime of the whole plant shall not exceed 24 hours.
- The periods for repairs and maintenance have to be communicated to the MBMC representative at least 5 calendar working days in advance.

(b) Operation of the plant as per O & M Manual

- The plant shall be operated according to the rules and procedures laid down in the O & M manual (as per CPHEEO MoUD Manual)
- The plant must be in position to Work at the design capacity at any time.

i) Operation of the Pumps

- The following points should be observed while operating the pumps.
- Dry running of the pumps should be avoided.
- Centrifugal pumps if installed with negative suction should be primed before Starting.
- Pumps should be operated only within the recommended range of the head-discharge
- If pump is operated at a point away from duty point, the pump efficiency normally reduces.
- Operation near the shut-off point should be avoided, as it causes substantial recirculation within the pump, resulting in overheating of sewage in the casing and consequently, overheating of the pump.
- Voltage during operation of the pump-motor set should be within  $\pm 10\%$  of the rated voltage. Similarly, current should be below the rated current shown on the name plate of the motor.
- When parallel pumps are to be operated, the pumps should be started and stopped with a time lag between two pumps to restrict change of flow velocity to minimum and to restrict the dip in voltage in the incoming feeder and should be adequate to allow the pump head to stabilize.

- When the pumps are to be operated in series, they should be started and stopped sequentially, but with minimum time lag. Any pump next in sequence should be started immediately after the delivery valve of the previous pump is even partly opened. Due care should be taken to keep open the air vent of the pump next in sequence, before starting that pump.
- The running of duty pumps and standby pumps should be scheduled so that no pump remains idle for a long period and all pumps are in ready-to-run condition. Similarly, the running schedules should be ensured so that all pumps do not wear equally needing simultaneous overhaul.
- If any undue vibration or noise is noticed, the pump should be stopped immediately and the cause for vibration or noise should be checked and rectified.
- Generally, the number of starts per hour shall not exceed four. Frequent starting and stopping should be avoided as each start causes overloading of motor, starter, contactor and contacts. Although overloading lasts only for a few seconds, it reduces the life of the equipment.
- Troubles in a sewage pumping station can be mostly traced to the design stage itself. This is all the more true when too much grit is likely to come into the sewage pumping stations from sewage at monsoon time, which is difficult to handle. Hence, sewers should not collect any storm water.

### **GATES, VALVES AND ACTUATORS**

Sluice gates are commonly used to control sewage levels in STPs. Attention should be paid to the following points for proper operation:

- Operate inactive sluice gates by smearing grease on stem threads.
- Clean sluice gate with wire brush and paint with proper corrosion-resistant paint.
- Ensure unobstructed operation of gate and headstock.
- Ensure that the spindle is not touching the stem guide.
- Remove foreign matter like paint, concrete, etc. in the fully open position of gate.

Do's for sluice gates

- Operate the gate at least once in every three months.

- Check the nuts of all construction and foundation bolts once in a year. Tighten the bolts, if loose.
  - Examine the entire painted surface for any signs of damage to the protective paint.
- Don'ts for sluice gates
- Do not remove lock plates until the gate has been properly installed.
  - Do not keep the gate out of operation for more than three months.
  - Do not forget to set the stop nut in the correct position.
  - Do not disturb the adjustment of wedge block bolts/studs.
  - Do not over torque the crank handle/hand wheel.

### **Sludge Feed Pump**

Operators should check the following items:

- Inlet and outlet flow rate
- Noise or vibration
- Bearing housing temperature
- Running amperage
- Pump speed
- Pressure
- Check the level and condition of the oil in the gear reducer
- Check the shaft alignment
- Check the condition of all painted surfaces
- Visually inspect mounting fasteners for tightness
- Clean dirt, dust or oil from equipment surfaces
- Check all electrical connections
- Stop and start equipment, checking for voltage and amp draw and any movement restrictions because of failed bearings, improper lubrication or other causes
- Check the drive motor for any unusual heat, noise or vibration
- Check mechanical seals and packing for leakage or wear

### **Maintenance**

During operation, the operator should check for the following:

- The oil level and the flow of oil to the bearings in circulating oil systems
- Flow of cooling water and oil temperature, to ensure it is operating in the proper range
- Machine vibration
- Ammeter reading on the bowl motor
- Bearing temperatures, by touching them
- System for leaks
- Centrate quality
- Because the centrifuge will shut itself down in the event of a fault, the operator typically only looks at the mechanical parameters once per shift.

(a) Awareness & Cleanliness

- The Contractor and their personnel shall maintain a high degree of awareness in operation and maintenance of the plant and all relevant safety codes and procedures.
- At all times the plant, its equipment and surrounding shall be kept clean and in order including the buildings, floors, walls, roofs, windows and garden etc.

(b) Preventive maintenance

- The preventive maintenance shall be carried out according to the preventive maintenance schedule of the plant.(annexure I)
- The regular staff may be reinforced with short-term specialists by the Contractor for special maintenance tasks, after duly informing the MBMC representative of the need and the schedule.

(c) Repairs

- Repairs shall be made as and when needed very promptly on the spot or at the Contractor's / Manufacturer's workshop. The need of repair on the spot or at the Contractor's workshop has to be defined in co-ordination with the MBMC representative and according to the status of spare parts availability.

(d) Spare parts

- The Contractor shall keep a reasonable stock of spare parts so that the down time of equipment can be kept within the limits specified.

- The contents of the stock and the reorder level of the inventory have to be approved by the MBMC representative.

(e) Transportation

All necessary transportation shall be arranged and made by the Contractor at his own expense. For better communication internet facility is provided throughout the entire operation & maintenance period on his own cost.

(f) Oil, Grease, Lubricants, Chemicals and Consumables

The Contractor has to ensure that there is always sufficient stock of 15 days of Oil, Grease, Lubricants consumables, and laboratory chemicals.

### **General Obligations**

- The Contractor shall operate and maintain the entire plant under this Contract for the period specified in this Contract.
- The Contractor will submit a detailed operation and maintenance plan for approval of MBMC representative.
- All operation and maintenance activities shall be carried out strictly in accordance with the approved plan.
- If for any reason the sewage standards are not met and the penalty is imposed by MPCB, the same shall be recovered from the Contractor's payable amount. However MBMC reserves right to terminate the Contract on statutory ground or default of the Contractors.

The services shall include but not be limited to the following items:

- a) Operation and maintenance of the Sewage Treatment Plant from the inlet chamber up to disposal into channel leading to creek.
- b) Training for O & M staff designated by MBMC as per requirement.
- c) Generation and maintenance of periodic reports.

## **Operation**

### (a) Operational services

- The Contractor shall operate the complete Sewage Treatment Plant and associated services on a continuous 24-hour basis.
- The Contractor shall operate and utilize the control and monitoring system provided, if found necessary, he shall make adjustment (within the operation range) of the control system and equipment, so that the plant operation matches the treatment process requirements.
- If it is determined that the facility is not capable of meeting the design Parameters for any reason beyond the Contractor's control and not attributable to him, the Contractor shall determine the specific cause of failure/abnormality in the plant functioning and report to the MBMC representative and seek his directive on the necessary corrective action to be taken /adopted.
- The Contractor will be required to furnish the details of electricity consumption in the format prescribed by the MBMC representative.
- All consumables, Polyelectrolyte, Chemical and spare required in operating and maintaining the plant in good condition shall be provided by the MBMC
- The screenings grit, dewatered sludge and other garbage generated in the plant shall be removed from the site on periodic basis. No accumulation of such residues will be permitted within the Sewage Treatment Plant campus without application by Contractor giving valid reasons as well as permission of MBMC representative
- The Contractor shall clarify that such residues are in conformity to Environmental regulation / rules in force.
- The MBMC representative may, if required, decide the mode and timing of disposal of such residues in consultation with concerned Environmental and Civic Authorities and such directions shall be promptly followed by the Contractor, both in letter and spirit, without any reservations promptly and without any impact on the quoted and awarded and awarded O&M price and other costs.

- The Contractor at his own expense shall provide all tools, cleaning and housekeeping equipment, security and safety equipment.

### **Laboratory Services**

- a) The Contractor using the existing facility shall perform all tests, sampling and analysis regularly as stipulated in the Bid document and as required by the regulatory agencies and as directed by engineer-in-charge.

### **Manpower**

- a) The Contractor shall provide the required qualified managerial, technical supervisory, laboratory, administrative and non technical personnel and labour necessary to operate and maintain the treatment plant and the premises in a safe way and efficiently on a continuous 24 hours basis for the full term of the O & M period.
- b) The qualification and capability of Contractor's personnel shall be appropriate for the tasks they are assigned to perform.
- c) The staff provided shall possess the necessary skills and trained in the operation of the plant prior to assign to the Work.
- d) If in opinion of the MBMC representative a person of Contractor's staff is considered to be inadequately trained and skilled or otherwise inappropriate for the assigned task and MBMC representative may inform the Contractor in writing, the Contractor shall replace him with a person of appropriate skills and training for the task, approved by the MBMC representative, immediately of being so informed.
- g. Normal time duty hours for the Contractor's O &M personnel shall be notified by the Contractor and if necessary be modified in consultation with the MBMC representative.
- h. A shift schedule shall be established by the Contractor and approved by the MBMC representative to ensure the presence of necessary number of Contractor's staff for duty at site 7 days a week, including holidays.
- i. In the event it becomes necessary for more than one of the Contractor's key personnel to be absent from the plant, the Contractor shall provide a qualified

- replacement at his own expense and ensure that specified project duty coverage is maintained.
- j. The Contractor shall include in his cost medical and accident insurance expenses of all the staff employed by him along with all provision of the labour welfare acts prescribed from time to time by the state and central government
  - k. Adequate insurance cover shall also be maintained during O &M period for all MBMCs aswell as casual temporary employees and visitors.
  - l. MBMC is not liable for any compensation on arising due to any accident/ mishap of any nature occurring in the plant premises.

### **Safety**

The Contractor shall be responsible for safety of his staff during O & M of the plant and shall procure, provide and maintain all safety equipment necessary for satisfactory O & M such as gloves, boots, mats, safety belts, masks, respiratory system for chlorine operation, etc.

- 1. The Contractor shall utilize awareness procedures in every element of operation and maintenance.
- 2. The Contractor shall emphasize site safety including adoption of maintenance.
  - a. Safe working procedures, cleanliness and care of the plant as a whole
  - b. Accident and hazardous conditions prevention and reporting
  - c. Shall impart safety training to all members at regular intervals, especially for new comers.
  - d. Shall provide Notice Boards and display boards at appropriate locations, detailing precautions to be taken by O & M personnel to Work in conformity to regulations and procedures and by the visitors to the plant.
  - e. Shall notify the MBMC representative immediately if any accident occurs whether on-site or off site in which Contractor is directly involved and results thereof any injury to any person, whether directly concerned with the site or a third party. Such initial notification may be verbal and shall be followed by comprehensive report within 24 hours of the accident.

3. The Contractor may refuse entry into the plant, to all personnel's including MBMC representative on grounds of safety and person not carrying proper identification.
4. Personnel shall be permitted entry into the plant only on disclosing their identity and those authorized personnel including MBMC representative shall be issued identity cards with photographs by the Contractor, this also includes casual visitors who shall be issued a temporary visitors entry permit.

### **Reporting**

- a. The Contractor shall prepare consolidated monthly reports on plant operation and maintenance and submit the same to the MBMC representative within first 7 working days of the next calendar month.
- b. The daily reports are to be prepared and retained at site for inspection.
- c. Overall reporting formats shall be approved by MBMC representative and may have to be modified from time to time as required and approved by MBMC representative.
- d. Contractor may have to prepare and submit additional reports on particular matters and incidents having special significance as and when required by the MBMC representative. Maintenance

### **General Obligations**

- (i) The Contractor shall ensure the continuity of the plant operations and that the breakdown or the deterioration in performance of the plant are minimized by a preventative maintenance schedule.
- (ii) The maintenance schedule of all critical components shall primarily comprise of preventative and break down maintenance.
- (iii) Regular preventative operational maintenance comprises of planned and regular maintenance carried out by the Contractor on a day-to-day basis, including cleaning, lubricating, minor adjustment, together with the preventive and corrective maintenance plan for those items of the plant and equipment

within the treatment works which have been commissioned and made operational.

- (iv) Breakdown maintenance comprises of any unplanned maintenance required.
- (v) Non commissioned assets / components of the plant if any shall have to undergo a regular "non operational& storage maintenance".
- (vi) The Contractor shall carry out the maintenance of the plant installations in accordance with the requirements of the O & M Manual and the equipment manufactures instructions and only approved grades of lubricants will be used. The frequency of lubrication, adjustments to be made regularly and recommended spare parts by the equipment/machine/ instrument manufactures/supplier shall always be carried out and appropriate inventory shall be held in store.
- (vii) The Contractor shall maintain a maintenance log of all repairs, oil & lubricant changes carried out for each equipment's maintenance Log Card.

### **Building and Site Maintenance**

The Contractor shall be responsible for:

- I. The total maintenance of building and all electrical, ventilation, plumbing and drainage installation in the building.
- II. Housekeeping and cleaning of all buildings
- III. Preventive and breakdown maintenance of the site water and wastewater services, cabling and earthing systems, air conditioning and the site road lighting system., Theupkeep of landscaped areas, tree plantation and flower pots etc.,
- IV. Maintenance of the communication system of the plant.
- .
- VI. Routine housekeeping maintenance shall be carried out in accordance with procedures.
- VII. Normal breakdown maintenance shall be attended to within a period of 3 working days.

VIII. Any unusual breakdown due to forces of nature covered under insurance shall be inspected to and attended to only after being permitted to do so by the insurance agency in writing.

### **Training**

- (a) The Contractor shall be responsible for instruction and training of all his personnel in all aspects of plant operation and maintenance till the end of the operation and maintenance period.
- (b) The Contractor shall also be responsible for training personnel nominated by the MBMC who shall submit the CVs of the person to be trained to the Contractor for assessment if the person is qualified to be trained.
- (c) The training will be imparted to skilled personnel possessing a basic qualifications as stipulated by the MBMC representative which shall be similar to those possessed by the Contractors personnel, will operate the plant at the expiry of the Contract, this shall be done in the last six months of the operation and maintenance Contract.
- (d) The Contractor will make available for this purpose competent staff as well as proposed schedule information that may be necessary for effective execution of the training programme.
- (e) The training shall be organized in three (3) stages as follows :
  - i. Basic technical training education to be carried out during the final stages of the erection period of the Contract through literature, manuals, handouts demonstration at site, etc.
  - ii. Intensive on the job training during commissioning and maintenance period.
  - iii. Examination at the end of the training and only those persons who qualify should be permitted to operate the plant.
- (f) By the end of this training period, these personnel should be able to carry out their respective duties efficiently under the supervision of MBMC representatives and supervisory staff of the MBMC.

### **Other Records**

- The Contractor shall maintain detailed record of consumption of Polyelectrolyte, Chlorine, Coagulants, dewatering polymer and other scrubbing chemicals (if used)
- Record of dewatered sludge transported out of the plant site shall be maintained. Similarly record of material movement shall also be maintained as appropriate and approved by MBMC representative.
- These records shall be available to the MBMC representative for scrutiny and copies shall be furnished on demand.
- During O & M period tests for BOD, SS, COD, TN, NH<sub>3</sub>N, Phosphates and pH, VSS, SVI shall be done daily on composite samples.
- The results of these Parameters shall have compliance of the guaranteed values.
- The Contractor shall also maintain the records for daily, monthly and annual reporting to the MBMC

### **3) Responsibility for payment of wages by the Contractor:-**

- 1) The contractor will have to pay the wages before 7<sup>th</sup> of every month in advance prior to receive bill payment from MBMC for previous month.
- 2) The contractor will have to pay his contribution as per the Employee's Provident Fund and Miscellaneous Provisions Act, 1952 and Employee's State Insurance Act, 1948 amended from time to time.
- 3) It shall be the duty of the contractor to ensure the disbursement of wages in the presence of the authorized representative of MBMC. The contractor shall have to open the Accounts in the name of labour and contractor and should deposit EPF, ESIC & Prof. Tax amount every month and attested challans should be submitted to MBMC before preparing monthly bill.

### **4) Monthly Bill Preparation, Submission & Payment:**

- i) The required documents for preparation of bill for this work shall be submitted upto 10<sup>th</sup> of every month. The following documents duly attested (True Copy) are to be submitted to MBMC in triplicate.
    - a) Typed bill in R.A. Bill form.
    - b) Acquaintance Roll of monthly payment of labour.
    - c) Monthly Muster Roll
    - d) ESIC / EPF / Prof. Tax Challans etc.
  - ii) The certificate from D.E. maintaining all workers attended duties in uniform approved by E.E.
  - iii) The contractor shall submit all the relevant forms of return e.g. Form No.3, 6 (a) & 9 for EPF and any other forms and submit it to MBMC as and when demanded.
- 5) Initial contract shall be for one year extendable upto one year on satisfactory performance report from Deputy Engineer, MBMC. Initial contract agreement is to be made on stamp paper of Rs.501- (Cost of stamp paper is to be borne by contractor only).
- 6) Recovery of absentee of labours will be made from each bill as reported by Deputy Engineer, at the rate proposed in the tender.
- 7) In case of any accident, it is full responsibility of the contractor / agency to pay workman compensation to Contract labour under workman compensation Act and MBMC will not pay extra separately to the contractor. Accident compensation if any granted by Hon. Labour Court shall be paid by contractor only. He should not claim on this account to MBMC. Contractor should draw Group Insurance with Life Insurance Corporation including natural death on duty of contract labour of minimum amount of Rs.20,000/- each.
- 8) Income Tax on gross value of the bill at the prevailing rate will be deducted from each R.A. / Monthly bill.

- 9) Contractor / Agency has to issue identity card having the signature of their authorized person to each member with their designation and other details of Duty etc.
- 10) Contractor will be held responsible for any theft of material, machinery etc. There shall not be any illegal business in plant / work premises by any person I employee.
- 11) If there is loss of MBMC property including pumping machinery etc. due to negligence of Contract labour, same shall be recoverable from agency at the rate recommended by Deputy Engineer.
- 12) Contractor shall timely report the arrangement made for the purpose of transportation work including Maintenance Vehicle Registration number.
- 13) Overtime expenses shall be fully borne by agency,
- 14) Monthly payment made by contractor to their labours shall be inclusive of all i.e. annual admissible leaves, medical leaves weekly of etc. Contractor is empowered to deduct the daily wages / salary for any absentee from wages of contract labour.
- 15) Agency shall submit details of duties and responsibility statement of each contract labour through Deputy Engineer, MBMC, within 15 days from the date of work order. However decision of Deputy Engineer, shall be final regarding duties to be fixed.
- 16) Contractor shall produce police-record report regarding character of the contract labour employed as and when demanded by MBMC.
- 17) It is not permissible to increase the number of contract labour in any case.
- 18) Agency shall submit the weekly report of the operation work in detailed through Deputy Engineer, to Managing Director for acceptance and suggestions.
- 19) Separate register for material supplied by agency, issued by department, consume and balance shall be maintained by the agency.

- 20) Contract Agreement under execution constitutes the full and complete understanding between the parties here to the said contract agreement including validity, performance or breach there of. If the parties hereto cannot reach by mutual understanding the same shall be referred to The Commissioner, MBMC as an Arbitrator and whose decision shall be final and binding on the parties hereto.
- 21) The different machineries required for M & R work should be provided as and when required during breakdown on emergency basis. No work should be hampered due to non availability of material and machinery.
- 22) The Contractor should see that no illegal PROPERTY connections are done ON DRAINAGE LINES. It is responsibility of Contractor to keep watch by patrolling. If illegal connection is found it should be immediately informed to Engineer-in-charge & disconnected. If it is found that the Contractor is involved in this, legal action against Contractor will be taken.
- 23) The Contractor must appoint One experienced Supervisors for overall monitoring of all M&R works covered under this Contract.. They should have a mobile phone and two wheeler for proper Co-ordination with MBMC officials, Concerned local bodies..

#### **27. IDENTIFICATION BADGE WITH IDENTITY CARD:**

Contractor will have to provide identification badge with title name plate strip to be displayed on shoulder or front pocket to each staff as approved by Engineer-in-charge along with identity card etc.

#### **28. HOLIDAYS AND LEAVES:**

Weekly off and leaves should be given to staff as per relevant labour rules, during holidays / causal leaves / earned leaves etc. and contractor shall arrange for the substitute the MBMC shall not make any separate payment or overtime for these substitute provided by the Contractor during above periods.

#### **29. CONDUCT:**

All employees of the Contractor shall follow the instruction of Engineer-in-charge. If any employee misbehaves with Engineer-in-charge he/she should be immediately removed from duty and substitute for that should be employed by the Contractor. If contractor fails to do so as non-refundable penalty of Rs.100/(Rupees One Hundred only) per day per such case will be recovered from the bill.

**30. MACHINERY REQUIRED:**

Vehicles such as Motor Cycles / rickshaw, cycles etc. besides Maintenance Vehicle required for maintenance and repairs of various components or conveyance of messages in respect of power or machinery failures or routine instruction etc. shall be arranged by the Contractor to attend the site immediately.

No extra payment shall be made for transportation required for maintenance and repairs from one site to another. The vehicles shall be in the charge of Engineer-in-charge and shall be ready for 24 hours for day to day maintenance and operation.

**31. TENDER TO BE STRICTLY TO TENDER CONDITIONS AND SPECIFICATIONS:**

It should be clearly noted that the Contractor has to strictly comply with the conditions and specifications laid down in the tender and no variation or deviations are permissible. Deviations made by the tenderer submitting the tender without following above instructions would result in treating the tender as conditional and it would not be binding on the MBMC to consider such conditional tender. In case the conditional tender is accepted due to oversight or any other reasons. It shall be treated as unconditional and all the conditions! deviations from NIT and minutes of pre-bid conference shall be treated as null and void for all purpose.

**32. GOVERNING OF LABOUR LAWS:**

The contractor shall be fully responsible for making arrangements entirely at his cost for housing all labour employed by him and make necessary satisfactory arrangements for the same as may be required under the rules and laws of the central Government, State

Government or local body, MBMC's quarters if available may be given on rental basis, but it is not binding on the MBMC. All the rules regarding workman's compensation etc. shall be binding on the Contractor without any claim on MBMC No guarantee shall be given by the MBMC to provide quarters to all the staff employed by the agency. So also food grains for the labour shall be arranged by the contractor where it is not available in the open market.

### **33. ACCIDENT ON THE WORK**

The contractors shall be fully responsible for any accident may occur to the labour on his work on duty and report the same to the Engineer-in-charge and concerned government labour department authority and shall pay all necessary compensation as per rules, failing which it may be paid by MBMC from the amount payable to him. Contractor shall also be fully responsible for any loss to any individual or public property occurred due to him or his workers under the scope of this contract.

### **34. LABOUR LICENCES:**

Agency has to produce labourlicence from labour department and its timely renewal is to be got done. Also agency has to pay to his labors as per labour act and should protect the interest of labour. Agency has to maintain various labour register as necessary as per labour act and should produce on demand. Other facilities like leave with pay overtime, bonus etc. are to be paid to labours without any extra claim. The agency is bound to comply the remarks raised by concerned labour authority for the tenure of contract.

### **35. LOSS OR DAMAGES AND IDENTITY AGREEMENT:**

The contractor shall be responsible during the progress as well as maintenance for any liability imposed by law for any damage to the work of any part thereof or to any of the materials or other things used in performing the work of injury to any person or persons or for any property damaged in or outside the works limit. The Contractor shall indemnify and hold the owner and the Engineer harmless against any and all liability,

claims, loss or injury including cost expenses and attorney's fees incurred in the defence of same arising from any allegations whether groundless or not, or damage or injury to any person or property resulting from the performance of the work or from any cause whatever during the progress and maintenance of the work. The agency has to properly maintain all register and other records as per labour act and factory act and other Governing laws! rules / laws. The agency should produce all such records as and when required (even after within three years from the completion of work).

**36. SAFETY OF CONTRACTORS STAFF & LOSS TO CONTRACTOR BY TERRORIST:**

The work under this contract are in the proximity of Mumbai, where the activities of terrorists is increasing day by day. The safety of his staff is his sole responsibility and any loss due to above if occur to contractor that will not be entertained by MBMC.

**37. USE OF SITE:**

The contractor shall not unreasonable encumber the site with material and equipment. The Contractor should not use land for his private purpose. Use of MBMC's land for the purpose of housing of the labours may be permitted by MBMC but it is not binding on MBMC.

**38. COMPLIANCE:**

The contractor shall be bound by all ordnance acts codes, rules, regulations, orders and decrees of which in any way affects conduct of work or workman engaged for the works. The Contractor shall protect and indemnify compensation the MBMC against any claim or liability arising from violation of above.

**39. HANDLING OF CHEMICALS:**

Safety and facilities to the staff for handling of chemicals and equipments is an important consideration. Handling of chemicals needs Special attention. Following instructions are for guidance of the Contractor and observing them strictly at his cost.

#### **40. CHLORINE (T.C.L. POWDER)**

At the time of mixing T.C.L precautions to be taken. Chlorine vapour is extremely hazardous avoid prolonged breathing suitable gas mask may be used anticoloro solution shall be ready for quick relief.

Special precaution for keeping store room well ventilated be seen before entering, smoke test be carried out.

As chlorine is a dangerous gas and above certain levels inhalation of this gas is fatal. Therefore, it is essential that all operators working with chlorine are considered to be familiar with dangers of the gas. It is imperative to have protection equipments always readily available at site at the contractor's cost.

#### **41. TESTS:**

Routine tests should be performed and recorded to control the operation. All testing and sampling procedures should be carried out in accordance with standard methods for the examination of water and waste water published by the American Public Health Association. All analysis should be recorded in the registers as per predetermined formats based on guide lines given in CPHEEO manual on SEWAGE. The contractor should send samples of raw and treated sewage to MPCB at Thane it is responsibility of agency to collect and send the samples and get it tested.

#### **42. MAINTENANCE AND SUBMISSION OF RECORD TO MBMC:**

The Contractor shall maintain various record as per prescribed format by MBMC. and submit the same once in a week. The details are as below:-

1. Job register containing date of complaint, type of complaint and compliance done by agency, material consumption and date of compliance of complaint duly signed with concern Mistry/ Mukudam/ Engineer-in-charge.
2. CHEMICAL. consumption register at every STP.

#### **43. NO INTEREST ON DUES:**

No interest shall be payable by dept. on the amounts due to contractors pending final settlement of the claims.

**44. POWER OF ATTORNEY:**

In case of tenderer is a firm or a company it shall in its forwarding letter mention the name of partners and of the persons who could hold the power of attorney, authorizing him to conduct the transactions on behalf of firm or company and shall produce certified true copy of power of attorney and partnership deed along with tender and original shall produced for verification on demand.

**45. EXTRA ITEMS:** It is binding on the contractor to carry out such extra works as and when required and ordered in writing will be ordered when the same can be carried out by the contractor in the opinion of the Engineer in charge as internal part of the main work either in addition alteration or legitimate and reasonable extra item cropped up will be paid at current sanctioned scheduled of rates of the M.J.P. / P.W.D. division. The decision of the MBMC will be binding. Payment of extra item will be released only after it approved finally by the appropriate Authority.

1. Unless or otherwise specifically provided for either in the item or in the specifications or in the schedule of supply of materials, all items in tender are inclusive of the cost of all materials required for the execution of the item and such of them as are not proposed to the notes below will be provided by the contractor of the approved type and make.
2. Other unforeseen items to be done in course of work will have to be done by the contractor as per specification in P.W.D. Hand Book Vol. I & II.
3. The contractor shall be responsible and liable to pay any damage to public property.

**46.** The contractor shall make proper and economic use of all the materials supplied by the Government whether free of cost or on payment and whether directly to him or through any other person for utilization in the execution of the contract. He shall keep

the account of such materials in suitable book which would be available for inspection by the Engineer-in-charge by the MBMC.

The contractor will be responsible for proper handling the safe custody of all materials deliver to him by government for use on work and shall return to government all surplus materials after completion of the work. The materials charge to the contractor and remaining surplus will be taken back and paid for and as required by Department. All surplus materials supplied to the contractor free of charge will be returned to government and delivered to places as directed and if any shortages are noticed or material found in damaged or unserviceable condition the cost therefore as fixed by the MBMC will be recovered from the contractor.

47. In case of legal dispute for materials brought and stored at site without permission of Engineer-in-charge contractor will be responsible for all legal dispute at his own cost and consequences without reference to Government.

48. Contractor shall give receipt of all materials issued either free of cost or at cost. In case if received free of cost he will make a mention of the same specifically in receipt book.

49. Extra charges of claims in respect of extra works shall not be allowed unless the work to which they relate are clearly without the spirit and meaning of the specifications or unless such works are ordered in writing by the MBMC and claimed for in specified manner before the work is taken in hand.

50. If it is found that a agency or owner of a agency working in the MBMC, misused the Power of Attorney for cheating to MBMC, given by the another agency which also working in MBMC, then no blank form to both the said agencies will be issued.

51. Salary should be paid to employed labour. Rise/Amendment in salary as per government norms (Minimum Wages Act) will be applicable and binding on contractor should quote accordingly. No reimbursement of any kind of rise is admissible to contractor. It is to be paid by the contractor to the labour only.

52. If agency/ tenderer not communicate their unwillingness to do the work beyond original time limit /extended time limit well before 3 months of expiry. It will be binding to the contractor to execute work for further 3 Months or finalization of new agency / contract whichever is earlier after said time limit.

53. During extension period if there is rise in wages contractor is bound to pay first accordingly and will be paid / reimbursed to contractor.

SCHEDULE "A"

## MIRA BHAYANDER MUNICIPAL CORPORATION

### SCHEDULE 'A' OF B1 TENDER

**NAME OF WORK : Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhyander Municipal corporation area.**

**Schedule 'A' showing (approximately) the materials to be supplied from the Departmental Store for the work contracted to be executed and the rates at which they are to be charged for.**

Sr. No.	Particulars	Quantity	Rate at which the materials will be charged to the contractor	Unit	Place of Delivery

CONDITIONS OF  
SCHEDULE "A"

## **MIRA BHAYANDER MUNICIPAL CORPORATION**

**NAME OF WORK : Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhyander Municipal corporation area.**

### **Conditions of supply under Schedule 'A'**

1. Materials indicated in the schedule above will only be supplied by the Corporation at the issue rates shown against them and only on production of unstamped receipt thereof.
2. Materials will be issued at the place of delivery indicated in the schedule. Carting of materials from Corporation Store to site of work will have to be done by the Contractor at his own cost.
3. Contractor shall maintain account of materials received from Corporation and its consumption. The account shall be produced for review of the Inspecting Officer as and when demanded.
4. Contractor shall at the site of work provide a leak-proof pucca shed, with proper double locking arrangements to store materials, issued by the Corporation.
5. The stores shall be accessible for checking by Corporation Officer whenever desired.
6. If, after completion of work, materials issued by Corporation is found surplus and unused, such surplus materials in good condition only shall be returned to the Corporation at its place of delivery indicated in the schedule. Transport required therefore will be at Contractor's cost. For such materials, rates allowed will be rates as indicated in Schedule 'A' minus (-) Storage charges at 3% (Percent). Contractor shall therefore be cautious in getting materials issued.
7. If surplus material is misused or is not returned by the contractor, recovery at double the issue rate indicated above or market rate whichever is high will be made.
8. Portland or Pozollana cement whichever is available will be supplied in jute bags. Each bag shall be considered as having 50 kgs. cement in it. No cement will be issued on actual weighment basis.

Note : The tenderer submitting the tender should see that the rates in the above schedule are filled up by the Executive Engineer on the issue of the form prior to submission of the tender.

I/We have carefully studied the various items mentioned in schedule B herein above with the scope of work and detailed specification and all other terms and condition of this tender, also inspected the work site. On the basis of that I/we hereby undertake to execute the work of MBMC water Distribution Scheme .

Note :- 1) All work shall be carried out as per Public Works Department Hand Book and Other Specification of the MJP/Corporation or as directed.

2) Rates quoted include clearance of site (Prior to commencement of work and site moisture weather etc.)

SCHEDULE "B"

## MIRA BHAYANDER MUNICIPAL CORPORATION

**NAME OF WORK : Operation & maintenance of Sewerage treatment plants and underground drainage system in Mira - Bhyander Municipal corporation area.**

### Schedule- B

## MIRA BHAYANDER MUNICIPAL CORPORATION Water Supply Department

**Name of work :- Operation & Comprehensive maintenance of Sewerage treatment plants and under ground drainage system in Mira Bhyander Municipal corporation area.**

### Shedule B

Quantity as per Sanction	Item of Work	Estimated Rate		Unit	Total Amount according to Estimate	Specification		Additional Specification
		In Figures	In Words			Clouse No	Page No	
1	2	3	4	5	6	7	8	9
	<b>Sub Work No 1:- Operation &amp; maintenance of STP Zone -2</b>							

12.00	Item No 1 :-24 x 7 operation and Comprehensive maintenance of sewage treatment plant with preventive and breakdown maintenance of all mechanical, civil structure, electrical, electronic and all other equipments in plant with supply of necessary spares, lubricants, nuts, bolts, gaskets, tools, electrical material, consumables, manpower and other Required material, including transportation and incidental charges complete and ensuring treated effluent quality as per MPCB/CPCB norms as per details specifications and as directed by the Engineer-in-Charge	640000.00	Rs. Six lac forty thousand only	MONTH	7680000.00			As per the Direction given by the Engineer in Charge
20.00	Item No 2:- Providing and filling in site MBBR media	39160.00	Rs. Thirty nine thousand one hundred sixty only	CUM	783200.00			As Above
15.00	Item No 3:- Providing & erecting in position Tube settler material	14410.00	Rs. Fourteen thousand four hundred ten only	SQ.MTR	216150.00			As Above
213.00	Item No 4 :- Sludge handling & transportation from STP to dumping ground up to 10 Km as per directives of Engineer In Charge.	514.00	Rs. Five hundred fourteen only	MT	109482.00			As Above
2880.00	Item No 5 :- Design, supply, installation, testing, commissioning, operation and maintenance of a complete bio-augmentation system for improvement of biological treatment efficiency in STP including continuous supply of approved microbial formulation, dosing tanks, metering pumps, injection arrangements at RSS sumps, level/flow sensing and PLC/SCADA integration for flow-paced dosing, and all related work complete as directed by the Engineer-in-Charge	1000.00	Rs. One thousand only	MLD	2880000.00			As Above
			<b>Total Sub work 1</b>		<b>11668832.00</b>			
	<b>Sub Work No 2:- Operation &amp; maintenance of STP Zone -3</b>							

12.00	Item No 1 :-24 x 7 operation and Comprehensive maintenance of sewage treatment plant with preventive and breakdown maintenance of all mechanical, civil structure, electrical, electronic and all other equipments in plant with supply of necessary spares, lubricants, nuts, bolts, gaskets, tools, electrical material, consumables, manpower and other Required material, including transportation and incidental charges complete and ensuring treated effluent quality as per MPCB/CPCB norms as per details specifications and as directed by the Engineer-in-Charge	1040000.00	Rs. Ten lac forty thousand only	MONTH	12480000.00			As Above
20.00	Item No 2:- Providing and filling in site MBBR media	39160.00	Rs. Thirty nine thousand one hundred sixty only	CUM	783200.00			As Above
15.00	Item No 3:- Providing & erecting in position Tube settler material	14410.00	Rs. Fourteen thousand four hundred ten only	SQ.MTR	216150.00			As Above
335.00	Item No 4 :- Sludge handling & transportation from STP to dumping ground up to 10 Km as per directives of Engineer In Charge.	514.00	Rs. Five hundred fourteen only	MT	172190.00			As Above
4680.00	Item No 5 :- Design, supply, installation, testing, commissioning, operation and maintenance of a complete bio-augmentation system for improvement of biological treatment efficiency in STP including continuous supply of approved microbial formulation, dosing tanks, metering pumps, injection arrangements at RSS sumps, level/flow sensing and PLC/SCADA integration for flow-paced dosing, and all related work complete as directed by the Engineer-in-Charge	1000.00	Rs. One thousand only	MLD	4680000.00			As Above
			<b>Total Sub work 2</b>		<b>18331540.00</b>			
	<b>Sub Work No 3:- Operation &amp; maintenance of STP Zone -4</b>							

12.00	Item No 1 :-24 x 7 operation and Comprehensive maintenance of sewage treatment plant with preventive and breakdown maintenance of all mechanical, civil structure, electrical, electronic and all other equipments in plant with supply of necessary spares, lubricants, nuts, bolts, gaskets, tools, electrical material, consumables, manpower and other Required material, including transportation and incidental charges complete and ensuring treated effluent quality as per MPCB/CPCB norms as per details specifications and as directed by the Engineer-in-Charge	960000.00	Rs. Nine lac sixty thousand only	MONTH	11520000.00			
20.00	Item No 2:- Providing and filling in site MBBR media	39160.00	Rs. Thirty nine thousand one hundred sixty only	CUM	783200.00			
15.00	Item No 3:- Providing & erecting in position Tube settler material	14410.00	Rs. Fourteen thousand four hundred ten only	SQ.MTR	216150.00			
304.00	Item No 4 :- Sludge handling & transportation from STP to dumping ground up to 10 Km as per directives of Engineer In Charge.	514.00	Rs. Five hundred fourteen only	MT	156256.00			As Above
4320.00	Item No 5 :- Design, supply, installation, testing, commissioning, operation and maintenance of a complete bio-augmentation system for improvement of biological treatment efficiency in STP including continuous supply of approved microbial formulation, dosing tanks, metering pumps, injection arrangements at RSS sumps, level/flow sensing and PLC/SCADA integration for flow-paced dosing, and all related work complete as directed by the Engineer-in-Charge	1000.00	Rs. One thousand only	MLD	4320000.00			As Above
			<b>Total Sub work 3</b>		<b>16995606.00</b>			
	<b>Sub Work No 4:- Operation &amp; maintenance of STP Zone -5</b>							

12.00	Item No 1 :-24 x 7 operation and Comprehensive maintenance of sewage treatment plant with preventive and breakdown maintenance of all mechanical, civil structure, electrical, electronic and all other equipments in plant with supply of necessary spares, lubricants, nuts, bolts, gaskets, tools, electrical material, consumables, manpower and other Required material, including transportation and incidental charges complete and ensuring treated effluent quality as per MPCB/CPCB norms as per details specifications and as directed by the Engineer-in-Charge	1360000.00	Rs. One lac thirty six thousand only	MONTH	16320000.00			
20.00	Item No 2:- Providing and filling in site MBBR media	39160.00	Rs. Thirty nine thousand one hundred sixty only	CUM	783200.00			
15.00	Item No 3:- Providing & erecting in position Tube settler material	14410.00	Rs. Fourteen thousand four hundred ten only	SQ.MTR	216150.00			
426.00	Item No 4 :- Sludge handling & transportation from STP to dumping ground up to 10 Km as per directives of Engineer In Charge.	514.00	Rs. Five hundred fourteen only	MT	218964.00			
6120.00	Item No 5 :- Design, supply, installation, testing, commissioning, operation and maintenance of a complete bio-augmentation system for improvement of biological treatment efficiency in STP including continuous supply of approved microbial formulation, dosing tanks, metering pumps, injection arrangements at RSS sumps, level/flow sensing and PLC/SCADA integration for flow-paced dosing, and all related work complete as directed by the Engineer-in-Charge	1000.00	Rs. One thousand only	MLD	6120000.00			
			<b>Total Sub work 4</b>		<b>23658314.00</b>			
	<b>Sub Work No 5:- Operation &amp; maintenance of STP Zone -6A</b>							

12.00	Item No 1 :-24 x 7 operation and Comprehensive maintenance of sewage treatment plant with preventive and breakdown maintenance of all mechanical, civil structure, electrical, electronic and all other equipments in plant with supply of necessary spares, lubricants, nuts, bolts, gaskets, tools, electrical material, consumables, manpower and other Required material, including transportation and incidental charges complete and ensuring treated effluent quality as per MPCB/CPCB norms as per details specifications and as directed by the Engineer-in-Charge	1040000.00	Rs. Ten lac forty thousand only	MONTH	12480000.00			
20.00	Item No 2:- Providing and filling in site MBBR media	39160.00	Rs. Thirty nine thousand one hundred sixty only	CUM	783200.00			
15.00	Item No 3:- Providing & erecting in position Tube settler material	14410.00	Rs. Fourteen thousand four hundred ten only	SQ.MTR	216150.00			
335.00	Item No 4 :- Sludge handling & transportation from STP to dumping ground up to 10 Km as per directives of Engineer In Charge.	514.00	Rs. Five hundred fourteen only	MT	172190.00			
4680.00	Item No 5 :- Design, supply, installation, testing, commissioning, operation and maintenance of a complete bio-augmentation system for improvement of biological treatment efficiency in STP including continuous supply of approved microbial formulation, dosing tanks, metering pumps, injection arrangements at RSS sumps, level/flow sensing and PLC/SCADA integration for flow-paced dosing, and all related work complete as directed by the Engineer-in-Charge	1000.00	Rs. One thousand only	MLD	4680000.00			
			<b>Total Sub work 5</b>		<b>18331540.00</b>			
	<b>Sub Work No 6:- Operation &amp; maintenance of STP Zone -6B</b>							

12.00	Item No 1 :-24 x 7 operation and Comprehensive maintenance of sewage treatment plant with preventive and breakdown maintenance of all mechanical, civil structure, electrical, electronic and all other equipments in plant with supply of necessary spares, lubricants, nuts, bolts, gaskets, tools, electrical material, consumables, manpower and other Required material, including transportation and incidental charges complete and ensuring treated effluent quality as per MPCB/CPCB norms as per details specifications and as directed by the Engineer-in-Charge	560000.00	Rs. Five lac sixty thousand only	MONTH	6720000.00			
20.00	Item No 2:- Providing and filling in site MBBR media	39160.00	Rs. Thirty nine thousand one hundred sixty only	CUM	783200.00			
15.00	Item No 3:- Providing & erecting in position Tube settler material	14410.00	Rs. Fourteen thousand four hundred ten only	SQ.MTR	216150.00			
183.00	Item No 4 :- Sludge handling & transportation from STP to dumping ground up to 10 Km as per directives of Engineer In Charge.	514.00	Rs. Five hundred fourteen only	MT	94062.00			
2520.00	Item No 5 :- Design, supply, installation, testing, commissioning, operation and maintenance of a complete bio-augmentation system for improvement of biological treatment efficiency in STP including continuous supply of approved microbial formulation, dosing tanks, metering pumps, injection arrangements at RSS sumps, level/flow sensing and PLC/SCADA integration for flow-paced dosing, and all related work complete as directed by the Engineer-in-Charge	1000.00	Rs. One thousand only	MLD	2520000.00			
			<b>Total Sub work 6</b>		<b>10333412.00</b>			
	<b>Sub Work No 7:- Operation &amp; maintenance of STP Zone -6C</b>							

12.00	Item No 1 :-24 x 7 operation and Comprehensive maintenance of sewage treatment plant with preventive and breakdown maintenance of all mechanical, civil structure, electrical, electronic and all other equipments in plant with supply of necessary spares, lubricants, nuts, bolts, gaskets, tools, electrical material, consumables, manpower and other Required material, including transportation and incidental charges complete and ensuring treated effluent quality as per MPCB/CPCB norms as per details specifications and as directed by the Engineer-in-Charge	880000.00	Rs. Eight lac eighty thousand only	MONTH	10560000.00			
20.00	Item No 2:- Providing and filling in site MBBR media	39160.00	Rs. Thirty nine thousand one hundred sixty only	CUM	783200.00			
15.00	Item No 3:- Providing & erecting in position Tube settler material	14410.00	Rs. Fourteen thousand four hundred ten only	SQ.MTR	216150.00			
274.00	Item No 4 :- Sludge handling & transportation from STP to dumping ground up to 10 Km as per directives of Engineer In Charge.	514.00	Rs. Five hundred fourteen only	MT	140836.00			
3960.00	Item No 5 :- Design, supply, installation, testing, commissioning, operation and maintenance of a complete bio-augmentation system for improvement of biological treatment efficiency in STP including continuous supply of approved microbial formulation, dosing tanks, metering pumps, injection arrangements at RSS sumps, level/flow sensing and PLC/SCADA integration for flow-paced dosing, and all related work complete as directed by the Engineer-in-Charge	1000.00	Rs. One thousand only	MLD	3960000.00			
			<b>Total Sub work 7</b>		<b>15660186.00</b>			
	<b>Sub Work No 8:- Operation &amp; maintenance of STP Zone -7</b>							

12.00	Item No 1 :-24 x 7 operation and Comprehensive maintenance of sewage treatment plant with preventive and breakdown maintenance of all mechanical, civil structure, electrical, electronic and all other equipments in plant with supply of necessary spares, lubricants, nuts, bolts, gaskets, tools, electrical material, consumables, manpower and other Required material, including transportation and incidental charges complete and ensuring treated effluent quality as per MPCB/CPCB norms as per details specifications and as directed by the Engineer-in-Charge	960000.00	Rs. Nine lac sixty thousand only	MONTH	11520000.00			
20.00	Item No 2:- Providing and filling in site MBBR media	39160.00	Rs. Thirty nine thousand one hundred sixty only	CUM	783200.00			
15.00	Item No 3:- Providing & erecting in position Tube settler material	14410.00	Rs. Fourteen thousand four hundred ten only	SQ.MTR	216150.00			
304.00	Item No 4 :- Sludge handling & transportation from STP to dumping ground up to 10 Km as per directives of Engineer In Charge.	514.00	Rs. Five hundred fourteen only	MT	156256.00			
4320.00	Item No 5 :- Design, supply, installation, testing, commissioning, operation and maintenance of a complete bio-augmentation system for improvement of biological treatment efficiency in STP including continuous supply of approved microbial formulation, dosing tanks, metering pumps, injection arrangements at RSS sumps, level/flow sensing and PLC/SCADA integration for flow-paced dosing, and all related work complete as directed by the Engineer-in-Charge	1000.00	Rs. One thousand only	MLD	4320000.00			
			<b>Total Sub work 8</b>		<b>16995606.00</b>			
	<b>Sub Work No 9:- Operation &amp; maintenance of STP Zone -8</b>							

12.00	Item No 1 :-24 x 7 operation and Comprehensive maintenance of sewage treatment plant with preventive and breakdown maintenance of all mechanical, civil structure, electrical, electronic and all other equipments in plant with supply of necessary spares, lubricants, nuts, bolts, gaskets, tools, electrical material, consumables, manpower and other Required material, including transportation and incidental charges complete and ensuring treated effluent quality as per MPCB/CPCB norms as per details specifications and as directed by the Engineer-in-Charge	1120000.00	Rs. Eleven lac twenty thousand only	MONTH	13440000.00			
22.00	Item No 2:- Providing and filling in site MBBR media	39160.00	Rs. Thirty nine thousand one hundred sixty only	CUM	861520.00			
15.00	Item No 3:- Providing & erecting in position Tube settler material	14410.00	Rs. Fourteen thousand four hundred ten only	SQ.MTR	216150.00			
365.00	Item No 4 :- Sludge handling & transportation from STP to dumping ground up to 10 Km as per directives of Engineer In Charge.	514.00	Rs. Five hundred fourteen only	MT	187610.00			
5040.00	Item No 5 :- Design, supply, installation, testing, commissioning, operation and maintenance of a complete bio-augmentation system for improvement of biological treatment efficiency in STP including continuous supply of approved microbial formulation, dosing tanks, metering pumps, injection arrangements at RSS sumps, level/flow sensing and PLC/SCADA integration for flow-paced dosing, and all related work complete as directed by the Engineer-in-Charge	1000.00	Rs. One thousand only	MLD	5040000.00			
			<b>Total Sub work 9</b>		<b>19745280.00</b>			
	<b>Sub Work No 10:- Operation &amp; maintenance of STP JESAL PARK</b>							

12.00	Item No 1 :-24 x 7 operation and Comprehensive maintenance of sewage treatment plant with preventive and breakdown maintenance of all mechanical, civil structure, electrical, electronic and all other equipments in plant with supply of necessary spares, lubricants, nuts, bolts, gaskets, tools, electrical material, consumables, manpower and other Required material, including transportation and incidental charges complete and ensuring treated effluent quality as per MPCB/CPCB norms as per details specifications and as directed by the Engineer-in-Charge	160000.00	Rs. One lac sixty thousand only	MONTH	1920000.00			
22.00	Item No 2:- Providing and filling in site MBBR media	39160.00	Rs. Thirty nine thousand one hundred sixty only	CUM	861520.00			
40.00	Item No 3 :- Sludge handling & transportation from STP to dumping ground up to 10 Km as per directives of Engineer In Charge.	514.00	Rs. Five hundred fourteen only	MT	20560.00			
720.00	Item No 4 :- Design, supply, installation, testing, commissioning, operation and maintenance of a complete bio-augmentation system for improvement of biological treatment efficiency in STP including continuous supply of approved microbial formulation, dosing tanks, metering pumps, injection arrangements at RSS sumps, level/flow sensing and PLC/SCADA integration for flow-paced dosing, and all related work complete as directed by the Engineer-in-Charge	1000.00	Rs. One thousand only	MLD	720000.00			
			<b>Total Sub work 10</b>		<b>3522080.00</b>			
	<b>Sub Work No 11:- Operation &amp; maintenance of SPS SHRUSHTI, SEC-3, SEC-8</b>							

12.00	Item No 1 :-24 x 7 operation and Comprehensive maintenance of sewage pumping station with preventive and breakdown maintenance of all mechanical, civil structure, electrical, electronic and all other equipments in plant with supply of necessary spares, lubricants, nuts, bolts, gaskets, tools, electrical material, consumables, manpower and other Required material, including transportation and incidental charges complete and ensuring treated effluent quality as per MPCB/CPCB norms as per details specifications and as directed by the Engineer-in-Charge	760000.00	Rs. Seven lac sixty thousand only	MONTH	9120000.00			
3420.00	Item No 2 :- Design, supply, installation, testing, commissioning, operation and maintenance of a complete bio-augmentation system for improvement of biological treatment efficiency in SPS including continuous supply of approved microbial formulation, dosing tanks, metering pumps, injection arrangements at RSS sumps, level/flow sensing and PLC/SCADA integration for flow-paced dosing, and all related work complete as directed by the Engineer-in-Charge	1000.00	Rs. One thousand only	MLD	3420000.00			
			<b>Total Sub work 11</b>		<b>12540000.00</b>			
	<b>Sub Work No 12:- Operation &amp; maintenance of UGD</b>							
	ITEM No 1 :- TWO DEPARTMENTAL VEHICLE MOUNTED RECYCLER MACHINE							
	Providing services for Operation and comprehensive maintenance of Departmental Vehicle Mounted Suction cum Jetting Machine with recycling Facility fitted on 28 Tonne chasis for the cleaning/deslting of sewer lines with manpower, fuel, oil ,repair and maintenace etc for trouble free operation as per requirement and detailed specifications as directed by Engineer-In-Charge.							

12.00	DEPARTMENTAL VEHICLE MOUNTED RECYCLER MACHINE No.01	844858.50	Rs. Eight lac forty four thousand eight hundred fifty eight & fifty paise only	MONTH	10138302.00			
12.00	DEPARTMENTAL VEHICLE MOUNTED RECYCLER MACHINE No.02	844858.50	Rs. Eight lac forty four thousand eight hundred fifty eight & fifty paise only	MONTH	10138302.00			
	ITEM No 2:-THREE DEPARTMENTAL VEHICLE MOUNTED GRAB BUCKET							
	Providing services for Operation and comprehensive maintenance of Departmental Vehicle Mounted Grab Bucket specially designed to quickly and safely cleanout the silt and other waste matter from manhole and any other chamber located at depth up to 10 mtrs on hire basis without necessitating man entry with required adequate manpower, fuel, oil, repair maintainance etc for trouble free operation for Underground Drainage department as per requirement and detailed specifications as directed by Engineer-In-Charge.							
12.00	DEPARTMENTAL VEHICLE MOUNTED GRAB BUCKET MACHINE No.01	214278.00	Rs. Two lac fourteen thousand two hundred seventy eight only	MONTH	2571336.00			
12.00	DEPARTMENTAL VEHICLE MOUNTED GRAB BUCKET MACHINE No.02	214278.00	Rs. Two lac fourteen thousand two hundred seventy eight only	MONTH	2571336.00			
12.00	DEPARTMENTAL VEHICLE MOUNTED GRAB BUCKET MACHINE No.03	214278.00	Rs. Two lac fourteen thousand two hundred seventy eight only	MONTH	2571336.00			

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	ITEM No 3 :- TWO DEPARTMENTAL RODDING MACHINE							
	Providing services for Operation and comprehensive maintenance of Departmental Rodding Machine with required trained staff for removal of Chock up from Under Ground Sewer Pipe Lines by taking all safety precautions with required fuel & liubricants etc complete as per requirement and detailed specifications as directed by Engineer-In-Charge							
12.00	DEPARTMENTAL RODDING MACHINE No.01	208287.00	Rs. Two lac eight thousand two hundred eighty seven only	MONTH	2499444.00			
12.00	DEPARTMENTAL RODDING MACHINE No.02	208287.00	Rs. Two lac eight thousand two hundred eighty seven only	MONTH	2499444.00			
	ITEM No 4 :-ONE DEPARTMENTAL SUPER SUCKER MACHINE							
12.00	Providing services for Operation and comprehensive maintenance of Departmental Super Sucker Machine with High Pressure Jetting Machine with required trained staff for removal of Chock up from Under Ground Sewer Pipe Lines by taking all safety precautions with required fuel & liubricants etc complete as per detailed specifications & as directed by Engineer-In-Charge	1007359.00	Rs. Ten lac seven thousand three hundred fifty nine only	MONTH	12088308.00			
	ITEM No. 5 :- DE-SILTING OF SEWER PIPE LINE							

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1500.00	Desilting the Supply Well, Intake Well / Head Works, Sump of water supply /sewerage works etc. in wet or dry condition in wet or dry condition including lifts upto 9 M and lead upto 150 M as required beyond the work site, stacking, spreading, including necessary guarding, etc complete as per detailed specifications & as directed by Engineer-In-Charge	820.05	Rs. Eight hundred twenty & five paise only	CUM	1230075.00			
	ITEM No. 6 :- TRANSPORTATION OF SILT							
800.00	Transportation charges including loading & unloading of soil of all types ,sand ,gravel and soft murum hard murum, boulders, Slushy soil, rock, solid waste etc complete for a lead for 5 km outside the work site at given dump yard as directed by the Engineer in charge.	468.35	Rs. Four hundred sixty eight & thirty paise only	CUM	374680.00			
	ITEM No 7 :- CONSTRUCTION of MANHOLES & RAISING OF HEIGHT							
40.00	ITEM No 7.A. - Providing Constructing on sewer BB masonry Circuler manhole concentric cone 1.2 M Dia at Bottom and 0.5 M Dia. At top and up to depth of 2.0 M....	30605.40	Rs. Thirty thousand six hundred five & forty only	Per No	1224216.00			
	Rebate for every decrease in depth of 50 CM or part thereof	4107.60	Rs. Four thousand one hundred seven & sixty only	Per 50 CM				
20.00	ITEM No 7.B. - . Providing Constructing on sewer BB masonry Circuler manhole concentric cone 1.5 M Dia at Bottom and 0.5 M Dia. At top and up to depth of 5.0 M....	87255.00	Rs. Eighty seven thousand two hundred fifty five only	Per No	1745100.00			
	Rebate for every decrease in depth of 50 CM or part thereof	8883.00	Rs. Eight thousand eight hundred eighty three only	Per 50 CM				

5.00	ITEM No 7.C. - . Providing Constructing on sewer BB masonry Circuler manhole concentric cone 1.8 M Dia at Bottom and 0.5 M Dia. At top and up to depth of 9.0 M....	186212.30	Rs. One lac eighty six thousand two hundred twelve & thirty paise only	Per No	931061.50			
	Rebate for every decrease in depth of 50 CM or part thereof	11287.50	Rs. Eleven thousand two hundred eighty seven & fifty paise only	Per 50 CM				
	ITEM NO 8:-PROVIDING HEAVY DUTY RCC MAN HOLE COVERS							
400.00	Rectangular size 900mm x 600mm x 100mm thick/Circular size 500mm inner Dia and 750 mm outer dia and 100mm thick	4185.00	Rs. Four thousand one hundred eighty five only	No	1674000.00			
	ITEM NO 9:-REMOVING CHOKE UP BY CONVENTIONAL METHOD							
100.00	ITEM NO 9.A - Pipe Dia 200 mm. to 400 mm and depth up to 4.00 Mtr	70954.76	Rs. Seventy thousand nine hundred fifty four & seventy six paise only	RMT	7095475.75			
50.00	ITEM NO 9.B - Pipe Dia 500 mm. to 700 mm and depth up to 6.00 Mtr	135482.49	Rs. One lac thirty five thousand four hundred eighty two & forty nine only	RMT	6774124.71			
45.00	ITEM NO 9.C - Pipe Dia 800 mm. to 1000 mm and depth up to 9.00 Mtr	225445.47	Rs. Two lac twenty five thousand four hundred forty five & forty seven only	RMT	10145046.30			

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	ITEM NO 10 - ROAD RESTORATION							
	ITEM NO 10.A - Supplying-----trap / granite / quartzite / gneiss / laterite stone metal at the road side for metal including conveying & stacking etc. complete.							
	a) By Blasting (Hand broken)							
26.00	i) 80 mm metal	1536.75	Rs. One thousand five hundred thirty six & seventy five paisa only	CUM	39955.50			
13.00	ii) 40 mm metal	1620.75	Rs. One thousand six hundred twenty & seventy five paisa only	CUM	21069.75			
	ITEM NO 10.B - Supplying----- crushed metal of trap / granite / quartzite / gneiss stone aggregate at the road side, including conveying and stacking etc. complete for use in bituminous road surface.							
14.80	i) 6 mm	2661.09	Rs. Two thousand six hundred sixty one & nine paisa only	CUM	39384.13			
45.22	Spreading oversize 40mm / 60mm metal including sectioning etc. complete.	82.95	Rs. Eighty two & ninety five paisa only	CUM	3751.00			
58.42	ITEM NO 10.C - Compacting sub grade / gravel / oversize metal (200mm loose)layer 2 to 7 m wide with static roller, including necessary, labour, materials and artificial watering etc. complete.	22.05	Rs. Twenty two & five paisa only	SQM	1288.16			
15.25	ITEM NO 10.D - Spreading gravel / hard murum /soft murum & stone dust over the rubble soling, oversize and size metal layer / blandage on W.B.M. surface etc., complete.	82.95	Rs. Eighty two & ninety five paisa only	CUM	1264.99			

130.88	ITEM NO 10.E- Compacting the size metal (150 mm loose) layer up to 2.00m width with static roller , including necessary labour, materials and artificial watering etc. complete.	22.05	Rs. Twenty two & five paisa only	SQM	2885.90			
150.72	ITEM NO 10.F - Providing and laying bituminous tack coat, @ 50 Kg/100 m2 over B.T. surface by manual/mechanical sprayer including supplying all materials, preparing the existing tack coat evenly on the surface etc. complete. (using 60/70 grade) surface, heating bitumen and applying tack Coat evenly on the surface etc., complete	22.05	Rs. Twenty two & five paisa only	SQM	3323.38			
20.72	ITEM NO 10.G - Providing and laying hot mix hot laid bituminous macadam 50/75 mm average thickness with 3.3% bitumen content by weight of total mix on prepared surface with specified graded crushed aggregates for the base / binding course including loading of aggregates with F.E. loader, heating of stone aggregates and bitumen and mixing in modern drum mix type of hot mix plant, transporting the mixed material to work site laying the mixed material with sensor paver finisher to the required grade, level and camber, rolling by power roller and vibratory roller to achieve the desired density ( Grade of Bitumen should be 60/70) and cost of all materials, bitumen from refinery etc. complete. (excluding tack coat)	8026.20	Rs.Eight thousand twenty six & twenty paisa only	CUM	166302.86			
100.83	ITEM NO 10.I - 9 MM SEAL COAT: Providing and laying of Type A9 mm premix sealcoat with HMP of aproprate capacity crushedstonechiping 6.7 mm size and penetration bitumen of specified grade@ .2kg/Sq.m, preparing existing road surface by mechanical means, spreading chip sand rolling, by static roller having weight 8 to10MT.etc.complete. (VG-30 bulk bitumen rates are considered to arrive at rates)	121.80	Rs. One hundred twenty one & eighty paisa only	SQM	12281.09			

64800.00	ITEM NO 11.Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches,well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer -in-charge ( including cost of machinery,	89.00	Rs. Eighty nine only	Hp/Hr	5767200.00			
			<b>Total Sub work 12</b>		<b>82330294.02</b>			

**Total**  
**Rs. 250112690.02**

**I/we herby agree to execute the above work at % below/above/estimated cost.**

Contractor/Agency

No. of Correction

Executive Engineer

# **Operation & Maintenance Manual**

## **O & M Manual**

### UNIT OPERATIONS

#### **Raw Sewage Collection and Pumping**

The raw sewage shall be received as overflow from inlet chamber(Client scope) to Mechanical coarse screen channel where coarse floating particle will be screened and separated from the sewage, The Mechanical Coarse Screens shall be cleaned by mechanically driven rake equipped with a comb. The screenings gets discharged onto the Belt Conveyor & is then discharged into the hopper from where it can be disposed off manually. An Manual Coarse screen is provided as Standby. Screened sewage enters into raw sewage sump from where it is pumped through submersible pumps to Stilling chamber.

1 working and 1 standby pump is provided with quarter capacity additionally 2 working + 2 standby pumps are provided with half capacity and 1 working + 1 standby pumps are provided with full capacity.

Selection of pumps to run is to be done manually on the basis of inlet sewage flow.

#### **Stilling Chamber**

The raw sewage shall be received in the Stilling Chamber where the turbulence is reduced. The sewage then flows by gravity to the down stream units.

#### **Mechanical Bar Rack, Grit separator Mechanisms Distribution Chamber**

2 nos. of channels are provided at downstream of the Stilling Chamber. In one channel the Manual Medium Screen is provided & in rest 1 channels the Mechanical fine Screens is provided. The Mechanical fine Screens shall be cleaned by mechanically driven rake equipped with a comb. The screenings gets discharged onto the Belt Conveyor & is then

discharged into the hopper from where it can be disposed off manually. The Sewage then flows by gravity to the Grit Chambers the heavy grit settled in the chamber is scrapped to the pit & then discharged into the hopper by using the conveyor. The Sewage then flows to

### **Secondary Treatment –Biological-MBBR Reactor followed by Clarification**

Two nos. of MBBR Reactors in series are provided for biological treatment. The objective / function of the MBBR Reactor is to convert the soluble organic matter in the waste water to suspended organic matter/bio-mass plus respiration products using both attached growth micro-organisms, with oxygen being supplied by Coarse Bubble aeration. The air required for biological treatment is provided by Air Blowers Two Blowers will be working depending on the organic load. The compressed air flow rate to each MBBR Reactor can be measured with the help of Flow meters. For Operation & Maintenance of MBBR reactor refer SECTION –IV. The Sewage from MBBR Reactor flows to the Flash Mixer followed by Flocculator The sewage then enters in Tube Settler The solids separated here are settled & the sludge formed is withdrawn from the Tube Settler & is taken to the sludge sump by gravity.

### **Disinfection**

The clear overflow from Tube Settler flows by gravity to the Chlorine Contact Tank Here Chlorine is dosed for disinfection of treated sewage.

### **Sludge Handling**

The sludge settled in the Tube Settler is collected in the Sludge sump & pumped periodically to Centrifuge using Centrifuge Feed Pumps Dewatered sludge then can transported to the sludge disposal area.

## **1.8. SALIENT FEATURES OF MBBR**

### **MBBR Reactor**

The Moving Bed Bio Reactor (MBBR) is an improved version of our own earlier development of SAFF (Submerged Aerated Fixed Film) Reactor. Fundamentally there is a difference between conventional activated sludge process (ASP) which is a suspended sludge growth process and

an attached growth process of SAFF or Moving Bed Bioreactor (MBBR). In the conventional process, which is widely accepted and practiced, although the construction of the plant is simple and

Inexpensive, there is a great demand on the operating personnel in order to maintain F/M ratio and MLSS levels by properly recycling the settled activated sludge in right quantities. This needs continuous monitoring 24 hrs/day.

In attached growth process (SAFF/MBBR), the phenomenon is entirely different, bacterial culture gets attached to and grows on the surface area submerged in the effluent. It is possible to provide larger surface areas, which is responsible for higher organic loading rates, making the

plant compact. As no sludge needs to be recycled for controlling MLSS, as in activated sludge process, it does away for the need of a skilled operator.

The SAFF reactor employs composite media in matrix formed out of corrugated sheets. Bacteria grow on its surface giving it the name attached growth process. In SAFF, however, there is a limitation on the maximum surface area, which can be accommodated.

A new process was therefore developed which has all the advantages of attached growth process of SAFF and at the same time takes care of the limitations of media. By providing media of smaller sizes and as such forms that can be moving freely in the effluent, one can pack a very large surface area in the given volume. There is a significant improvement over

the attached growth process involving fixed media, as now we are able to increase total surface by a factor of-3. The media shape, size and density are to be chosen carefully such that the biomass is attached to the carrier, which moves freely along with the water.

**Basic idea behind Moving Bed Bio Reactor is to have a continuously operating bio film reactor with low head loss and high specific bio film surface. This is achieved by having bio film (biomass) grow on small elements that move along with the water in the fluidised bed state. The movement is caused by bubbling air at the bottom of the reactor. This is the air, which takes care of aeration requirement of the aerobic reactor.**

The advantages of MBBR reactor are:

1. Compact: Due to high organic loading rate as a result of large surface area.
2. Robust: Stable under large load variation.
3. No sludge recycles - no sludge bulking.
4. Low sludge generation.
5. Flexible reactor design.
6. Easy upgrading capability: Existing aeration tank of conventional process can be retrofitted to enhance this capacity several times over.

In research during development of this process and tested a variety of media, of various shapes and sizes, density and materials etc. and came up with the most appropriate combination that is cost effective.

For the main reactor, we need to introduce adequate oxygen (air) for providing aerobic conditions when the effluent is being treated. The air is distributed at the bottom of the reactor uniformly using air distribution grid and stainless steel pipe diffusers. The key for proper fluidization is uniform distribution of air, which also acts as a fluidizing medium.

The main element of the process is the media having proper density, shape and size. Entry and exit of effluent are strategically located. Although this is a completely mixed reactor, we must not allow short-circuiting of inlet and outlet. At the end of reactor the treated effluent will also contain sludge generated from the MBBR. This sludge is settled in the down stream clarifier unit .

### **GLOSSARY OF TERMS**

1. **Absorption** - A process in wastewater treatment by which organic material is consumed by a microorganism by passing the material through the cell of the microorganism.
2. **Adsorption** - The sticking of a solid in the wastewater to the surface of the microorganism.
3. **Aerobic** - A condition in which "free" or Dissolved Oxygen is present in the aquatic environment.
4. **Anaerobic** - A condition in which "free" or Dissolved Oxygen is not present in the aquatic environment.
5. **Biochemical Oxygen Demand (BOD)** - A measurement of the amount of oxygen required by the microorganisms to metabolize or digest the Organic material in the wastewater.
6. **Total Nitrogen** - Total nitrogen consists of organic nitrogen, nitrate nitrogen, nitrite nitrogen and ammonical nitrogen.
7. **Total Kjeldahl Nitrogen (TKN)** - TKN consist of organic nitrogen and ammoniacal nitrogen.
8. **Grit** - The heavy mineral material present in the wastewater such as sand, eggshell, gravel and cinders.
9. **Inorganic Waste** - Waste material such as sand, salt, iron, calcium & other materials which are not converted in large quantities by microorganism action .

10. **Microorganism** - Microscopic living objects which require energy, carbon and small amounts of inorganic elements to grow and multiply. They get these requirements from the wastewater and the sun, and in doing so help to remove the pollutants from the wastewater.
11. **Overaerated** - Sludge which has been exposed to high aeration rates which has resulted in a Dissolved Oxygen level at 4 mg/L and above in the Aeration Tank.
12. **Overoxidized** - Sludge which has been retained in the treatment system for too long time, thereby, allowing it to be highly oxidized. (too high sludge age).
13. **Organic Wastes** - Waste material, which comes from animal or vegetable sources. Bacteria and other small organisms generally can consume organic waste. Organic wastes contain mainly carbon and hydrogen along with other components.
14. **pH** - A term used to express the intensity of the acidity or alkalinity in water or wastewater. A pH of 7 is considered neutral, with acidity increasing as the pH decreases.
15. **Septic** - A condition produced by the growth of anaerobic organisms. If severe, the wastewater turns black, giving off foul odors and creating a heavy oxygen demand.
16. **Settleable Solids** - That matter in wastewater which will not stay in suspension during a pre-selected settling period.
17. **Sludge** - The settleable solids separated from the liquid during sedimentation (clarification)
18. **Sludge Thickener** - A tank where sludge is concentrated by gravity forces and where the dry solid content in the sludge is increased to reduce total sludge volume. Excess water (supernatant) is drained off from settled sludge.
19. **Supernatant** - Supernatant commonly refers to the liquid remaining between the sludge on the bottom and the scum on the surface of any Settlement Tank.
20. **Suspended Solids** - Solids that either float on the surface of, or are in suspension in water, wastewater or other liquids and are largely removable by filtration.

#### 4.2. INTRODUCTION TO WASTEWATER TREATMENT

## **Characteristics of Wastewater**

It is very important for plant operators to be familiar with the characteristics of wastewater. This composition refers to the actual amounts of physical, chemical and biological constituents present in the wastewater.

The source of wastewater entering a Treatment Plant (called plant influent) is the combination of water supplied for communal use & industrial use in the industry. Plant influent may also comprise storm water and groundwater, which has inadvertently been allowed to enter the wastewater collection system.

### **a) Solids**

The solids in wastewater can be divided into two general groups:

1. Organic Solids: Organic solids come from animals or plants, and include the waste products of plant and animal life. These solids will decompose.
2. Inorganic: Inorganic Solids usually will not decompose and comprise sand, silt, salts and so on. Both organic and inorganic solids can be broken down further into Suspended Solids and

Dissolved Solids. The Suspended Solids which are mainly organic in nature, are visible and are separated from the wastewater by physical/mechanical means e.g. screening and sedimentation.

Dissolved Solids are the ones actually in solution, similar for example to sugar mixed into hot coffee - the sugar dissolves into the coffee. Dissolved solids generally pass through the system unaffected.

### **b) Gases**

Besides solids, wastewater may contain small and varying amounts of dissolved gases depending on the age of the wastewater. The most important of these gases in wastewater

treatment is oxygen. Other gases such as carbon dioxide, CO<sub>2</sub> and hydrogen sulphide, H<sub>2</sub>S are produced as a result of decomposition of organic matter. H<sub>2</sub>S is produced under septic conditions and causes offensive odor.

### c) Microorganisms

Wastewater may carry a full spectrum of microorganisms which are too small to be seen without an aid of a microscope. The microorganisms can be classified in four groups: bacteria, viruses, protozoa, and helminths.

Out of the four groups, bacteria play the major role in biological treatment. Bacteria degrade the soluble organic matter present in the wastewater and utilize it as food necessary for growth and reproduction. Each of the four groups of microorganisms contains some pathogenic species which can cause diseases. The presence of pathogens in wastewater or treated effluent may adversely affect public health if the wastewater is not managed properly.

### Natural Treatment Process

Traditionally, man has dumped the wastes directly into the environment, expecting nature to take care of these wastes. However, there is a "limited amount" of waste that the environment can deal with naturally. If the polluting load is too high (or the waste discharged is too much) the natural purification process will not be able to cope. This causes undesirable growths and nuisance conditions and possibly health hazards.

The composition of waste commonly discharged varies considerably. However, in municipal or domestic wastewater there is a large amount of organic material present. This organic material is the major food source for countless numbers of living microorganisms, hereafter called "bugs" as a matter of convenience.

In the natural treatment process, it is the naturally occurring bugs which perform the main task of biodegrading the organic material commonly found in wastewater, in other words

these bugs purify the wastewater. Decomposable organic material in wastewater is broken down into less harmful by-products by the action of the bugs present in the system. Bacteria are the most important of the bugs available for this stabilization process. They use the organic material as food.

When the bugs eat the organic material, they obtain the energy required to reduce.

**BUGS + FOOD + OXYGEN = NEW CELLS + ENERGY + STABLE END-PRODUCTS**

When the bugs have consumed the pollutants present in the wastewater, they can be removed by settling. Now the dissolved organic matter has been converted to a form (called sludge) which can be removed by settling.

Just like human beings, the bugs need a healthy environment in which to live and grow: Enough oxygen (1-2 milligrams per liter), the right number of bugs for the food coming in, suitable pH, adequate temperature and enough time to digest the food. If these conditions are maintained, and proper sludge wasting and return sludge flow procedures are followed, the bugs will give us a cleaner wastewater.

On the contrary, conditions such as too much food for the number of bugs, high flows, lack of wasting, or too much air may prevent the production of a good clear effluent.

This is the basic mechanism by which all biological wastewater treatment systems operate, i.e biological conversion of organic material to energy, new cells and stable end-products.

The strength of the wastewater is often determined by measuring the amount of oxygen consumed by bacteria in biodegrading the organic matter. This measurement is known as the BIOCHEMICAL OXYGEN DEMAND (BOD) and is usually performed over a 5 days period at a constant temperature of 20°C. The measurement is sometimes referred to specifically as BOD5.

Another test known as the CHEMICAL OXYGEN DEMAND (COD) is usually carried out instead. This test can be made within a 2 hour period and is therefore more practical to undertake compared to the BOD5 test.

For specific domestic wastewater there is some correlation between BOD5 and COD, and the BOD5 can therefore be calculated simply by using a factor.

A Dissolved Oxygen (DO) level between 1.0 mg/L and 3.0 mg/L should usually be maintained in the Aeration Tank for this to occur. Ideally, sufficient air shall be added to the mixed liquor to maintain this level. In practice however, an Operator should ensure that there is never less than 0.5 mg/L of O<sub>2</sub> while in some cases 3.0-4.0 mg/L O<sub>2</sub> is necessary to achieve satisfactory results. Any less than 0.5 mg/L can result in septic conditions with deterioration of the quality of the activated sludge and a serious reduction of plant efficiency. The use of excessive amounts of air is not only wasteful but may result in a sludge so finely dispersed that it becomes difficult to settle.

Apart from the quantity of air supplied (for diffused aeration systems), the number, location, and type of aeration equipment, control the flow mixture pattern of the mixed liquor and the O<sub>2</sub> transferred to the liquor, and consequently to the bugs.

### **Attached Growth Process**

Fundamentally there is a difference between conventional activated sludge process (ASP) which is a suspended sludge growth process and an attached growth process of MBBR (Moving Bed Bio Reactor). In the conventional process, which is widely accepted and practiced, although the construction of the plant is simple and in-expensive, there is a great demand on the operating personnel in order to maintain F/M ratio and MLSS levels by properly recycling the settled activated sludge in right quantities. This need continuous monitoring 24 hrs/day. Also due to constraints on maximum MLSS levels the plant has limitations in terms of organic loading rates which are generally between 1 to 1.5 kg COD/m<sup>3</sup>/day.

In attached growth process (MBBR), the phenomenon is entirely different, bacterial culture gets attached to and grows on the surface area submerged in the effluent. It is possible to provide larger surface areas, which is responsible for higher organic loading rates, making

the plant compact. As no sludge needs to be recycled for controlling MLSS, as in activated sludge process, it does away for the need of a skilled operator.

The settled sludge can be pumped to a "Sludge Dewatering Sr" for further concentration. After that, sludge may possibly be transferred to Sludge Drying Beds or other facilities for further dewatering.

With the bugs settled to form a sludge blanket and the scum removed, the clarified wastewater flows over weirs for disposal or to another tank for disinfection/further treatment, depending upon the discharge requirement.

#### 4.3. EFFECTS OF WEATHER

Environmental factors that affect the wastewater treatment process include temperature and precipitation. The wastewater temperature affects the activity of the microorganisms or bugs. During cold winter weather the reduced activity might lower the efficiency of the treatment system. Besides the biological effects of temperature, the flocculation and sedimentation of the mixed liquor solids are not as effective at lower temperatures. The infiltration of rainwater into the wastewater line may cause the wastewater flow to increase. This is generally accompanied by a weaker wastewater in terms of Biochemical Oxygen Demand (BOD) due to the dilution effect of the stormwater. These occasions might cause the treatment system to be hydraulically overloaded. This results in reduced time spent by the wastewater in the treatment system; thus treatment efficiency is reduced.

Without Plant modifications, there is not much the Operator can do to offset the changes in treatment efficiency caused by temperature changes and high flows during storms. It will normally be necessary to vary the amount of sludge as seasons change.

#### Notes

- The Plant will not provide the designed performance until sufficient bacteria have developed. This usually takes three to four weeks in warm climates. Until that time,

the Plant will not be able to process the full load of wastewater and therefore alternative wastewater disposal may be necessary.

- The processes are limited mainly by the peak flow and the BOD5 load.
- The biological nature of the process relies on the absence of concentration of materials that are toxic to the bacteria such as heavy metals (Cr, Ni, Zn, Hg, Cd, Sn), hydrocarbons, chlorine and chlorinated hydrocarbons, antibiotics, cyanide, and pH values outside the range of 6-9.

#### 4.4. OPERATION GUIDELINES

In general terms, the duties of a Plant Operator may be described as below:

- TO ENSURE THAT THE PLANT CONSISTENTLY PRODUCES AN EFFLUENT OF NO LOWER QUALITY THAN IT WAS DESIGNED TO PRODUCE.
- TO SEE THAT ALL OPERATING DETAILS ARE PERFORMED PROMPTLY AND EFFICIENTLY. THIS IS BEST ACCOMPLISHED BY ESTABLISHING A ROUTINE SCHEDULE OF OPERATION.
- TO SYSTEMATICALLY MONITOR AND RECORD DIFFERENT PROCESS PARAMETERS INCLUDING CHEMICAL CONSUMPTION.
- TO CARRY OUT OR ARRANGE FOR ALL REQUIRED LABORATORY ANALYSIS AND TESTS OF THE SEWAGE PASSING THROUGH THE PLANT AS TO MAINTAIN PROPER EFFICIENCY IN OPERATION.
- TO MAINTAIN ALL EQUIPMENT AND STRUCTURES OF THE PLANT IN GOOD ORDER AND CONDITION
- TO KEEP PROPER RECORDS OF OPERATION & MAINTENANCE JOBS INCLUDING SPARE PART COSTS AND CONSUMED MANHOURS
- TO ENSURE THAT ALL PRECAUTIONS NECESSARY FOR THE SAFETY OF PERSONNEL AND PROPERTY ARE OBSERVED
- TO BRING THE NOTICE OF THE ENGINEER ANY ALTERATION WORK, OR FACILITIES WHICH MAY BE NECESSARY TO PLACE OR MAINTAIN THE PLANT IN EFFICIENT OPERATION
- TO PLACE AND MAINTAIN THE SURROUNDINGS OF THE PLANT IN A CONDITION AS ATTRACTIVE AS POSSIBLE.

The contractor may require a more specific Operator job-description to be worked out. This may be based on information contained in this Manual as well as local requirements for this particular Plant.

#### 4.5. OPERATION & PROCESS CONTROL

- MBBR Reactor

##### **Duty**

This advanced system is developed so as to take care of all the advantages of attached growth process of SAFF as well as the limitations of media and to serve the basic purpose of producing an activated mass of micro - organisms capable of stabilizing the effluent aerobically.

The MBBR reactor is mainly based on the principle of "FLUIDISED ATTACHED GROWTH PROCESS" and consists mainly of the following components:

- MEDIA, which provides surface area for the growth of micro organisms.
- AIR GRID SYSTEM, which ensures high oxygen transfer efficiency to meet the oxygen demand exerted by the microorganisms and the fluidized state of the media.

#### GENERAL DESCRIPTION

The system comprises of the following main units:

- a) MBBR reactor tank – I
- b) MBBR reactor tank – II
- c) Final Tube settler

#### MBBR REACTOR TANKS – I & II

The MBBR reactor tanks consists of an air grid placed at the bottom of the tank which helps in inducing O<sub>2</sub> transfer from the air to the effluent through the air blowers and at the same time maintains the media with attached bacterial culture in suspension. It is here that bacterial culture utilizes this O<sub>2</sub> to biodegrade the organic matter in the effluent and also for their endogenous respiration, resulting in the production of simpler end products. The mixed liquor consisting of old and new bacterial cells are then sent to a Tube Settler.

#### TUBE-SETTLER

This is a Settling Tank with the Tube Modules in which solid liquid separation occurs under the gravity.

#### OPERATION OF MOVING BED BIOREACTOR PROCESS

MBBR reactor is a fluidized- attached growth biological treatment system. The media on which the bacterial growth takes place is kept in fluidized state by aeration. Influent is continuously fed to the reactor and the treated effluent is discharged from the system by overflow. The high concentration of bacterial growth on the media hastens the process of BOD/COD treatment thereby making the system very compact. Generally two stages are sufficient to achieve

#### 4.6. PROCESS CONTROL

1. Like any other biological system it operates well within a pH range between 6.5 to 8.5.
2. The reading of air at the Flow meter of each MBBR shall be as per the required DO levels to be maintained in the tanks as explained in section 3.5. Air filter on the Air blowers need to be cleaned periodically.
3. Lubricating oil level in the Air blowers to be maintained properly.

4. The reactor may be periodically (say once in a year) drained from the bottom for a very short interval to remove accumulated sludge if any, which would otherwise result in choking of air grid.
5. The dead weights provided on the air blowers should be kept free by applying grease periodically.
6. The upstream pressure on the airside should be checked in each of the reactors while starting the system fresh. Any increase in the upstream pressure over a period of time would indicate choking of air grid and would need to be cleaned.

## MAINTENANCE

The Air grid of the MBBR reactor shall be cleaned by putting off the air to another reactor in series thus allowing the full flow of air through the air grid & thus scouring of air grid. This shall be done once in a month.

## **Final Tube settler**

### SETTLING OR CLARIFICATION.

The basic function of this unit is the solid liquid separation. The settle able flocs in flocculated water are separated and removed out from the drain as sludge. It produces clarified water or settled water of the desired and designed turbidity.

### TUBE SETTLERS – GENERAL DESCRIPTION

The efficiency of Tube Settlers depends on the following factors:

1. Effective draining of the sludge from Clarifier bottom.
2. Uniform distribution of flocculated wastewater through feed well, below tube modules.
3. Uniform collection of clarified wastewater.

The tube modules are fabricated out of R. PVC tubes of 50 mm x 50 mm size. The length of the tube is 0.58 m. The angle of inclination is 60 degrees to the horizontal. The width of modules varies from 0.27 m to 0.38 m. The height of the modules is normally about 0.5 m. The modules are located at about 1.5 m to 2.0 m above top of the hopper. The zone below tube modules is known as buffer zone. It acts as a cushion between incoming flocculated water and tube modules. It dampens the turbulence and eddy currents, if any, and prepares the water to enter into the tube modules. This zone also acts as a sludge blanket and provides additional flocculation action. The wastewater enters into the Tube Settler Zone through the Feedwell to reduce turbulence at the entry.

The settled water collection troughs are located at above top of the tube modules. This is known as collection zone. The troughs are to collect equal amount of settled water uniformly along its length to impart uniform surface loading to the modules. The collection weirs of all the troughs must be at equal level to achieve the said objective.

The Tube settler is provided with the Hopper the sludge settled at the bottom of tank skids to the central hopper of the tank. The sludge valve is provided for periodical dislodging of the Tube settler.

#### OPERATION

Before starting the plant or taking over the new shift, ensure that Clarifier sludge is drained off. It is extremely important to run the plant continuously at a uniform flow rate as per the total requirement. Avoid frequent stoppages and start-ups of the plant, otherwise, the delicate physio chemical reactions and hydraulic equilibrium will get upset resulting in unsatisfactory water quality. The wastewater enters into buffer zone below the modules. It travels in upward direction. Solid liquid separation takes place in the modules. The separated solids start moving downwards along the slope of the tubes. In a short time counter current of upward flowing clarified water and downward flowing sludge is established in the tubes. The separated solids are ejected out in the buffer zone and start accumulating in a form of sludge blanket.

Over a time the concentration of the sludge in the buffer zone goes on increasing. The clarified water is collected at top in the collection troughs from where it is transferred to the collection channel. After a certain time, depending on raw water turbidity, the concentration of the sludge in the buffer zone reaches its optimum limit. The separated solids will start escaping through the tubes and the quality of settled water will subsequently start deteriorating. Just before this phenomenon begins, it is essential to open the sludge valve to drain out the deposited sludge. The frequency of draining will depend upon sludge generation in MBBR. It varies from 2 – 3 hours in case of high turbidity to once in a shift in case of low turbidity. Check the settled water turbidity periodically.

Practical problems in operation and remedies:

1. Normally, the settled water or clarified water will contain micro flocs, which contribute to the residual turbidity.
2. Sometimes the clarified water turbidity is seen more than the desired. This could be due to one of the following reasons:
  - The sludge is not drained off from the Tank: The operator should first check by opening the drain valves of the hoppers.
  - In case of fragile flocs, which do not settle, the chemistry of the water, especially, alkalinity should be checked.

Sometimes, it is seen that the floc is escaping only from a particular spot in the tank. Normally, it is the gap between the two adjacent modules or modules and the sidewall. Plug the gap with wooden batten or plastic pipe to eliminate this problem.

#### SLUDGE REMOVAL

Periodical and timely sludge removal is the most important aspect of the tube settling operation. The frequency of draining as discussed earlier will depend on the sludge generation in MBBR. The operator will normally grasp this technique over a period of operation of the plant based on experience. While draining the sludge from the Tube

settler the valve should be opened gradually until the sludge starts draining out (which could be seen in the Sludge Sump)? Then open the valve completely for the duration of 5-7 minutes until clear water starts coming out from the drain pipe then close the valve gradually. After gaining some experience, it will be possible to make a schedule for operating the drain valves.

## MAINTENANCE

As there are no moving parts in the Tube Settler, the maintenance of the plant is relatively easy and could be managed without skilled labors. As discussed earlier, the algae growth may take place on the side walls. In addition to this the algae may grow on the top surface of the modules and in the troughs. Some deposition of the sludge may also be observed on the top of the modules, wherever the modules are plugged at the top (especially, at the ends where gaps in the tubes are plugged with horizontal pipe pieces essential feature of module fabrication).

To take out the floating matter (example dead leaves etc.) out of the tank, use nylon mesh strainer attached to long handle/bamboo rods.

- Following plant commissioning and growth of the active biomass the process will ideally operate automatically with little requirement for manual operation. The Plant can therefore be operated with all Man/Off/Auto switches, if provided, in "Auto" position.
- However, a number of factors may influence an ideal process operation. These factors are discussed in the following pages.

### **4.7. "Steady State" Condition**

It shall be the Operator's aim to get the Plant properly running in and to achieve a sort of "steady state" condition where the final effluent quality may be kept within a satisfactory

range. When this condition is reached, the operator shall know how control the different parameters to maintain this condition..

The procedure to reach the "steady state" condition shall be based on a trial and error approach. Until such time the system stabilizes and the operating personnel have gained sufficient hands-on experience, operational problems must be treated as they arise. The Operator shall be able to control the following parameters efficiently:

- Addition of nutrients to the process if the incoming wastewater is deficient in nutrients
- Discharge rate of wastewater into the collection system upstream o the Treatment Plant
- Type of waste introduced to the system (source control)

In order to keep the Plant operating effectively, daily inspection is required. Walking around the Plant following the normal flow route gives the Operator an idea of the type of wastewater the Plant has received since the previous inspection.

Four- (4) pages check list is given ahead. The Operator should "tick" out each of the items on this checklist on his daily round at the Plant. The following sections explain some of the parameters that the Operator should learn to observe and identify.

### **Wastewater Color and Odor**

Some of the best indicators of good performance can be determined by observing the color and odor of the liquids in various parts of the Plant. It must be kept in mind that the colors mentioned are typical and may vary from Plant to Plant depending on the size of plant and the type of raw wastewater.

From recorded observations the Operator will be able to determine typical colors and odors throughout a properly operating Plant. Any marked change is a likely indication that

some parameter has changed. The Operator should then follow this observation up with a closer examination of the Plant to enable him to decide if something is going wrong and/or needs further attention.

If no air is supplied to the wastewater, the bacterial action which takes place differs from that which is desirable. In this situation the wastewater turns black and offensive odors are produced. This condition is described as septic.

### **Bar Screen**

Sources of odor may be an accumulation of rags and other debris on the Bar Screen. Daily frequent removal and disposal by burying helps to control the odor.

### **MBBR Reactor**

The Operator should observe the entire MBBR Reactor surface for turbulence. Though some of his conclusions will be based on past experience, extent of surface activity will show if the contents are thoroughly mixed. Watching the surface for dead spots will tell if the mixing is the same throughout the Reactor.

- If the Dissolved Oxygen (DO) level does not increase above 1.0 mg/L at full capacity of the aeration system, it means a high strength waste.
- If the DO-level fails to rise over a 24-hour period, a further check of the aeration system may be needed.

### **Type of Foam/Scum**

The type of foam or scum, if any, on the Aeration Tank surface gives the Operator a clue how well the process is working. Fresh, Crisp, White Foam: Only a modest accumulation of white, or at least light colored, crisp appearing foam is usually present on MBBR Reactor Tank surfaces when a good final effluent is produced. The Operator should record the operating conditions in the process and keep them within these ranges because whatever is happening is just right.

### **Settling Tank (Tube settler)**

The Operator should also observe the final effluent and the water surface in the Settling Tank to see how the process is working. If the final effluent appears clear or is improving day by day, obviously the Operator should continue to do what he has been doing. However, if it appears turbid or contains noticeable solids, trouble may be likely to continue or get worse. Visual observations and control tests will help to show what needs to be done.

Sludge in the Settling Tank shall be removed batch-wise on a manual basis and the sludge withdrawal process shall be watched closely by the Operator. It is generally the best practice to waste only while the Operator is on site to watch the operation. When the waste-valve is left open overnight, it is too easy to either waste too much or something plugs the line up and nothing is wasted. There are two methods to estimate the quantity to be wasted. The 1st method requires experienced approach while the second method is easier to follow.

### **Discussion of Operation Parameters**

#### **General**

A number of parameters may influence the treatment efficiency in a Wastewater Treatment Plant. Some of these factors are shortly discussed below and some counteractions suggested.

#### **Hydraulic Overload**

Increased flows may be due to an increase in the production or inordinate spills. Even if the plant is operating at or near its hydraulic capacity, the efficiency of the settling is not affected and does not result in loss of sludge over the effluent weirs.

#### **Organic Overload**

Organic overload usually occurs when the Treatment Plant is receiving its heaviest load due to a strong waste being dumped into the sewer. If this is suspected, the Operator should make a survey of the production premises and try to educate the concerned personnel to avoid such dumping.

### **High or Low Aeration Rate**

Sufficient Dissolved Oxygen (DO) is essential to the biological process employed in Extended Aeration. The desirable DO concentration is between 1.0 and 3.0 mg/L, (never lower than 0.5 mg/L and seldom over 4.0 mg/L).

**Insufficient aeration (low DO)** is detrimental to proper treatment. This problem, if allowed to continue will result in the Plant becoming septic. When a septic condition occurs, or when objectionable wastewater is being received, the Operator must initiate any action necessary to determine the source and eliminate it. Indications of insufficient aeration are the absence of DO and grey, murky colors accompanied by a slight septic odor resembling rotten eggs.

**Over aeration (high DO)** can also be a problem. This may be caused by air excessive supply. Usually it is the result of plant influent much below the level (or strength) for which the Plant was designed. A reddish color is likely to appear in all areas of the system with the exception of the influent. A reddish brown, slimy scum will often be present on the surface of the Settling Tank.

### **High or Low pH**

The pH value is a measure of the acid or alkaline condition of a solution. The center of the scale is neutral and is given a value of 7.0. Values smaller than 7.0 indicate acidic conditions. The smaller the value the more acidic the solution is. Values larger than 7.0, up to a maximum of 14, indicate the presence of alkali. The larger the value, the more alkaline the solution is. The most favorable pH for a biological system is between 6.5 and 7.5, but the MBBR Reactor may have a range of 5.0 to 8.5. Extreme changes of pH in the raw wastewater feed are undesirable.

### **Septic Influent**

Incoming septic wastewater can cause the contents of the entire Plant to become septic if sufficient air is not provided. Septic wastewater is generally acidic and may have a pH possibly as low as 6.0. Common causes of septic wastewater are long and flat sewer lines in which the wastewater flow is so low that solids settle and decompose. High wastewater temperature adds to the problem.

### **Counteraction**

Manholes should be inspected for buildup of sludge and/or sand. These lines and manholes require periodic flushing. Chlorine may also be used to reduce the odors from septic influent wastewater. Care must be taken not to chlorinate the influent to a level that will kill the biomass in the MBBR Reactor. A proper dosage to be added over a 24 hour period is 0.25 kg chlorine for every 40 m<sup>3</sup> of wastewater (» 6 mg/L).

### **Growth of filamentous organisms**

Swelling of bacterial cells due to bound water - non filamentous bulking The first form is the predominant one. Operational causes of filamentous bulking include low DO in Aeration Tank, insufficient nutrients (nitrogen and phosphorus), widely varying organic loading, low F/M ratio and insufficient soluble BOD gradient. Operation causes of non-filamentous bulking are improper organic loading, over aeration or the presence of toxics. In almost all cases, all of the aforementioned conditions represent some sort of adverse operation condition.

In the control of bulking the following items needs to be checked :

- (1) wastewater characteristics,
- (2) DO-content,
- (3) process loading,
- (4) sludge return and wasting rates,
- (5) process microbiology,
- (6) Internal plant overloading,

(7) operation of Settlement Tank.

**Counteraction:**

Depending on the reason for the sludge bulking, various counteractions are recommended. Limited oxygen level has been reported to be the most common cause. Check capacity of aeration system. It should be able to maintain at least 2 mg/L of dissolved oxygen in the Aeration Tank under normal loading condition.

Operation of Settling Tank should preferably not leave sludge for more than 30 minutes. If sludge withdrawal is not uniform, i.e. if parts of the sludge are retained for many hours, sludge bulking can occur. In this case changes must be made to the sludge withdrawal equipment.

**Clumping/Rising Sludge**

At times large masses of sludge, possibly 100 mm in diameter may be seen rising, then bursting and finally spreading over the water surface. This is sometimes referred to as "Clumping" or "Rising Sludge" and is caused by denitrification. In this process nitrites and nitrates in the wastewater are converted to nitrogen gas which will be trapped by the sludge and eventually force the sludge to rise or float to the surface. Rising sludge can be differentiated from bulking sludge by noting the presence of several gas bubbles attached to the floating solids.

**Turbid Effluent**

Turbid effluent can be caused by various factors. Pin flocs are mentioned above resulting from high sludge age and over oxidization. Excessive agitation in Aeration Tank may be another cause, but anaerobic condition in the Aeration Tank or toxic shock loads can also cause a turbid effluent in the Settlement Tank. If toxic loads are received, re-seeding from other Plant may be required.

## 5.1. LABORATORY TESTS AND INTERPRETATIONS

### LABORATORY TESTS

Field and laboratory tests give the operator an idea about the performance of the treatment plant, and are necessary to evaluate process performance. In addition to physical observations such as color and odor, instrument readings and field and laboratory tests should be performed to ensure proper operation. Testing and recording the result shall be an integral part of the Operator's routine work at the Plant.

Testing will assist in evaluation of the operating conditions and help to pinpoint trouble spots and give possible remedies and advance information for process control.

**Test:** A procedure to be followed to find a specific chemical/physical water parameter through tests in a Laboratory or by use of a Portable Instrument (to be used in the field if found convenient).

#### **Recommended Tests regarding sewage quality control are:**

- Total Suspended Solids (TSS) Test
- pH Test
- COD Test
- Dissolved Oxygen (DO) Test
- BOD5 Test

During Plant start-up more frequent tests may be required. When the Plant has been properly run in and the Operator has gained experienced on how to operate the process, and knows the sensitivity of different operational parameters, tests may be taken less frequent if the analysis gives stable results with small variations. Table ahead, shows readings and tests that shall be carried out on samples taken from different parts of the Plant.

## **5.2. SAMPLING AND ANALYSIS**

Sampling and analysis of the effluent should be done to check the quality of waste and performance of each unit. Samples should be taken and analysed at the following points –

1. At Stilling Chamber
2. At the inlet of MBBR reactor – I
3. At the outlet of Final Tube settler
4. At the outlet of Chlorine Contact Tank.

### **METHODS OF SAMPLING**

Samples collected must be representative in nature otherwise laboratory analysis will be misleading. Careless collection of samples would lead to wrong conclusions. Sampling point should be selected where wastewater is homogenous in nature. Care should be taken to avoid entry of extraneous material such as scum and floating matter into sampling bottles.

### **GRAB SAMPLES**

Grab samples are collected when changes in concentration are likely to occur and influence the treatment. Representative samples should be taken and analyzed within 2-3 hours of sampling.

### **COMPOSITE SAMPLES**

Composite samples are required to see performance of the units. Composite samples should be collected over a period of 12 to 24 hours.

### **SAMPLE VOLUME**

About one to two liters of sample are adequate for the parameters required for process control. Samples should be immediately transported to laboratory for analysis. In case there is some delay, proper preservation like keeping the samples in ice should be done.

### ANALYSIS

For simplified analytical procedures for the major parameters, please refer to analytical tests.

### 3.DAILY SAMPLING SCHEDULE

SR. NO.	SAMPLE STATION	SAMPLING TYPE	pH	SS	O&G	BOD	COD
1.	At Stilling Chamber Composite	Composite					
2	Effluent at the inlet of MBBR reactor-I Composite	Composite	<b>Yes</b>	<b>No</b>			
3	At the outlet of Final Tube Settler Composite _ _ _	Composite					
4	At the outlet of Chlorine Contact Tank Composite	Composite					

NOTE - The parameters from different sampling points shown above are required to be tested minimum twice a day.

## **5.4. TEST PROCEDURES**

### **A. Total Suspended Solids**

#### **OUTLINE OF THE METHOD**

Suspended matter is determined by filtering the sample through an asbestos pad in a Gooch crucible.

#### **REAGENT**

##### **ASBESTOS CREAM**

Make a cream of acid-washed medium-fibre Gooch asbestos with water. Add one litre of water for every 15 g of asbestos. If the asbestos contains too much fine powder, remove the latter by repeated decantation.

#### **PROCEDURE**

Make carefully an asbestos mat in the Gooch crucible by adding sufficient asbestos cream to produce a mat about 3mm thick. In preparing the mat, first fill the crucible with well-mixed asbestos cream, let stand for about two minutes to allow the heavier particles to settle and then apply suction to the same extent as will be used for filtering the sample. Wash the mat with water with the suction on by filling and drawing through. Dry the crucible with the asbestos mat in an oven at 103 Deg.C. to 105 Deg.C. for one hour, cool in a desiccator and weigh.

Filter the sample through the weighed Gooch crucible after moistening with a few drops of water. Add successive increments of 10 ml of the well-shaken sample for filtration using suction. Add each increment of sample before the mat becomes dry. The use of a pipette with an orifice wide enough to prevent clogging with suspended matter is recommended. Continue successive 10ml additions of the sample until the filtration becomes inconveniently slow or until about 10 to 20 mg of suspended matter has been filtered. Carefully wash the mat with 10ml of water to remove soluble salts. Continue suction until

draining is complete. Dry the crucible in an oven at 103 Deg.C. to 105 Deg.C. for one hour, cool to room temperature in a desiccator and weigh.

### **CALCULATION**

$$\text{Total suspended solids, mg/l} = \frac{1000 w}{V}$$

where,

W = weight in mg of the suspended matter, and

V = volume in ml of the sample taken for filtration.

Express the result to the nearest 5 mg/l.

### **B. pH TEST**

The pH shall be recorded for Influent, before MBBR Reactor, for 1<sup>st</sup> Stage Effluent and for final Effluent. As mentioned earlier, the generally accepted safe operating range for the is between pH 6.5 and 8.5.

The pH of a solution is the negative logarithm of the hydrogen-ion concentration of the same. It is determined directly by the pH meter. Equipment required:

- pH-meter/pH paper
- Beaker, 100 MI
- Reagents required:
- Deionised water / Distilled Water
- Standard pH 4.0 buffer solution
- Standard pH 7.0 buffer solution
- Standard pH 10.0 buffer solution

### **Procedural Summary**

Power on the pH-meter. Allow 10 minutes for instrument stabilization.

Press the pH key Calibrate the instrument with standards pH bufffer solution.

Rinse the electrode and dry with soft tissue paper.

Place the electrode in a beaker containing sample. Press dispenser button. Allow for 30 seconds for a steady result. Note down the result as a number to one decimal place, for instance 8.2

**Note:** Before each reading rinse the electrode with demonized water and with soft tissue paper.

## **C. Biochemical Oxygen Demand (BOD)**

### **OUTLINE OF THE METHOD**

Bio chemical oxygen demand (BOD) is the quantity of oxygen required by a definite volume of the liquid effluent for oxidizing the organic matter contained in it by micro-organisms under specified conditions. For its determination, the dissolved oxygen content of the sample, with or without dilution, is measured before and after incubation at 20 Deg.C. for 5 days.

### **TEST PROCEDURE:**

#### **1. APPARATUS REQUIRED**

Glass stoppered bottles, narrow neck bottles of about 300 ml capacity, with suitable water sealing.

#### **2. REAGENTS REQUIRED**

- Sodium Hydroxide Solution - approximately 1 N.
- Hydrochloric acid - approximately 1 N.
- Sodium sulphite solution - Dissolve 5 g of anhydrous sodium sulphite in 1 liter of water. Prepare fresh solution daily for use.
- Dilution water - Distilled water of good quality, free from metals, particularly copper, and aerated.
- Phosphate buffer solution - Dissolve 5g of potassium de-hydrogen phosphate ( $\text{KH}_2\text{PO}_4$ ), 2.75g of dipotassium hydrogen phosphate ( $\text{K}_2\text{HPO}_4$ ), 3.4 g of di sodium

hydrogen phosphate ( $\text{Na}_2\text{HPO}_4 \cdot 7\text{H}_2\text{O}$ ) and 7 g of ammonium chloride in about 500 ml of water and dilute to 1 liter. The pH of this solution should be

- Magnesium Sulphate Solution - Dissolve 22.5 g of magnesium sulphate in water and dilute to 1 liter.
- Calcium chloride solution - Dissolve 27.5 g of anhydrous calcium chloride in water and dilute to 1 liter.
- Ferric Chloride Solution - Dissolve 0.25 g of ferric chloride ( $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ ) in water and dilute to 1 liter.
- Seeding Material - Supernatant liquor of domestic sewage stored for 24 to 36 hours at 20 Deg.C. In the case of industrial effluent containing organic compounds which are not easily oxidized by sewage seed, the receiving water collected about 3.5 km below the discharge point may be used.

## **TEST PROCEDURE**

- Samples containing acidity or caustic alkalinity should be neutralised to pH about 7.0 with sodium hydroxide solution or hydrochloric acid respectively by adding a predetermined quantity.
- Samples containing residual chlorine or chloramines should be dechlorinated if chlorine is not dissipated on standing for 2 hours. To dechlorinate, first determine the quantity of sodium sulphite solution required for a known aliquot of the sample by titration to starch-iodide end point. After acidifying the sample with acetic acid (1:1) or sulphuric acid (1:50) followed by 10ml of 10 percent potassium iodide solution. Then add to the requisite volume of the sample the predetermined quantity of sodium sulphite, avoiding any excess, and check for the absence of chlorine after 20 minutes.
- Samples containing toxic substances in large amounts would require special treatment. However, the effect of small amount may be overcome by using the proper dilution

so that toxicity is removed and the maximum BOD value is obtained. If increasing dilution's show increasing BOD, the dilution should be increased to a level where BOD levels off at a maximum.

- To check the quality of the dilution water and the effectiveness of the seed, determine the BOD of a standard solution of 300 mg/l either glucose or glutamic acid in the dilution water. Standard glucose solution should show a BOD of  $224 \pm 10$  mg/l and glutamic acid  $217 \pm 10$  mg/l.
- Store the dilution water at 20 Deg.C. and use when near that temperature. Take the desired volume of dilution water required for the test sample and add, for every 1 liter of water, 1 ml each of phosphate buffer solution, magnesium sulphate solution, calcium chloride solution and ferric chloride solution. Seed the dilution with seeding material. The quantity of seeding material (0.1 to 1 percent of settled sewage or 1 to 5 percent receiving water) added should be such that oxygen depletion in the dilution water control is between 0.2 and 0.8 mg/l after incubation at 20 Deg.C. for 5 days.
- Prepare as follows several dilution's of the sample (usually 0.1 to 0 percent for strong industrial effluents and 5 to 25 percent for treated effluent) so as to obtain a depletion of at least 2 mg/l of dissolved oxygen after incubation for 5 days. In the case of dilution's greater than 1:100, prepare a 10 percent primary dilution in a volumetric flask and from this make the final dilution's.
- Siphon carefully the prepared seeded dilution water into a graduated 1000 ml measuring cylinder and fill to the 500 ml mark. Add the requisite quantity of the carefully well mixed sample to make the particular dilution and fill with dilution water to 1 liter. Mix thoroughly but gently with a plunger type of rod without entraining air. Siphon the dilution into two glass stoppered bottles, fill completely and stopper. Prepare succeeding dilutions of lower concentrations in the same manner. Determine the initial dissolved oxygen concentration in one of the two bottles of each dilution. Water seal the other bottles and incubate at 20 Deg.C. for 5 days. At the same time,

siphon the dilution water alone into two glass-stoppered bottles and determine the blank in one and incubate the other at 20 Deg.C, for 5 days. After incubation for 5 days, determine the dissolved oxygen in the dilution's and the blank in the same manner as the initial dissolved oxygen content.

- CALCULATION

Biochemical oxygen demand

$$(5 \text{ days at } 20 \text{ Deg.C.}), \text{ mg/l} = \frac{(D1 - D2) - (C1 - C2) F}{P}$$

Where

D1 = Initial dissolved oxygen content of the diluted sample,

D2 = Dissolved oxygen content of the diluted sample after incubation.

C1 = Initial dissolved oxygen content of the seeded dilution water,

C2 = Dissolved oxygen content of the seeded dilution water after incubation,

F = ratio of the seed in the sample to that in the control, that is, percent seed in D1 divided by percent seed in

C1, and P = Decimal fraction of the sample used.

## **D. CHEMICAL OXYGEN DEMAND (COD)**

### **OUTLINE OF THE METHOD**

This is determined by refluxing the sample with an excess of potassium dichromate in acid conditions and estimating by titration the amount of dichromate consumed.

### **INTERFERENCE**

Unstable samples should be tested without delay and samples containing settleable solids should be homogenized by suitable means for ease of representative sampling. Initial dilution's in volumetric flasks should be made on those samples having a high COD, in

order to reduce the error which is inherent in measuring small sample volumes. Chlorides are quantitatively oxidized by this procedure when silver sulphate is not used as a catalyst. In this case, a correction should be applied by determining chlorides on a separate sample and subtracting the calculated oxygen demand of the chlorides from the result. Since 1 mg/l of chloride will consume 0.23 mg/l of oxygen, the correction is mg/l of chloride x 0.23

### **REAGENTS REQUIRED**

Standard Potassium Dichromate Solution - 0.25 N. Concentrated Sulphuric Acid. Standard Ferrous Ammonium Sulphate Solution - 0.25 N. The solution shall be standardised daily against standard potassium dichromate solution.

Ferriin Indicator Solution - Dissolve 0.485 g of 1,10 phenanthroline (monohydrate), together with 0.695g of ferrous sulphate ( $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ ) in distilled water and dilute to 100 ml. Silver Sulphate Mercuric Sulphate

### **TEST PROCEDURE**

Place a 50ml sample, or an aliquot diluted to 50 ml with distilled water, in a 300 - ml round-bottom flask fitted with ground-glass joint for attaching a condenser, and add 25 ml of standard potassium dichromate solution. Carefully add 75 ml of concentrated sulphuric acid, mixing after each addition.

### **CAUTION**

The mixture shall be thoroughly mixed before heat is applied. If this is not done, local heating occurs in the bottom of the flask and the mixture may be blown out. Attach the flask to the condenser and reflux the mixture for 2 hours. Pumice granules or glass beads should be added to the reflux mixture to prevent bumping. Cool and then wash down the condenser with about 25ml of distilled water. In many cases, the 2 hour reflux period is not necessary. Therefore, with particular samples, the reflux period necessary to give the

maximum COD should be determined and the shorter period of refluxing may be permissible.

Transfer the contents to a 500-ml conical flask, washing out the reflux flask 4 to 5 times with distilled water. Dilute the mixture to about 350 ml and titrate the excess potassium dichromate with standard ferrous ammonium sulphate solution, using ferroin indicator. Generally 2 to 3 drops of the indicator are used. The colour change is sharp, changing from the blue-green to a reddish-blue. The end point, however, will not be as sharp as in the standardisation of the reagents because of the lower acid concentration. For this reason, it is necessary that the sample be diluted to atleast 350 ml before the titration is carried out. A blank consisting of 50 ml of distilled water instead of the sample, together with the reagents, is refluxed in the same manner.

### **CALCULATION**

$$\text{Chemical oxygen demand, mg/l} = \frac{(A - B) N \times 8000}{V}$$

Where,

A = volume in ml of ferrous ammonium sulphate solution used in the titration in the blank.

B = volume in ml of ferrous ammonium sulphate solution used in the titration with the sample,

N = normality of standard ferrous ammonium sulphate solution and ,

V = volume in ml of the sample taken for the test.

### **E. DISSOLVED OXYGEN**

#### **OUTLINE OF THE METHOD**

The dissolved oxygen in the sample oxidizes manganous hydroxide to manganic hydroxide, which, in turn, oxidizes iodide to free iodine in an acid medium. The iodine liberated is determined by titration.

#### **INTERFERENCE**

The method given here is most suitable for waters containing not more than 0.1 mg/l of nitrite nitrogen and not more than 1 mg/l of ferrous iron. Other reducing or oxidizing materials should be absent. If 1 ml of potassium fluoride solution is added before acidifying the sample and there is little delay in titration, the method is also applicable in the presence of 100 to 200 mg/l of ferric iron.

### **REAGENTS REQUIRED**

1. Manganous sulphate solution Dissolve 480 g of manganous sulphate ( $\text{MnSO}_4 \cdot 4\text{H}_2\text{O}$ ) in distilled water, filter and dilute to 1 litre. The solution should liberate not more than a trace of iodine when added to an acidified solution of potassium iodide.
2. Iodide-azide reagent Dissolve 500 g of sodium hydroxide (or 700 g of potassium hydroxide) and 135 g of sodium iodide (or 150 g of potassium iodide) in distilled water and dilute to 1 litre. The reagent should not give a colour with starch solution when diluted and acidified. Dissolve 10 g of sodium azide in 40 ml of distilled water and add to 950 ml of the first solution, with constant stirring.
3. Concentrated sulphuric acid - approximately 36 N. One millilitre of the acid is equivalent to about 3 ml of iodideazide reagent.
4. Standard sodium thiosulphate solution - exactly 0.025 N, freshly standardized against potassium dichromate. One millilitre of this solution is equivalent to 0.2 mg of oxygen (as O).
5. Starch indicator. Titrate 5 g of starch and 0.01 g of mercuric iodide with 30 ml of cold distilled water and slowly pour it with constant stirring into 1 litre of boiling distilled water. Boil for 3 minutes. Allow to cool and decant off the supernatant clear liquid.

### **PROCEDURE**

1. To the sample as collected in a 250 to 300 ml bottle, add 2 ml of manganous sulphate solution, followed by 2 ml of iodide-azide reagent well below the surface of the liquid.

2. Stopper with care to exclude air bubbles completely and mix by inverting the bottle several times. When the precipitate settles leaving a clear supernatant above the manganese hydroxide floc, repeat the shaking a second time.
3. When settling has produced at least 100 ml of clear supernatant, carefully remove the stopper and immediately add 2 ml of concentrated sulphuric acid, allowing the acid to rundown the neck of the bottle; re-stopper and mix by gentle inversion until solution is complete. The iodine should be uniformly distributed throughout the bottle before decanting the amount needed for titration. This should correspond to 200 ml of original sample after correction has been made for the loss of sample by displacement with the reagents. Thus, when a total of 4 ml, 2 ml each of the monogamous sulphate solution and the iodide-azide reagent, is added to a 300ml bottle, the volume taken for titration should be

$$200 \times \frac{300}{300 - 4} = 203 \text{ ml}$$

Titrate with standard sodium thiosulphate solution to a pale straw colour. Add 1 to 2 ml of starch solution and continue the titration to the first disappearance of the blue colour. Subsequent recolourations due to the catalytic effect of nitrites or to the presence of traces of ferric salts, which have not formed fluoride complexes, should be disregarded.

### **CALCULATION**

$$\text{Dissolved oxygen, mg/l} = V$$

Where,

V = volume in ml of standard sodium thiosulphate solution used in the titration.

**.4. PLANT ROUTINE CHECK UP**

**TABLE No. 1**

OPERATOR DAILY ROUTINE JOBS & CHECKLIST

JOB DESCRIPTION	REMARKS/REFERENCES
<b>MBBR REACTOR</b>	
1. Check aeration for uniform bubbling in the MBBR Reactors.	Refer to Operation & Process Control section
2. Scrape off dirt on the wall of the MBBR Reactors, Tube settlers.	The tank wall should be kept as clean as possible
3. Check oil/grease level in Gear Box, Clarifier drives, Pumps, Blowers. fill up or change lubricant as necessary	For frequency of lubrication change, see Lubrication Schedule indicated by the manufacturer
<b>TUBE SETTLER</b>	
1. Check that, the water surface within the tank is calm and that there are no clouds of sludge rising.	See "Remarks" under 2 above
2. Check that the effluent flowing over the weir is transparent and colorless	See "Remarks" under 2 above
3. Clean the launder channel	Dirt can lead to blockage of the channel around and can cause a rise

TABLE No. 1

OPERATOR DAILY ROUTINE JOBS & CHECKLIST

JOB DESCRIPTION	REMARKS/REFERENCES
whenever required.	in the water level in the Clarifier Tank and the Aeration Tank
<b>PUMPS</b>	
1. Check that all lamps are working	Press Lamp Test button

2. Check that the outlet isolation valves on all pumps are fully open	Partly closed valves may reduce flow to the Plant.
1. AIR BLOWERS	
1. Check function by looking at the pressure gauge.	
2. Check for excessive noise and vibrations.	
3. Check oil level in the blower periodically.	

### 5.6. LABORATORY EQUIPMENT

Please note the laboratory is common for all the STPs at MBMC.

#### A. INSTRUMENTS LIST

S. No	Description	Quantity
<b>1</b>	pH meter	<b>1</b>
<b>2</b>	Hot air oven	<b>1</b>
<b>3</b>	BOD Incubator	<b>1</b>
<b>4</b>	Hot Plate	<b>1</b>
<b>5</b>	Centrifuge	<b>1</b>
<b>6</b>	COD Measuring System open reflux method	<b>1</b>
<b>7</b>	Analytical Balance	<b>1</b>
<b>8</b>	Magnetic stirrer with hot plate	<b>1</b>
<b>9</b>	Water bath	<b>1</b>
<b>10</b>	Desiccators	<b>1</b>
<b>11</b>	Water still 4 liter Distillation Unit	<b>1</b>

<b>12</b>	Filtration Assembly	<b>1</b>
<b>13</b>	Refrigerator 220 ltr	<b>1</b>
<b>14</b>	Colony Counter Digital	<b>1</b>
<b>15</b>	Bacteriological Incubator	<b>1</b>
<b>16</b>	Heating Mantle	<b>1</b>
<b>17</b>	Oil & Grease Measuring System	<b>1</b>
<b>18</b>	Aerator	<b>1</b>
<b>19</b>	Fecal Coli form kit	<b>1</b>

**B GLASSWARES**

Sr No	Description	Quantity
1	Beakers – 100 ml	6
2	Beakers – 150 ml	18
3	Beakers – 250 ml	10
4	Beakers – 500 ml	2
5	Beakers – 100 ml	1
6	Reagent Bottle – 500 ml	10
7	Reagent Bottle – 1000 ml	5
8	Wash Bottle Plastic – 500ml	2
9	PETRIDISHES 100 x 17 mm	10
10	Erlenmeyer flask 50 ml	26
11	BURETTES 10 ml	6
12	BURETTES 25 ml	5
13	BURETTES 50 ml	5
14	Cylinders – 25 mm Plastic	4
15	Cylinders – 25 mm Plastic	2

16	Cylinders – 25 mm Plastic	2
17	Cylinders – 500 ml	2
18	Cylinders – 100 ml	6
19	Cylinders – 250 ml	2
20	Cylinders – 1000 ml	2
21	Funnel Dia – 65 mm	4
22	Funnel Dia – 75 mm	12
23	Funnel Dia – 100 mm	4
24	Separating Funnel-250 mm	6
25	Test Tubes – 12x100	10
26	Test Tubes – 25x150	5
27	Graduated – 1 ml	5
28	Graduated – 2 ml	5
29	Graduated – 5 ml	5
30	Graduated – 10 ml	5
31	Pipettes - 1 ml	6
32	Pipettes -2 ml	6
33	Pipettes – 5 ml	6
34	Pipettes – 10 ml	6
35	Pipettes – 25 ml	6
36	Deessicator wit ceramic plate inside-250 mm dia	1
37	BOD Bottles – 300 mm	30

### C. MISCELENEOUS

Sr No	Description	Quantity
1	Glass Beeds (500 mg)	1
2	Burrtte Stand	5
3	Pipette Stand	2
4	Spreading Funnel Stand	3
5	Test Tube Stand (Five Tubes)	1
6	Non Absorbent Cotton	5 Bundles
7	Filter Paper – Rim (100 nos)	1
8	Aluminum Coil	1 box
9	Whatman (41 nos in each packet)	10 pkts
10	Rubber Bulb Small	5
11	Rubber Bulb Large	5
12	Condensor Tubing	25 mtrs
13	Spatulae	5
14	Magnetic Needle	5
15	Tissue Paper Roll	5
16	Tripod Stand	5
17	Plastic Can – 2 ltrs	330
18	Plastic Can – 5 ltrs	70
19	Plastic Can – 10 ltrs	3
20	Plastic Mug 1 ltr	5
21	Hand Gloves	4
22	Safety Goggles	2

**LABORATORY CHEMICALS**

1	MnSO <sub>4</sub> (500 gms)	1
2	NaOH (500 gms)	1
3	Sodium Azide (100 gms)	3
4	Sodium Iodide (250 gms)	1
5	H <sub>2</sub> SO <sub>4</sub> (conc.) 1 bottle of 5 ltrs	1
6	Starch (500 gms)	1
7	Sodium bisulphate Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (500 gms)	1
8	K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> (500 gms)	2
9	Silver Sulphite Ag <sub>2</sub> SO <sub>4</sub>	275 Gms
10	Ferroun indicator 1 bottle of 100 ml	1
11	Ferrous ammonium sulphate (500 gms)	5
12	HgSO <sub>4</sub> (250 gms) 1	1
13	Potassium Iodide 500 gms	1
14	Potassium Hydrogen Pthalate KHP (500 gms)	1
15	Hcl Acid – 500 gms	1
15	N – Hexane (500 ml)	5
16	1/10 Phenopthalien ( 25 gms)	1
17	Phospate Buffer 50 Ml each	3
18	Potassium Dihydrogen Orthophosphate 500 gms	1
19	Di potassium Hydrogen Othro Phosphate 500 gms	1
20	Ammonium Chloride 500 gm	1
21	Glucose 500 gm	1
22	Glutamoc Acid 250 gm	2
23	Petroleum Ether 2.5 liters each	6
24	pH tablet 4, 7,9.2 - 1 set	20 Set

**DETAILED ITEMWISE  
SPECIFICATION**

**MIRA BHAYANDER MUNICIPAL CORPORATION**  
**Water Supply Department**

**Name of Work** - Operation & Comprehensive maintenance of Sewerage treatment

plants and under ground drainage system in Mira Bhayander Municipal corporation area.

**DETAILED ITEMWISE TECHNICAL SPECIFICATIONS**

**1. INTRODUCTION**

1.1 Mira Bhayandar Municipal Corporation is having 115 MLD Underground Sewerage Scheme. This scheme is based on De-centralized system. It has 10 STPs having different capacities and 3 sewage pumping stations.

1.2 STP & SPS locations & capacities

Sr.No	Name / Location of STP	Year of Commissioning	Installed capacity
1	Zone - 2 Near Kasturi Garden Bhayandar (W)	2017	8
	Zone - 3 Near sai darka hsg, Navaghar road, bhayandar (W)	2025	13
2	Zone -4 Behind sports complex, New Golden Nest, Bhayandar (E)	2017	12
3	Zone -5 Near Galaxy Hospital Kanakiya Road, Miraroad (E)	2019	17
4	Zone -6A Shanti Nagar Opposite st Joscph School Mira Road (E)	2014	13
5	Zone -6B Near Shrushti Complex, Mira Road (E)	2021	7
6	Zone -6C Near Ayyappa Mandir, Poonam sagar road Miraroad(E)	2014	11
7	Zone -7 Reservation No. 170, Kanugo, Miraroad (E)	2021	12
8	Zone -8 Near Gaurav Sankal Soc. Ghadbandar Road	2020	14

9	STPS AT JASAL PARK,	-	
10	SHANTI NAGAR SECTOR 8,3 & Shrushti (SPS)	-	

## OPERATION AND MAINTENANCE

### 1.0 General

The contractor has to maintain all zones (SPS, STP & All Collection System) as specified. The contractor is to operate, maintain and monitor STPs. This contract includes other incidental items of work connected with the regular operation & maintenance of the treatment plant.

Collection system as decided by Engineer-in-Charge from time to time. The scope of work is given below but not limited to the following.

1. The contractor shall ensure proper running of the plant to give the desired effluent standards as under / as per MPCBs Norms in force And his responsible to all MPCB office related documentation work like consent for STP, compliance of plant, reports all other related work.

#### Required Treated Sewage Quality as per CPCB

Sr	Parameters	Unit	Discharge Standards
1	pH		6.5 to 8.5
2	Total Suspended Solids	mg/1	<10.00
3	BODs at 20 °C	mg/1	<10.00
4	COD	mg/1	<50.00
5	Oil & Grease	mg/1	<10.00
6	Fecal Coliform	NPN / 100 ml	<100.00
7	Ammonical Nitrogen	mg/1	<5.00
8	Residual Chlorine	mg/1	1.00

3. The contractor shall also be responsible for overall comprehensive maintenance of the plant

i.e. civil, electrical, electronic and mechanical system. The contractor shall also be

responsible

for replacement of parts of related equipment / machinery to keep all system in working

condition 24 x 7.

4. The contractor shall monitor the quality of raw and treated sewage. The contractor shall intimate and take adequate action to ensure smooth and satisfactory running of the plant. The contractor shall make raw and treated sewage analysis for pH, SS, BOD and oil & grease shall be carried out on daily basis during O & M period at MBMC lab and once in a month from MPCB Testing lab.
5. The contractor shall prepare and implement an effective plant maintenance program in consultation with Engineer-in-Charge. It shall be absolutely contractor's responsibility to look after all sorts of maintenance whether preventive or break down. The contractor shall maintain the operational activity record as prescribed.
6. The contractor shall be responsible for keeping updated record of documents including History- Card for equipment and maintaining every day logbook relating to running of machinery, consumption of energy, and other consumables etc. and various analysis performed. In addition to above the contractor shall maintain the operation and maintenance data for the following.
  - Daily status record of STP
  - Daily flow record
  - Daily analysis record
  - Operation records of mechanical screens
  - Operation record of grit channel
  - Operation record of Surface aerators
  - Operation record of Secondary clarifier
  - Operation record of Return sludge pumps
  - Operation record of chlorination system

- Record of quantity of sludge generation
  - Operation record of Centrifuge unit
  - Performance data of Aeration System.
  - Performance data of Chlorination system
  - Any other allied works required during O&M.
7. The Contractor shall submit a monthly report to MBMC, about the operation and maintenance indicating the manpower, electric power, chemicals and other consumables consumed, problems faced and rectified along with various analysis performed for raw and treated sewage.
  8. The contractor shall be responsible to carry out day to day as well as periodic maintenance necessary to ensure smooth and efficient performance/running of all equipment/instruments installed at the Sewage Treatment Plant..
  9. The contractor shall also be responsible for proper upkeep of administrative block of the Sewage Treatment Plant.
  10. He shall be responsible for proper maintenance of all the pumps and allied equipments including mechanical screens, gates, Aerators, sludge pumps, chlorinator etc.
  11. He shall be responsible for timely removal and safe disposal of the dried sludge including transportation, loading and unloading etc. He should get approval for the location of the disposal of the dried sludge from MBMC.
  12. He shall be responsible for maintenance of streetlight, poles & fixtures also in STP area.
  13. The sewerage system in the STP premises, roads and pathways provided at the sewage treatment plant shall be maintained properly.
  14. Round the Clock watch and ward of the entire premises including plants/machinery etc. will also be the responsibility of the contractor.

15. The entire STP premises including Administration building will be kept neat and clean.
16. The records maintained by the contractors shall be produced periodically to the Engineer-in charge for proper monitoring as desired by him.
17. Operation & maintenance of boundary wall of STP, Landscaping and Forestation done in the Sewage Treatment Plant premises etc. shall be carried out.
18. The Contractor shall operate and maintain the entire plant within its Contract price for a total operation and maintenance period
19. All necessary repairs, maintenance, replacements etc., shall be made during the comprehensive O & M to maintain the plant at the status of formal handing over. Contractor shall be responsible for preventive repair, breakdown repair, for operation and maintenance during the period of O&M.
20. At the end of O & M period the plant shall be handed over to the MBMC in fully functional condition except normal wear and tear expected during the period of operation and maintenance.
21. During O & M period cost of power consumed shall not be in the Contractor price and bills of electric power shall be paid by the MBMC as per actual consumption.
22. Sampling and testing of influent wastewater based on the tests and frequency desired by the MBMC'S representative and in general in accordance with the CPHEEO manual on Sewerage and Sewage Treatment.
23. Sampling and testing of additional samples for the day to day O & M of the STP and as mutually agreed from time to time between the Contractor and the MBMC representative.
24. MPCB or any other laboratory effluent treatment charges shall be borne by the Tenderer.
25. Sampling of final treated sewage to ensure that the guarantee Parameters are as stipulated in the Bid document.

26. The sampling frequency to be as per relevant norms of Maharashtra pollution Control Board or higher as decided by MBMC representative. The MBMC reserves right to collect samples at random at the will of the MBMC through any agency nominated by him.
27. The MBMC shall have right to seek part of sample collected by the Contractor without any prior intimation to cross check the result on random basis, however the analysis charges of such samples shall be borne by Contractor.
28. Maintenance of log books of all the equipment's/instruments connected to the PLC/SCADA shall forwarded at monthly intervals in the form of a hard copy as monitored by the PLC. Such records are given regularly to the MBMC in the form of hard copy at monthly intervals.
29. The reports shall contain sufficient appropriate and adequate data to make the records meaningful and amenable to analysis for evaluating the performance of the plant as well as to help in O & M decisions.
30. Security of the campus and contents therein shall be Contractor's responsibility.
31. The records maintained by the Contractor shall be produced periodically to the MBMC representative for proper monitoring. The MBMC representative's remarks shall be attended to on next submission. Consolidated summary report shall be furnished to the MBMC monthly, quarterly and yearly containing salient features.
32. The Contractor shall also maintain history sheets of overhauling, maintenance, replacement of all the important electrical and mechanical equipment.
33. The O &M shall include the appropriate preventive maintenance of equipment as per the Manufacturer's recommendation.
34. All the equipment even standby supplied, installed and commissioned by the Contractor should be in operational/ functional condition throughout the O & M period. The Contractor shall take all preventive measures to maintain them in working condition.

35. The frequency of break downs of various equipment shall be the least as far as possible. The total number of such re-occurrences shall not exceed three times per annum otherwise penalty shall be levied on the Contractor at the discretion of Engineer-in-charge.
36. The operation, maintenance and repairs services shall be performed according to the following.
37. The Operator shall also liaise with Competent Authorities such as MSEDCL, MIDC, any other electricity supplier as required.
38. The ownership of all scrap and replaced equipment or the parts that are supplied by the Corporation shall be that of the Corporation. All these scrap material should be stake properly as per direction of Engineer-in-charge.
39. All the spare parts required for the maintenance of equipment's shall be provided by the Contractor. The Contractor shall warrant to the effect that all the spares shall be procured from the authorized sources and be of the best quality and fit for the purpose for which it is being used.
40. The contractor is expected to carry out the work in such a manner as not be cause any damage to public property on account of negligence or otherwise. The Contractor shall be fully responsible for making good the damages so caused by him entirely at his own cost.
41. The assets/works/Facilities/Systems of the Corporation shall be at the risk and in the sole charge of the Contractor and the Contractor shall be responsible for making good any loss or damage there to arising from any cause whatever including that due to a theft or robbery.

42. The Contractor shall provide adequate engineering equipment, maintenance staff, inventories, plant and machinery, Vehicle, and all other things, whether of a temporary or permanent nature required for carrying out Operations under the Contract.
43. The Contractor shall take all necessary measures to minimize the power consumption in carrying out its Operations. The energy audit Operations shall include, but not be limited to, the following:
1. Reducing electricity consumption by regulating pumping, through suitable modifications to the operating schedules
  2. Maintaining power factor at unity and demand to avoid penalty;
  3. Contractor shall carry out the inspection of all electrical installation once in a six month period in said zone through Govt. approved / registered Class-I electrical Supervisor or Certified Energy Auditor
44. If for any reason the sewage standards are not met and the penalty is imposed by MPCB, the same shall be recovered from the Contractor's payable amount. However MBMC reserves right to terminate the Contract on statutory ground or default of the Contractors.

#### **ITEM NO 1 :- 24 X 7 OPERATION AND COMPREHENSIVE MAINTENANCE**

The scope of work under this item shall include complete, round-the-clock operation and comprehensive operation & maintenance of all Sewage Treatment Plant (STP) of different capacity, based on MBBR, in all respects, as detailed below, to ensure continuous, safe and efficient functioning of the plant and compliance with MPCB / CPCB / Municipal Corporation norms, as directed by the Engineer-in-Charge.

##### **1. Operation of Sewage Treatment Plant (24×7)**

- Continuous operation of the STP on 24 hours × 7 days basis, including Sundays and public holidays.
- Handling of full design sewage flow without overflow or bypass.

- Regulation of inlet flow, process control and monitoring.
- Maintaining proper hydraulic and organic loading conditions.
- Ensuring uninterrupted treatment and disposal/reuse of treated effluent.

## **2. Unit-wise Operation & Maintenance**

### **a) Inlet Works (Chambers, Screens, Grit Units)**

- Manual/mechanical cleaning of bar screens.
- Removal and disposal of screenings, plastics, rags and grit.
- Prevention of choking, overflow and odor nuisance.
- Routine cleaning and maintenance of inlet structures.

### **b) Equalization / Collection Tanks**

- Operation and maintenance of pumps, mixers and pipelines.
- Cleaning of settled solids and scum.
- Odor control and proper housekeeping.

### **c) Biological Treatment Units (MBBR / Aeration Tanks)**

- Operation and control of aeration system and air blowers.
- Maintaining required DO, HRT, MLSS and bio-media movement.
- Maintenance of diffusers, air headers and media retention sieves.
- Preventing loss, choking or damage of bio-media.
- Cleaning and repairs of tanks and internal fittings.

**d) Secondary Clarifier / Settling Tank**

- Efficient sludge settling and clarification.
- Operation of sludge withdrawal system.
- Regular desludging to prevent carryover.
- Cleaning of weirs, launders and outlets.

**e) Treated Water System**

- Operation and maintenance of treated water tanks and pumps.
- Ensuring safe storage and reuse/disposal of treated water.
- Periodic cleaning of tanks.

**f) Sludge Handling & Disposal System**

- Operation and maintenance of sludge pumps and pipelines, mechanical dewatering systems
- Handling, drying and safe disposal of sludge as per MPCB norms.
- Maintaining sludge handling records.

**g) Disinfection System**

- Operation, maintenance and monitoring of chlorine / hypochlorite / UV system.
- Supply, handling and dosing of disinfectant.
- Maintaining required residual chlorine.

- Chlorine safety, leak detection and emergency handling.

### **3. Comprehensive Maintenance**

#### **a) Mechanical Maintenance**

Preventive and breakdown maintenance of with replacement of all necessary parts to keep in smooth running of :

- Pumps & motor
- gates, valves and actuators
- air blowers
- pipelines, diffusers
- Gearboxes, couplings, bearings
- Lubrication, alignment and tightening.
- Replacement of worn-out mechanical parts.
- Anticorrosive painting and cleaning.
- And all other mechanical machinery/equipment should follow above

#### **The following points should be observed while operating the pumps:**

- Dry running of the pumps should be avoided.
- Centrifugal pumps if installed with negative suction should be primed before Starting.
- Pumps should be operated only within the recommended range of the head-discharge
- If pump is operated at a point away from duty point, the pump efficiency normally reduces.

- Operation near the shut-off point should be avoided, as it causes substantial recirculation within the pump, resulting in overheating of sewage in the casing and consequently, overheating of the pump.
- Voltage during operation of the pump-motor set should be within  $\pm 10\%$  of the rated voltage. Similarly, current should be below the rated current shown on the name plate of the motor.
- When parallel pumps are to be operated, the pumps should be started and stopped with a time lag between two pumps to restrict change of flow velocity to minimum and to restrict the dip in voltage in the incoming feeder and should be adequate to allow the pump head to stabilize.
- When the pumps are to be operated in series, they should be started and stopped sequentially, but with minimum time lag. Any pump next in sequence should be started immediately after the delivery valve of the previous pump is even partly opened. Due care should be taken to keep open the air vent of the pump next in sequence, before starting that pump.
- The running of duty pumps and standby pumps should be scheduled so that no pump remains idle for a long period and all pumps are in ready-to-run condition. Similarly, the running schedules should be ensured so that all pumps do not wear equally needing simultaneous overhaul.
- If any undue vibration or noise is noticed, the pump should be stopped immediately and the cause for vibration or noise should be checked and rectified.
- Generally, the number of starts per hour shall not exceed four. Frequent starting and stopping should be avoided as each start causes overloading of motor, starter, contactor and contacts. Although overloading lasts only for a few seconds, it reduces the life of the equipment.
- Troubles in a sewage pumping station can be mostly traced to the design stage itself. This is all the more true when too much grit is likely to come into the sewage pumping stations from sewage at monsoon time, which is difficult to handle. Hence, sewers should not collect any storm water.

**The following points should be observed while operating the pumps Sluice gates :**

- Operate inactive sluice gates by smearing grease on stem threads.
  - Clean sluice gate with wire brush and paint with proper corrosion-resistant paint.
  - Ensure unobstructed operation of gate and headstock.
  - Ensure that the spindle is not touching the stem guide.
  - Remove foreign matter like paint, concrete, etc. in the fully open position of gate.
- Do's for sluice gates
- Operate the gate at least once in every three months.
  - Check the nuts of all construction and foundation bolts once in a year. Tighten the bolts, if loose.
  - Examine the entire painted surface for any signs of damage to the protective paint.
- Don'ts for sluice gates
- Do not remove lock plates until the gate has been properly installed.
  - Do not keep the gate out of operation for more than three months.
  - Do not forget to set the stop nut in the correct position.
  - Do not disturb the adjustment of wedge block bolts/studs.
  - Do not over torque the crank handle/hand wheel.

**The following points should be observed while operating the air blowers :**

General Operation The Contractor shall operate the Air Blowers to ensure adequate Dissolved Oxygen (DO) levels are maintained in the MBBR/Aeration tanks as per the process requirements. The operation shall ensure that the standby blower is rotated into service regularly to ensure all equipment remains in functional condition.

Pre-Start & Start-up Checks

- Ensure the inlet air filter is clean and free from choking.
- Check the oil level in the gear side and drive side oil sumps; top up if necessary using the recommended grade of oil.

- Ensure the discharge valve is in the open position before starting (unless a bypass line is provided for starting).
- Check the belt tension (for belt-driven units) or coupling alignment (for direct-coupled units).
- Rotate the blower manually (hand-cranking) to ensure free rotation of the lobes/impellers and to check for any internal friction or abnormal sound.
- Ensure all safety guards for belts/couplings are securely in place.

### **Operational Checks**

The following points must be observed while operating the blowers:

- **Discharge Pressure:** Monitor the pressure gauge on the discharge line. A gradual increase in pressure over time often indicates clogging of the underwater diffusers or the air filter.
- **Amperage:** Continuously monitor the motor current (Amperes). It should remain below the rated current shown on the motor nameplate.
- **Temperature:** Check the discharge air temperature and bearing housing temperature. Excessive heat indicates friction or oil starvation.
- **Vibration & Noise:** If any knocking sound, abnormal squealing, or high vibration is noticed, the blower must be stopped immediately and the cause rectified.
- **Oil Splash:** Ensure the oil splash/lubrication system is functioning (visible through sight glass if applicable).

### **Routine Maintenance**

- **Air Filters:** Clean the suction filters weekly. Replace them strictly as per the manufacturer's recommendation or if the pressure drop across the filter exceeds the limit.
- **Lubrication:** Change the gear oil after the initial run-in period (e.g., first 500 hours) and subsequently as per the manufacturer's schedule.
- **Belts:** Check V-belts for wear, fraying, and proper tension monthly. Loose belts cause slippage and power loss; tight belts damage bearings.
- **Diffuser Cleaning:** Monitor back-pressure constantly. If back-pressure rises significantly, the Contractor shall perform diffuser cleaning (acid dosing/purging) or physical cleaning as required to reduce strain on the blowers.
- **Safety Valves:** Manually lift/test the spring-loaded safety relief valve periodically to ensure it is not stuck and will pop off if pressure exceeds the design limit.

**The following points should be observed while operating the Sludge Feed Pump:**

- Inlet and outlet flow rate
- Noise or vibration
- Bearing housing temperature
- Running amperage
- Pump speed
- Pressure
- Check the level and condition of the oil in the gear reducer
- Check the shaft alignment
- Check the condition of all painted surfaces
- Visually inspect mounting fasteners for tightness

- Clean dirt, dust or oil from equipment surfaces
- Check all electrical connections
- Stop and start equipment, checking for voltage and amp draw and any movement restrictions because of failed bearings, improper lubrication or other causes
- Check the drive motor for any unusual heat, noise or vibration
- Check mechanical seals and packing for leakage or wear

### **Maintenance**

During operation, the operator should check for the following:

- The oil level and the flow of oil to the bearings in circulating oil systems
- Flow of cooling water and oil temperature, to ensure it is operating in the proper range
- Machine vibration
- Ammeter reading on the bowl motor
- Bearing temperatures, by touching them
- System for leaks
- Centrate quality
- Because the centrifuge will shut itself down in the event of a fault, the operator typically only looks at the mechanical parameters once per shift.

#### **(a) Awareness & Cleanliness**

- The Contractor and their personnel shall maintain a high degree of awareness in operation and maintenance of the plant and all relevant safety codes and procedures.
- At all times the plant, its equipment and surrounding shall be kept clean and in order including the buildings, floors, walls, roofs, windows and garden etc.

#### **(b) Preventive maintenance**

- The preventive maintenance shall be carried out according to the preventive maintenance schedule of the plant.(annexure I)
- The regular staff may be reinforced with short-term specialists by the Contractor for special maintenance tasks, after duly informing the MBMC representative of the need and the schedule.

(c) **Repairs**

- Repairs shall be made as and when needed very promptly on the spot or at the Contractor's / Manufacturer's workshop. The need of repair on the spot or at the Contractor's workshop has to be defined in co-ordination with the MBMC representative and according to the status of spare parts availability.

(d) **Spare parts**

- The Contractor shall keep a reasonable stock of spare parts so that the down time of equipment can be kept within the limits specified.
- The contents of the stock and the reorder level of the inventory have to be approved by the MBMC representative.

(e) **Transportation**

All necessary transportation shall be arranged and made by the Contractor at his own expense. For better communication internet facility is provided throughout the entire operation & maintenance period on his own cost.

(f) **Oil, Grease, Lubricants, Chemicals and Consumables**

The Contractor has to ensure that there is always sufficient stock of 15 days of Oil, Grease, Lubricants consumables, and laboratory chemicals.

**b) Electrical & Electronic Maintenance**

Preventive and breakdown maintenance of with replacement of all necessary parts to keep in smooth running of:

- Panels, MCCs, starters, VFDs
- Cables, switches, control wiring
- Instruments, sensors, meters
- Rectification of faults and short circuits.
- Replacement of damaged, faulty electrical items immediately.
- Maintenance of HT/LT panels, MCC, PCC, starters, VFDs, transformers, DG sets and lighting systems and other related system.
- Periodic checking of insulation resistance, earthing resistance and cable health.
- Maintenance of power supply system including cables, bus bars, breakers, contactors, relays and meters.
- Compliance with CEA Safety Regulations, IS 732, IS 3043 and Electricity Act provisions.
- Replacement of defective electrical items including cables, glands, lugs, MCB/MCCB, contactors, relays, switches, indication lamps, meters, earthing, lighting fittings and all other related material, involving dismantling, supply, installation, testing and commissioning of approved make materials, complete as per IS/BIS standards, CEA safety regulations and CPWD/PWD specifications, as directed by the Engineer-in-Charge.
- Panel Air-Conditioned Environment: All electrical control panels, PLC/SCADA panels and MCC/PCC panels shall be installed, operated and maintained in a continuous air-conditioned environment, ensuring suitable temperature and humidity as per OEM recommendations, including operation and maintenance of panel room air-conditioning system at all times, complete as directed by the Engineer-in-Charge.
- Replacement of damaged circuit breakers;
- Replacement of capacitors/ Installation of New Capacitors to avoid penalty

- Replacement of damaged cables

### **c) Civil Structures**

- repairs to tanks, chambers, platforms, walkways and all other civil structure in plant with compound wall.
- Cleaning, painting and keep of civil structures always in well condition.
- Maintaining safe access and housekeeping.
- The total maintenance of building and all electrical, ventilation, plumbing and drainage installation in the building.
- Housekeeping and cleaning of all buildings
- Preventive and breakdown maintenance of the site water and wastewater services, cabling and earthing systems, air conditioning and the site road lighting system., The upkeep of landscaped areas, tree plantation and flower pots etc.,
- Maintenance of the communication system of the plant.
- Routine housekeeping maintenance shall be carried out in accordance with procedures.
- Normal breakdown maintenance shall be attended to within a period of 3 working days.

## **4. Supply of Spares, Consumables & Materials**

This item shall include supply, storage and use of all required:

- All mechanical spares
- All Electrical materials
- All electronic parts
- All civil material

- All Lubricants, oils, greases and other necessary consumable.
- Nuts, bolts, gaskets, washers
- Chemicals and consumables required for treatment
- Tools & tackles for operation and maintenance
- All materials shall be of approved quality and as directed by the Engineer-in-Charge.

## **5. Manpower Deployment**

- Deployment of qualified and experienced necessary engineer, operators, electricians, fitters, chemist, helpers, security guards, Gardner and supervisors in shift wise or in gen.
- Manpower shall be provided in sufficient numbers for 24×7 operation.
- Contractor responsible for wages, statutory compliances, safety gear, insurance as per minimum wages.
- Training program should be done in quarterly basis about safety training, chemical handling, soft skill and other related to work.
- The shift timing will be as under :-
  - a) 1st Shift from 7.00 hrs. to 15.00 hrs.
  - b) 2nd shift from 15.00 hrs. to 23.00 hrs.
  - c) 3rd shift from 23.00 hrs. to 7.00 hrs.

The above schedule may change to suit the local requirements as per instruction of Executive Engineer,/Engineer-in-charge, Mira Bhayandar Municipal Corporation.

- The Contractor shall not employ in connection with the Operations any child who has not completed his/her eighteenth year of age. It shall also not employ an adolescent who has not completed his/her eighteenth year unless he/she is certified fit for carrying out Operations as an adult as prescribed under clause (b) of sub-section (2) of Section 69 of the Factories Act, 1948.

- The Contractor shall provide its staff, a minimum of two sets of uniforms with the titles 'MBMC' inscribed on the back and subject to approval of the Corporation. Each worker on duty shall wear a clean uniform whenever on duty.
- The Contractor shall, if required by the Competent Authority, deliver to it, in such form and at such intervals as the Competent Authority may prescribe, a return showing the numbers of the several classes of staff employed by the Contractor on the Site and such other information as the Competent Authority may require.
- If the Competent Authority asks the Contractor to remove a person who is a member of the Contractor staff stating the reasons, the Contractor shall ensure that the person leaves the Site within seven (7) days and has no further connection with Operations under this Contract.
- At all times during continuance of the Contract, the Contractor and its Subcontractors shall abide by all existing and future labour enactment and rules made the re under, regulations, notifications and bye-laws of the Central, State or Local Government. The Operator shall keep the Corporation indemnified in case any action is taken against the Corporation by any Authority on account of contravention of any of the provisions of any Act or rules made the re under, regulations or notifications including amendments.
- The Contractor shall include in his cost medical and accident insurance expenses of all the staff employed by him along with all provision of the labour welfare acts prescribed from time to time by the state and central government
- Adequate insurance cover shall also be maintained during O &M period for all MBMCs as well as casual temporary employees and visitors.
- MBMC is not liable for any compensation on arising due to any accident/ mishap of any nature occurring in the plant premises.
- The contractor will have to pay the wages before 7<sup>th</sup> of every month.

## Contractor Superintendence

- The Contractor shall provide all necessary superintendence while carrying out its Operations and as long thereafter as the Competent Authority may consider necessary for the proper fulfilling of the Contractor obligations under the Contract. The Contractor shall nominate a competent and authorized representative ("Contractor Representative") approved of by the Competent Authority, which approval may at any time be withdrawn. The Contractor Representative shall give its whole time to the superintendence of the Operations. The Operator's Representative shall receive, on behalf of the Contractor, instructions from the Competent Authority, which shall be deemed received by the Contractor.

## **6. Testing, Monitoring & Reporting**

- Daily in-house monitoring of process parameters.
- Regular testing of influent and treated effluent.
- Monthly testing from approved laboratory like NABL and MPCB.
- Sampling and testing of influent wastewater based on the tests and frequency desired by the MBMC'S representative and in general in accordance with the CPHEEO manual on Sewerage and Sewage Treatment.
- Sampling and testing of additional samples for the day to day O & M of the STP and as mutually agreed from time to time between the Contractor and the MBMC representative.
- MPCB or any other laboratory effluent treatment charges shall be borne by the Tenderer.
- Sampling of final treated sewage to ensure that the guarantee Parameters are as stipulated in the Bid document
- The sampling frequency to be as per relevant norms of Maharashtra pollution Control Board or higher as decided by MBMC representative. The MBMC reserves right to collect samples at random at the will of the MBMC through any agency nominated by him.

- The MBMC shall have right to seek part of sample collected by the Contractor without any prior intimation to cross check the result on random basis, however the analysis charges of such samples shall be borne by Contractor.

**Maintain of:**

- Daily logbooks
- Chemical and power consumption records
- Maintenance and breakdown records
- Submission of reports to the department monthly.

**7. Treated Effluent Quality Assurance**

Ensuring treated effluent consistently meets:

- MPCB / CPCB standards
- Municipal reuse/discharge norms
- Immediate corrective actions in case of deviation.
- No bypassing of untreated sewage without written permission.

**8. Safety, Health & Environmental Compliance**

- Compliance with all safety rules and labour laws.
- Providing PPE and safety equipment.
- Safe handling of chemicals and sludge.
- Maintaining hygienic and clean plant premises.

- The Contractor shall be responsible for safety of his staff during O & M of the plant and shall procure, provide and maintain all safety equipment necessary for satisfactory O & M such as gloves, boots, mats, safety belts, masks, respiratory system for chlorine operation, etc.
- The Contractor shall utilize awareness procedures in every element of operation and maintenance.
- The Contractor shall emphasize site safety including adoption of maintenance.
- Safe working procedures, cleanliness and care of the plant as a whole
- Accident and hazardous conditions prevention and reporting
- Shall impart safety training to all members at regular intervals, especially for new comers
- Shall provide Notice Boards and display boards at appropriate locations, detailing precautions to be taken by O & M personnel to Work in conformity to regulations and procedures and by the visitors to the plant.
- Shall notify the MBMC representative immediately if any accident occurs whether on-site or off site in which Contractor is directly involved and results thereof any injury to any person, whether directly concerned with the site or a third party. Such initial notification may be verbal and shall be followed by comprehensive report within 24 hours of the accident.
- The Contractor may refuse entry into the plant, to all personnel's including MBMC representative on grounds of safety and person not carrying proper identification.
- Personnel shall be permitted entry into the plant only on disclosing their identity and those authorized personnel including MBMC representative shall be issued identity cards with photographs by the Contractor, this also includes casual visitors who shall be issued a temporary visitors entry permit.

## **9. Improvement And Maintenance of Green Area (Gardening):**

Carrying out necessary works to develop, improve and maintain green areas within and around the STP premises including cleaning of area, soil preparation, lawn development, planting of shrubs and trees (as approved), regular watering, trimming, pruning, removal of weeds, application of manure/fertilizer, replacement of dried plants, maintenance of pathways and overall upkeep to ensure a clean, green and aesthetically pleasing environment, complete with supply of required labour, tools, water, consumables and all other material as directed by the Engineer-in-Charge.

#### **10. Maintenance and Cleaning of Washrooms:**

Regular cleaning, upkeep and maintenance of all washrooms/toilets at the STP including daily cleaning, washing and disinfection of floors, walls, sanitary fittings and drainage, ensuring proper water supply, lighting and hygiene at all times, complete with supply of necessary labour, cleaning materials and consumables, as directed by the Engineer-in-Charge.

#### **11. Transportation & Incidental Charges**

- All transportation of materials, spares, chemicals and sludge.
- Loading, unloading and handling.
- All incidental charges required for smooth operation are included in the item rate.

**ITEM DESCRIPTION OF ALL ZONE**

		<b>Units</b>	<b>Z2</b>	<b>Z4</b>	<b>Z5</b>	<b>Z6A</b>	<b>Z6B</b>	<b>Z6C</b>	<b>Z8</b>
	<b><i>CAPACITY OF PLANT</i></b>	<b><i>MLD</i></b>	<b><i>8</i></b>	<b><i>12</i></b>	<b><i>17</i></b>	<b><i>13</i></b>	<b><i>7</i></b>	<b><i>11</i></b>	<b><i>14</i></b>
<b>A</b>	<b>MECHANICAL</b>								
<b>A.1</b>	<b>FLOCCULATOR</b>								
	CLARIFLOCCULATOR								
	MOC	* * *	* * *	* * *	IS 2062 Gr.A	* * *	* * *	* * *	* * *
	DIA	* * *	* * *	* * *	13 Mtr	* * *	* * *	* * *	* * *
<b>A.1.1</b>	<b>FLOCCULATOR</b>								
	Paddle size	Dia	2250	2200	* * *	2250	2250	2200	2300
	Length	Mts	2250	2800	* * *	2250	2800	2800	2650
	RPM	rpm	920	920	* * *	920	920	920	920
	Motor	HP	0.75	0.75	* * *	0.75	0.75	0.75	0.75
	QTY	Nos	2	2	* * *	3	2	2	2
<b>A.1.2</b>	<b>TUBE MODULES</b>								
	Module Size								
	Length	mts	1900	2300	Varies	1950	3300	2200	2325
	Width	mts	A-390, B-190	A-390, B-230	A-390, B-165	290	A-390, B-360	A-390, B-220	A-390, B-330
	Height	mts	1040	1040	1040	1040	1040	1040	1040
	Flute Size	mm	55mmx55mm	55mmx55mm	55mmx55mm	55mmx55mm	55mmx55mm	55mmx55mm	55mmx55mm

	Total Qty	sq mts	57	84	105	91	43	77	86
	MOC								
A.1.3	COLLECTION TROUGHS								
	Length	mm	3550	4250	3195	A-3650, B-3400	3050	4000	4200
	Width	mm	250	250	200	A-250, B-250	250	250	250
	MOC		CS	CS	CS	CS	CS	CS	CS
	Capacity	cum/ hr	-	-	-	-	-	-	-
	QTY		12	16	36	A-12, B-6	12	16	16
<b>A.2</b>	<b>ROTARY EQUIPMENT</b>								
A.2.2	THICKNER FEED PUMPS								
	Type of Pump		PROGRESS IVE CAVITY	PROGRES SIVE CAVITY	PROGRES SIVE CAVITY	-	PROGRES SIVE CAVITY	PROGRES SIVE CAVITY	PROGRES SIVE CAVITY
	Capacity	cum/ hr	9	13	20	-	8	12	15
	Solid Handling	mm	10 to 12mm Soft solids	10 to 12mm Soft solids	10 to 12mm Soft	-	10 to 12mm Soft	10 to 12mm Soft	10 to 12mm Soft
	Head		15	15	15	-	15	15	15
	Qty	Nos	2	2	2	-	2	2	2
A.2.3	CENTRIFUGE FEED PUMPS								

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	Type of Pump		PROGRESSIVE CAVITY	PROGRESSIVE CAVITY	PROGRESSIVE CAVITY	PROGRESSIVE CAVITY	PROGRESSIVE CAVITY	PROGRESSIVE CAVITY	PROGRESSIVE CAVITY
	Capacity	cum/hr	4	5	7	14	3	5	6
	Solid Handling	mm	10 to 12mm Soft solids	10 to 12mm Soft solids	10 to 12mm Soft solids	10 to 12mm Soft solids	10 to 12mm Soft solids	10 to 12mm Soft solids	10 to 12mm Soft solids
	Head		15	15	15	15	15	15	15
	Qty	Nos	2	2	2	2	2	2	2
A.2.4	ALUM DOSING PUMPS								
	Type		DIAPHRAGM	DIAPHRAGM	DIAPHRAGM	DIAPHRAGM	DIAPHRAGM	DIAPHRAGM	DIAPHRAGM
	Capacity	LPH	100	150	200	150	80	125	200
	Head		15	15	15	15	15	15	15
	Liquid Type		Alum	Alum	Alum	Alum	Alum	Alum	Alum
	Qty	Nos	2	2	2	2	2	2	2
A.2.5	DEWATERING POLYELECTROLYTE DOSING PUMPS								
	Type		DIAPHRAGM	DIAPHRAGM	DIAPHRAGM	DIAPHRAGM	DIAPHRAGM	DIAPHRAGM	DIAPHRAGM
	Capacity		100	150	200	150	80	125	200
	Head		15	15	15	15	15	15	15
	Liquid Type		DWPE	DWPE	DWPE	DWPE	DWPE	DWPE	DWPE
	Qty	Nos	2	2	2	2	2	2	2

A.2.6	MIXER FOR ALUM DOSING TANKS								
	Type of Mixer		Axial Turbine	Axial Turbine	Axial Turbine	Axial Turbine	Axial Turbine	Axial Turbine	Axial Turbine
	Length		To Suit tank height of 1410	To Suit tank height of 1410	To Suit tank height of 1410	To Suit tank height of 1410	To Suit tank height of 1410	To Suit tank height of 1410	To Suit tank height of 1410
	RPM		90	90	90	90	90	90	90
	Qty	Nos	2	2	2	2	2	2	2
A.2.7	MIXER FOR DEWATERING POLYELECTROLYTE DOSING TANKS								
	Type of mixer		Axial Turbine	Axial Turbine	Axial Turbine	Axial Turbine	Axial Turbine	Axial Turbine	Axial Turbine
	Length		To Suit tank height of 1410	To Suit tank height of 1410	To Suit tank height of 1410	To Suit tank height of 1410	To Suit tank height of 1410	To Suit tank height of 1410	To Suit tank height of 1410
	RPM		90	90	90	90	90	90	90
	Qty	Nos	2	2	2	2	2	2	2
A.2.8	FLASH MIXER								
	Type of mixer		RADIAL TURBINE	RADIAL TURBINE	RADIAL TURBINE	RADIAL TURBINE	RADIAL TURBINE	RADIAL TURBINE	RADIAL TURBINE
	Impeller Size	Dia	550	550	600	550	600	650	600
	Length	Mts	To Suit tank	To Suit tank	To Suit tank	To Suit tank	To Suit tank	To Suit tank	To Suit tank

			height of 2200	height of 2400	height of 2700	height of 2500	height of 2100	height of 2400	height of 2600
	RPM		141	141	141	141	141	141	141
	Qty	Nos	1	1	1	1	1	1	1
A.2.9	AIR BLOWERS								
	TYPE		TWIN LOBE ROTARY	TWIN LOBE ROTARY	TWIN LOBE ROTARY	TWIN LOBE ROTARY	TWIN LOBE ROTARY	TWIN LOBE ROTARY	TWIN LOBE ROTARY
	Capacity	cum/ hr	1450	2150	3050	2350	2250	2050	2500
	Head	mmW c	6500	6500	6500	6500	6500	6500	6500
	RPM		1050	1200	835	1295	935	1400	1365
	Qty	Nos	3	3	3	3	3	3	3
<b>A.3</b>	<b>OTHER MECHANICAL ITEMS</b>								
A.3.1	GRIT SEPERATOR MECHANISM								
	Dimension		4.4M X 4.4M X 1.0 Ht	5.4M X 5.4M X 1.0 Ht	6.4M X 6.4M X 1.0 Ht	6.4M X 6.4M X 1.0 Ht	4.2M X 4.2M X 1.0 Ht	5.2M X 5.2M X 1.0 Ht	5.8M X 5.8M X 1.0 Ht
	Scrapper speed		2.82 Mts per min	2.4 Mts per min	2.95 Mts per min	2.58 Mts per min	2.7 Mts per min	2.39 Mts per min	2.67 Mts per min
	Qty	Nos	2	2	2	2	2	2	2
	<i>Motor</i>								
	Type		Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted
	HP		2	2	2	2	2	2	2

	Qty	Nos	2	2	2	2	2	2	2
A.3.2	SLUDGE THICKNER MECHANISM								
	Dimension		7.0m Dia. X 3.8m Ht.	8.4m Dia. X 3.8m Ht.	9.8m Dia. X 3.8m Ht.	6.4m Dia. X 3.8m Ht.	8.2m Dia. X 3.8m Ht.	8.4m Dia. X 3.8m Ht.	8.8m Dia. X 3.8m Ht.
	Tip Speed		2 mtrs/ min	2 mtrs/ min	2 mtrs/ min	2 mtrs/ min	2 mtrs/ min	2 mtrs/ min	2 mtrs/ min
	<u>Motor</u>								
	Type		Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted
	HP		1	1	1	1	1	1	1
	Qty	No	1	1	1	1	1	1	1
A.3.3	CENTRIFUGE								
	Type		Counter Current	Counter Current	Counter Current	Counter Current	Counter Current	Counter Current	Counter Current
	Capacity		200	250	350	700	150	250	300
	RPM		4400	4400	4400	4400	4400	4400	4400
	HP	HP	11.19	11.19	13.80	22.38	11.19	11.19	13.80
	Qty	No	2	2	2	2	2	2	2
A.3.4	MMBR MEDIA								
	Capacity of 2 MMBRs	cum	508	748	1084	728	432	708	904
	Size								
	Qty	cum	127	187	271	182	108	177	226
	MOC		Recycled PP	Recycled PP	Recycled PP	Recycled PP	Recycled PP	Recycled PP	Recycled PP

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A.3.7	MECHANICAL FINE SCREEN								
	Bar spacing	nos	6	6	6	6	6	6	6
	Dimensions		As per required channel width	As per required channel width	As per required channel width	As per required channel width	As per required channel width	As per required channel width	As per required channel width
	MOC		SS 304	SS 304	SS 304	SS 304	SS 304	SS 304	SS 304
	Capacity (Peak Flow Rate)	m3/hr	751.5	1125	1595.25	1219.5	657	1032.75	1314
	Motor, HP	HP	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	Qty	nos	1	1	1	1	1	1	1
A.3.8	MANUAL MEDIUM SCREEN								
	Bar Spacing	mm	15	15	15	15	15	15	15
	Dimensions		As per required channel width	As per required channel width	As per required channel width	As per required channel width	As per required channel width	As per required channel width	As per required channel width
	Capacity								
	MOC		SS 305	SS 307	SS 308	SS 309	SS 310	SS 311	SS 313
	Qty	No	1	1	1	1	1	1	1
A.3.9	MEDIA RETAINING SCREEN								
	Bar Spacing	mm	12	12	12	12	12	12	12
	Dimensions		1000X100 5	1250X100 5	1000X100 5	1250X100 5	1000X100 5	1000X100 5	1000X100 5
	Capacity								
	MOC		MS (Galv)	MS (Galv)	MS (Galv)	MS (Galv)	MS (Galv)	MS (Galv)	MS (Galv)
	Qty	Nos	8	12	16	10	10	14	14

A.3.1 0	GAS CHLORINATOR SYSTEM WITH BOOSTER PUMPS								
	Capacity	LPH	1.5	2	3	2	1	2	2
	Type								
	Qty	Nos	2	2	2	2	2	2	2
A.3.1 1	MANUAL CHAIN PULLEY BLOCK								
	Lifting Capacity	Tonnes	2	2	2	2	2	2	2
	Type		Manual	Manual	Manual	Manual	Manual	Manual	Manual
	Make		Transpade	Transpade	Transpade	Transpade	Transpade	Transpade	Transpade
	Qty	No	1	1	1	1	1	1	1
A.3.1 2	ELECTRIC HOIST								
	Lifting Capacity	Tonnes	2/3/2/2	2/3/2/2	2/3/2/2	2/3/2/2	2/3/2/2	2/3/2/2	2/3/2/2
	Type		Electric	Electric	Electric	Electric	Electric	Electric	Electric
	Make		Transpade	Transpade	Transpade	Transpade	Transpade	Transpade	Transpade
	Power required		1.5/2.2/1.5	1.5/2.2/1.5	1.5/2.2/1.5	1.5/2.2/1.5	1.5/2.2/1.5	1.5/2.2/1.5	1.5/2.2/1.5
		kW	/1.5	/1.5	/1.5	/1.5	/1.5	/1.5	/1.5
	Qty	Nos	4	4	4	4	4	4	4
A.3.1 3	ISOLATION GATES								
	Type		Manual	Manual	Manual	Manual	Manual	Manual	Manual
	Size	mm	1050 W X	1050 W X	1250 W X	1250 W X	800 W X	1250 W X	1350 W X

			800 HT	800 HT	1100 HT	1100 HT	1100 HT	1100 HT	1000 HT
	Size	mm	650 W X 800 HT	850 W X 800 HT	950 W X 1100 HT	850 W X 1100 HT	500 W X 1100 HT	850 W X 800 HT	950 W X 1100 HT
	Size	mm	850 W X 1100 HT	950 W X 1100 HT	1150 W X 1100 HT	1050 W X 1100 HT	750 W X 1100 HT	950 W X 1100 HT	1050 W X 1100 HT
	Size	mm	550 W X 1100 HT	750 W X 1100 HT	850 W X 1100 HT	750 W X 1100 HT	550 W X 1100 HT	650 W X 1100 HT	750 W X 1100 HT
	Size	mm	850 W X 800 HT	950 W X 800 HT	1150 W X 1000 HT	1050 W X 800 HT	750 W X 800 HT	950 W X 800 HT	1050 W X 800 HT
	Size	mm	550 W X 800 HT	750 W X 800 HT	850 W X 800 HT	750 W X 800 HT	550 W X 800 HT	650 W X 800 HT	750 W X 800 HT
	MOC		Cast Iron IS 210	Cast Iron IS 210	Cast Iron IS 210	Cast Iron IS 210	Cast Iron IS 210	Cast Iron IS 210	Cast Iron IS 210
	Qty	Nos	6	6	6	6	6	6	6
A.3.1 4	ALUM DOSING TANK								
	Tank Capacity	Lts	1000	1000	1000	1000	1000	1000	1000
	MOC		LLDPE	LLDPE	LLDPE	LLDPE	LLDPE	LLDPE	LLDPE
	Qty	Nos	2	2	2	2	2	2	2
<b>B</b>	<b>ELCTRICAL</b>								
B.2	<b>Disel Generator</b>								
	Capacity	KVA	320	380	500	500	320	320	500
	Type								
	Fuel Type		HSD	HSD	HSD	HSD	HSD	HSD	HSD
	Qty	No	1	1	1	1	1	1	1

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<b>B.3</b>	<b>MOTORS</b>								
B.3.1	THICKNER FEED PUMPS								
	Type		Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted
	RPM	RPM	400	245	370		370	505	290
	HP	HP	0.82	1.12	2.76		0.82	1.12	1.64
	Pole	Nos	4	6	4		4	4	6
	Qty	Nos	2	2	2		2	2	2
B.3.2	CENTRIFUGE FEED PUMPS								
	Type		Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted
	RPM	RPM	370	455	338	265	437	455	538
	HP	HP	0.56	0.82	0.82	1.64	0.41	0.82	0.82
	Pole	Nos	4	4	4	4	4	4	4
	Qty	Nos	2	2	2	4	2	2	2
B.3.3	ALUM DOSING PUMPS								
	Type		Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted
	RPM	RPM	1500	1500	1500	1500	1500	1500	1500
	HP	LHP	100	150	200	150	80	125	200
	Pole	Nos							
	Qty	Nos	2	2	2	2	2	2	2
B.3.4	DEWATERING POLYELECTROLYTE DOSING PUMPS								

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	Type		Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted
	RPM	RPM	1500	1500	1500	1500	1500	1500	1500
	HP	LHP	100	150	200	150	80	125	200
	Pole								
	Qty	Nos	2	2	2	2	2	2	2
B.3.5	MIXER FOR ALUM DOSING TANKS								
	Type		Flange Mounted	Flange Mounted	Flange Mounted	Flange Mounted	Flange Mounted	Flange Mounted	Flange Mounted
	RPM		90	90	90	90	90	90	90
	HP	HP	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Pole								
	Qty	Nos	2	2	2	2	2	2	2
B.3.6	MIXER FOR DEWATERING POLYELECTROLYTE DOSING TANKS								
	Type		Flange Mounted	Flange Mounted	Flange Mounted	Flange Mounted	Flange Mounted	Flange Mounted	Flange Mounted
	RPM		90	90	90	90	90	90	90
	HP	HP	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Pole								
	Qty	Nos	2	2	2	2	2	2	2
B.3.7	FLASH MIXER								
	Type		Flange Mounted	Flange Mounted	Flange Mounted	Flange Mounted	Flange Mounted	Flange Mounted	Flange Mounted

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	RPM	RPM	141	141	141	141	141	141	141
	HP	HP	1.5	1.5	3	1.5	1.5	1.5	1.5
	Pole								
	Qty	NO	1	1	1	1	1	1	1
B.3.8	AIR BLOWERS								
	Type		Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted	Foot Mounted
	RPM	RPM	1050	1200	835	1295	935	1400	1365
	HP	HP	26.71	36.48	53.04	39.17	24.32	33.79	41.1
	Pole								
	Qty	Nos	3	3	3	3	3	3	3

RSS ITEM DESCRIPTION		Units	Z2	Z4	Z5	Z6A	Z6B	Z6C	Z8
<b>A</b>	<b>MECHANICAL</b>								
<b>A.2</b>	<b>ROTARY EQUIPMENT</b>								
A.2.1	RAW SWEWAGE PUMPS								
	1/4 Capacity	m3/hr	84	125	180	136	73	115	146
	1/2 Capacity	m3/hr	166	250	360	272	146	230	292
	Full Capacity	m3/hr	336	500	72	544	292	460	584
	Type		Submerged Motor	Submerged Motor	Submerged Motor	Submerged Motor	Submerged Motor	Submerged Motor	Submerged Motor
	Impeller Type		Non Clog Semi Open	Non Clog Semi Open	Non Clog Semi Open	Non Clog Semi Open	Non Clog Semi Open	Non Clog Semi Open	Non Clog Semi Open

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	Solid Handling Capacity	mm	100mm	100mm	100mm	100mm	100mm	100mm	100mm
	Head	mts							
	1/4 Capacity		18	18.5	19	19	18.5	19	19
	1/2 Capacity		17.5	17	17.5	18	17	18	18
	Full Capacity		16	15.5	16	16.5	15	16	17.5
	Motor								
	Type		Submerged Motor	Submerged Motor	Submerged Motor	Submerged Motor	Submerged Motor	Submerged Motor	Submerged Motor
	HP								
	1/4 Capacity	HP	15	20	25	20	12.5	17.5	20
	1/2 Capacity	HP	20	30	45	30	15	25	35
	Full Capacity	HP	30	45	65	50	25	45	55
	QTY	Nos							
	1/4 Capacity	Nos	2	2	2	2	2	2	2
	1/2 Capacity	Nos	4	4	4	4	4	4	4
	Full Capacity	Nos	2	2	2	2	2	2	2
<b>A.3</b>	<b>OTHER MECHANICAL ITEMS</b>								
A.3.5	MECHANICAL COARSE SCREEN								
	Bar Spacing	mm	20	20	20	20	20	20	20
	Dimensions		As per required channel width	As per required channel width	As per required channel width	As per required channel width	As per required channel width	As per required channel width	As per required channel width
	Capacity (Peak Flow Rate)	m3/hr	751.5	1125	1595.25	1219.5	657	1032.75	1593

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	MOC		SS 304	SS 304	SS 304	SS 304	SS 304	SS 304	SS 304
	Qty	No	1	1	1	1	1	1	1
A.3.6	MANUAL COARSE SCREEN								
	Bar Spacing	mm	20	20	20	20	20	20	20
	Dimensions		As per required channel width	As per required channel width	As per required channel width	As per required channel width	As per required channel width	As per required channel width	As per required channel width
	Capacity								
	MOC		SS 304	SS 304	SS 304	SS 304	SS 304	SS 304	SS 304
	Qty	No	1	1	1	1	1	1	1

**Item No 2:- Providing and filling in site MBBR media**

Supply of MBBR Media size 16mm x 12mm pp material having density less than 1. Per meter cube rate include supply, transportation, loading, unloading & filling in MBBR tanks.

**Item No 3:- Providing & erecting in position Tube settler material**

Supply of Tube settler square tube media MOC - PP Media Height 520 mm, Area per square meter supply, transportation Loading, unloading and installation in tube settler tank.

**Item No 4 :- Sludge handling & transportation from STP to dumping ground up to 10 Km as per stander practices and directives of Engineer In Charge.**

**Item No 5 :- Design, supply, installation, testing, commissioning, operation and maintenance of a complete bio-augmentation system**

**A.PREAMBLE AND OBJECTIVE**

The Corporation has observed challenges in the conventional operation of STPs due to fluctuating influent loads, high concentration of surfactants (detergents) from households, and "shock loads" of disinfectants (QACs). These factors inhibit the formation of healthy biofilm on MBBR media and lead to high energy consumption, excess sludge generation, and odor nuisance in residential zones.

The objective of this Scope of Work is to implement a "Source-Dosing Efficiency Model". The Contractor is required to dose high-performance microbial/enzymatic accelerators at the Raw Sewage Pumping Stations (RSS) upstream of the STPs. This method utilizes the sewer network (rising mains) as a pre-digestion reactor to hydrolyze waste before it reaches the STP, thereby optimizing the entire treatment chain.

**B. SCOPE OF WORK**

The scope under this item includes the "Supply, Dosing, and Monitoring of Microbial/Enzymatic Bio-formulations" for the designated capacity (e.g., 100 MLD) on a daily basis.

## **Key Scope Components:**

Survey & Strategy: Identification of upstream Pumping Stations (RSS/IPS) linked to each Zone STP for strategic dosing points.

Infrastructure Setup: Supply and installation of automated dosing units (dosing pumps with timer/PLC control) at the designated Pumping Stations.

Supply of Formulation: Continuous supply of non-pathogenic, facultative & Non Facultative microbial consortia and enzymatic bioformulation capable of functioning in both anaerobic (sewer lines) and aerobic (STP) conditions.

Dosing Operations: Daily dosing of the formulation at the designated rates to ensure consistent "In-Pipe" treatment.

Monitoring: Monthly reporting on key efficiency parameters (Sludge reduction, Odor reduction, and Aeration efficiency).

## **C. TECHNICAL SPECIFICATIONS OF BIO-FORMULATION**

To ensure the survival of biomass against detergents and disinfectants, the proposed bio-formulation must meet the following technical criteria:

Nature: The formulation must be a consortium of natural, non-genetically modified (non-GMO) bacteria and enzymes.

**Surfactant Degradation:** The formulation must possess high Lipase and Esterase enzymatic activity to break down detergents and fats/oils/grease (FOG) which cause frothing and inhibit MBBR media efficiency or SBR Process.

**Mode of Action:** It must be Facultative, capable of initiating hydrolysis in the anaerobic conditions of the rising main (sewer pipe) and continuing oxidation in the aerobic STP tanks.

### **Microbial Nature & Physiology**

- The product shall contain a **multi-strain, non-pathogenic, naturally occurring microbial consortium**.
- Microorganisms shall be:
  - **Facultative (Anaerobic + Aerobic active)**
  - Capable of functioning in **anaerobic, anoxic, and aerobic environments**
- No genetically modified organisms (GMOs) shall be used.

### **Functional Capability (Mandatory)**

The bioremediation formulation shall demonstrate the following capabilities:

- **Hydrolysis of complex organic matter** (proteins, fats, cellulose, polysaccharides) in anaerobic sewer conditions
- **Conversion of high-molecular-weight organics to biodegradable fractions**
- **Biological oxidation of organics** under aerobic STP conditions
- **Reduction of H<sub>2</sub>S generation**, odour, and septicity in sewer networks
- **Breakdown of detergents**
- **Improvement in influent quality** to the STP

### **Pollution Reduction Performance (Indicative Benchmarks)**

The bioremediation system shall be capable of achieving:

<b>Parameter</b>	<b>Expected Reduction</b>
BOD	≥ 60–90% (with STP integration)
COD	≥ 50–80%
FOG	≥ 70%
Ammoniacal Nitrogen	≥ 50-80%
Sulphides / H <sub>2</sub> S	≥ 70–90%
Sludge generation	≥ 40–70% reduction

### **Compatibility with STP Processes**

- The formulation shall be compatible with:
  - ASP
  - SBR
  - MBBR
  - UASB (post-treatment)
  - Hybrid biological treatment systems
- It shall **not inhibit nitrifying or denitrifying bacteria**.
- No foaming, bulking, or biomass washout shall occur.

Safety: Must be non-pathogenic, non-toxic, and safe for handling by STP operators.

### **Scope of Work for Operation & Maintenance of Automation, Pumping and Process**

#### **Control Systems**

##### **1. Objective**

The objective of this scope is to ensure **continuous, energy-efficient, hydraulically correct, and process-stable operation** of:

- Raw Sewage Sump (RSS) in STPs,
- Sewage Pumping Stations, and
- Sewage Treatment Plants (STPs) based on MBBR technology,

through **proper operation, monitoring, tuning and maintenance of VFD-driven equipment, field instrumentation, and PLC/SCADA-based closed-loop control systems.** The O&M contractor shall be fully responsible for maintaining the system in a manner that:

- Ensures gravity flow conditions in upstream sewer networks,
- Prevents surcharge, backflow, silting and choking,
- Maintains process stability and treatment efficiency in STPs,
- Minimizes energy consumption and equipment stress,
- Ensures high system availability, particularly during monsoon and peak flow periods.

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## **2. Operation & Maintenance of RSS and Sewage Pumping Stations**

### **2.1 General Responsibility**

The O&M contractor shall:

- Operate and maintain all pumps, VFDs, PLC systems, level sensors, and associated panels,
- Ensure **24x7 functional availability** of the pumping and automation systems,
- Maintain all wet wells / sumps in hydraulically safe operating condition at all times.

### **2.2 Control Philosophy and Performance Requirement**

2.2.1 All pumps shall be operated through **Variable Frequency Drives (VFDs)** in **automatic mode under PLC control.**

2.2.2 The contractor shall ensure that:

- **Radar / non-contact level sensors** are always functional, calibrated, and reliable,
- The **PLC-based closed-loop control system** is always operational.

2.2.3 The contractor shall operate and tune the system during fair season such that:

- The wet well / sump level is maintained **below the incoming sewer invert level,**
- The upstream underground drainage system operates in **free gravity flow condition,**
- Surcharge, backflow, and loss of self-cleansing velocity are prevented.

2.2.4 The contractor shall:

- Maintain and tune:
  - PID loops,
  - Pump sequencing (lead-lag),
  - Peak flow handling logic,
- Ensure smooth speed control of pumps via VFDs and avoid frequent starts/stops.

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## **3. SCADA, Monitoring and Reporting**

3.1 The contractor shall:

- Operate and maintain the complete **PLC-SCADA system** in 24x7 working condition,
- Continuously monitor:
  - RSS levels,
  - Pump and blower operation,
  - VFD health,
  - DO levels,
  - Alarms and interlocks.

3.2 The contractor shall provide:

- Daily, weekly, and monthly reports on:
  - Pumping performance,
  - Energy consumption,
  - DO trends,
  - Alarm and trip history,
  - Any incidents of high level, overflow, or process upset.

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## 5. Maintenance Responsibilities

5.1 The contractor shall be responsible for:

- Preventive, predictive and breakdown maintenance of:
  - VFDs,
  - PLC systems,
  - Sensors,
  - Control panels,
  - Instruments.

5.2 The contractor shall ensure:

- Regular calibration of level sensors and DO sensors,
- Health checks of control loops and automation logic,
- Proper housekeeping of panels, field instruments and cable systems.

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## 6. Performance Accountability

6.1 The O&M contractor shall be **fully accountable** for:

- Maintaining RSS levels at set point,
- Preventing sewer surcharge caused by pumping mismanagement,
- Maintaining stable and efficient biological treatment in MBBR tanks.

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## 7. Outcome and System-Level Intent

This O&M scope is intended to ensure:

- Shift from **reactive complaint-based sewer management** to **proactive system control**,
- Better performance of UGD cleaning operations,
- Reduced choking and surcharge incidents during fair season,
- Lower energy consumption,
- Higher plant reliability and public confidence.

## Autodesk Water Infrastructure Specifications for Digital Twin in Sewerage Systems & Treatment Plants

- A) Autodesk InfoWorks ICM Ultimate
- B)

### Urban Sewer Modeling

The hydraulic modelling software should be single and extensive solution to model Sewerage/Wastewater networks. It should have direct integration with 3D infrastructure base

software (industry standard software e.g. Civil3D) for streamlined data exchange. It should support advanced 2D culvert modeling for more accurate and robust infrastructure simulations. It should offer superior data validation and data flagging capabilities. It should support built in 3D visualization of results. It should support data exchange with 3D visualization of results. It should maintain model data in a centralized multi-user master database (on-premises or cloud) to facilitate workgroup and standalone operation. It should allow for real-time editing of models by simultaneous users, with automated data conflict detection and resolution workflows. It should support linking observed and forecasted data to model objects to aid model calibration, and to support real-time operational decision making. It should allow for cloud database management, and parallel cloud computing, significantly reducing simulation durations. It should support SQL queries and advanced user scripting to streamline model updates and automate workflows. It should support performance integration with the Real-time operational tool with direct integration amongst both. Software should ensure that the teams can work together in a shared space to create unified models that are complete and accurate. The software should ensure non-technical and supervisory stakeholders can access models with a free "Viewer only" tool.

#### B) Autodesk Info360 Insight

Operational Analytics Cloud Based Solution/Software for Sewerage Network and Plant Operations.

The solution must be a cloud-based operational analytics platform designed for Sewerage/Wastewater networks, as well as treatment plants. It should provide digital workspaces with interactive dashboards, enabling real-time process modelling, advanced analytics, and alerting tools to support workflows related to performance, compliance, and operational planning. Minimum core capabilities must include the following:

- **Data Integration:**

- Connect to diverse data sources, including standard databases, telemetry & SCADA systems, and a wide range of sensor types relevant to network and plant optimization.
- Unify utility network and plant data via Amazon Web Services (AWS) cloud infrastructure.

- **Visualization & Mapping:**

- Integration with ESRI for importing and visualizing data, including water/wastewater network maps and plant Piping & Instrumentation Diagrams (P&IDs).

- **Hydraulic Modeling:**

- Support integration with Autodesk Water Infrastructure solutions for hydraulic modelling of Sewerage & Drainage.

- **Real-Time Telemetry & Analytics:**

- Ingest and analyze telemetry data such as actual real time pressure, flow, level, pump activity, etc(from relevant sensors ) transmitted via IoT gateways to the server via mqtt protocol.
- Detect anomalies and abnormal patterns, including leakage and potential bursts.

➤ Network and plant power consumption analysis and energy footprint.

• **Custom Analytic Tools:**

➤ Enable user-configurable detection logic tailored to sewer network behavior, such as calculations of Dry Weather Flows (DWF), Infiltration and Inflow (I&I) due to Wet Weather Flows (WWF), Combined Sewer Overflows (CSO) detection and other sewer related threshold-based alerts e.g., Odour (H<sub>2</sub>S), collapse, etc.

• **Catchment specific Surrogate Machine Learning modelling and forecasting:**

➤ Data-driven models are trained using outputs from hydrodynamic simulations to approximate flows, levels, and overflows at locations of interest, enabling much quicker evaluation of sanitary load patterns and operational scenarios without the time consuming of running full dynamic simulations.

## **D. METHODOLOGY & APPLICATION INSTRUCTIONS**

The bidder must adhere to the "Upstream Dosing Methodology" to ensure retention time for the microbes to act.

Step-by-Step Methodology:

Dosing Point: The bio-accelerator shall be dosed at the suction side or wet well of the Raw Sewage Pumping Station (RSS) and Can also be dozed directly into the STP collection tank for shock dosing.

Retention Time (In-Pipe Treatment): The travel time from the RSS to the STP (via the rising main) shall be utilized as a "Pre-Digestion Phase." The formulation must start breaking down complex organics and surfactants during this transit.

Odor Control: The dosing must effectively suppress the formation of Hydrogen Sulfide (H<sub>2</sub>S) in the sump and rising main to eliminate odors at the source.

STP Inlet: Upon reaching the STP inlet, the sewage should be partially hydrolyzed, reducing the immediate Oxygen Demand on the biological system.

MBBR Augmentation: The formulation must strip the "slippery" surfactant layer from the plastic MBBR media, enabling native bacteria to adhere and form a healthy, brown biofilm.

## **E. CONTRACTOR'S OBLIGATIONS & INCLUSIONS**

The quoted rate (per MLD/Day) shall be fully inclusive of the following. No separate claims for these items will be entertained:

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Cost of Formulation: All costs for the bio-culture/enzymes required for 365 days.

Dosing Equipment: Cost of Dosing Pumps, storage tanks (HDPE), tubing, and sensors required at the RSS.

Manpower: Dedicated personnel for preparing the solution and ensuring dosing at the scattered pumping stations.

Maintenance: Repair and maintenance of the dosing infrastructure.

## **6. PERFORMANCE INDICATORS (KPIs)**

The success of the bio-augmentation program will be measured against the following improved benchmarks:

Odor Reduction: Significant reduction in H<sub>2</sub>S odors at the Pumping Station and the STP Inlet/Grit Chamber.

Froth Control: Visible reduction in white, billowy detergent foam in the Aeration Tanks.

Sludge Reduction: A minimum achievable reduction of 20-30% in wet sludge generation (volume) compared to historical baseline data, due to enhanced cell lysis.

Energy Efficiency: Improvement in Alpha Factor (Oxygen Transfer Efficiency) allowing for potential optimization of blower running hours (subject to DO levels maintained > 2 mg/l).

## **F. PENALTY & COMPLIANCE**

Failure to maintain the dosing schedule as per the logbook at the Pumping Stations will attract a penalty equivalent to 2 times the daily dosing cost.

The Contractor must ensure that the bio-formulation does not contain any banned chemicals or hazardous substances as per norms.

### **1. Legal and Statutory Compliance of Bio accelerator formulation manufacturer:**

- **Company Registration:** The company must be a legally registered entity under relevant laws.
- **Tax Compliance:** Valid Tax Identification Number (TIN), GST registration (or equivalent), and up-to-date tax filings.
- **Must have valid license showing manufacturing of biocultures and bioremediation activities.**
- Must have a technology validation from agency like DRDO.

### **2. Experience and Expertise**

- **Industry Experience:** Minimum of 5 years of proven experience in manufacturing bioculture for wastewater treatment or bioremediation.
- **Project References:** Provide details of at least 3 completed projects involving supply of bioculture for wastewater treatment or bioremediation in drains or similar applications.

### 3. Manufacturing Facility Standards

- **Infrastructure:** The manufacturing facility must have:
  - Dedicated production units for bioculture to prevent cross-contamination.
  - Temperature-controlled storage facilities to maintain product stability.
  - Quality assurance (QA) and quality control (QC) laboratories on site.
- **Capacity:** Minimum production capacity to meet the tender's requirements, with evidence of scalability for large volumes.

### 4. Product Quality and Certification

- **ISO Certification:** ISO 9001 for quality management and ISO 14001 for environmental management.
- **Product Testing:** Test reports from DRDO /CSIR / IIT validating the efficacy of the bioculture in bioremediation. Must have at least certifications / studies from 2 government institutes from the above mentioned institutes.
- **Safety Standards:** Compliance with safety standards for biological agents, such as WHO biosafety standards or equivalent.

### 5. Research and Development (R&D) Capability

- Evidence of in-house R&D facilities or collaboration with recognized research institutions to develop and improve bioculture formulations.

### 6. Client Support and Service

- Ability to provide technical support for application, monitoring, and troubleshooting during the implementation phase.
- Availability of training programs for end-users on bioculture application and maintenance.

### 7. Submission of Documentation

- Company profile and organizational structure.
- Details of manufacturing facility, certifications, and quality control measures.
- Project case studies and client references.
- Technical specifications and efficacy data of the bioculture.

### 8. Other Requirements

- Declaration of no blacklisting by any government or private organization.

- Ability to deliver within the specified time frame and meet project-specific logistic requirements.

## **9. Comprehensive Operation & Maintenance (O&M)**

- Complete Comprehensive operation and maintenance of the bio-augmentation system during the contract period.
- Regular monitoring of STP performance parameters such as BOD, COD, TSS, ammonia and odor levels.
- Optimization of dosing rates based on influent quality, flow variations and plant performance.
- Preventive and breakdown maintenance of dosing pumps, tanks, sensors, panels and accessories.

## **10. Manpower & Training**

- Deployment of qualified technical personnel for operation, monitoring and troubleshooting.
- If the contractor installs any automation system for operation of the STP and SPS at his own cost during the contract period, the contractor shall be permitted to operate the STP and SPS with minimum manpower as per the automated system. However, upon completion/expiry of the contract period, the contractor shall hand over the entire automation system, including all hardware, software, instruments, panels, PLC/SCADA, licenses (if any), drawings, manuals, and passwords, to the Municipal Corporation in good working condition, without any additional cost.
- Training of STP operators and municipal staff on system operation, safety and routine maintenance.

## **11. Safety, Compliance & Documentation**

- Compliance with applicable environmental regulations and safety standards.

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- Submission of operation manuals, maintenance schedules, log sheets and performance reports.
- All works shall be carried out safely without disturbing existing STP operations.

## **12. Guarantee & Performance Responsibility**

- Contractor shall be fully responsible for achieving consistent and stable biological treatment performance.
- Any failure due to improper dosing, equipment malfunction or microbial inefficiency shall be rectified at no additional cost.

All works shall be carried out as directed by the Engineer-in-Charge.

## **OPERATION AND OMPREHENSIVE MAINTENANCE OF UNDERGROUND DRAINAGE SYSTEM IN MIRA - BHYANDER MUNICIPAL CORPORATION AREA**

PREAMBLE - Mira-Bhayandar Municipal Corporation is having Under Ground Sewerage Scheme of 115 MLD for which MBMC laid total 96 kM main RCC Sewer line and approx. 100 km propertySewer Line dia is from 150 mm dia to 1200 mm which laid 2.0 Mtr to 9.0 Mtr below the ground level.

SCOPE OF WORK - This includes cleaning of total laid Under Ground Sewer Lines. Removal of Heavy Choke Up in Sewer pipe lines and make it clear by removing, any deposited material like Boulders, Stones, Sand, Gravel, Soft Murum, Gunny bags, Plastic Bags, Plastic, Derbis, Cloths, WBM, Asfalt anything whatever it may be in the sewer pipe line is to be removed to get Sewer Pipe line clean without any obstructions by using Pneumatic Gate, Sewerage Mud Pumps etc by taking all the Safety precautions of Labours by using all safety measures like Oxygen Mask, Gas Detector, Gas Monitor, Breathing Appratus, On Line Breathing Appratus, etc to get Sewer Pipe Line in 100% Clean as per detailed Specifications & as per instructions of Engineer-In-Charge.

Contractor needs to remove all the foreign material and make sewer line clean 100% so as to easy flow of sewer. The required machinery, Manpower, Experts opinion, Sewer Line Water proof Camera, Robotic cutter, High Strength Suction & Jetting Machine or any other machines required is to be make available by the contractor, without any extra cost. As this includes in the tender cost. No any extra payment in any case will be entertained by MBMC, which may pl be noted.

Disposal of Excavated stuff / Sludge will be on contractors part, All the required permissions & Royalty will be the Contractors responsibility. No any extra payment will be made an any of case other than the contract value. Pl note.

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Tenderer advised to visit the site of the works and its surrounding. Inspect & Investigate the site & Sewer line conditions. It is Contractors responsibility gather all the required information such as Soil condition, Sewer line conditions, availability of labour, basic materials, water, etc available at site. For De-Watering of sewer lines necessary pumps with DG Set need to be arrange by the contractor.

Tender should be submitted by considering all the facts & figures on site. No extra payment will be made against any of the reason.

- ✓ Price variation clause is deleted. No extra payment will be made for this.
- ✓ All permissions from various departments if required, is in contractors scope. No any extra payment will be made against any permission.
- ✓ MBMC adopted Prohibition of Manual Scavenger Act 2013. Hence no Manual Scavenger should enter on Sewerage Manhole.
- ✓ All the Safety precautions will have to be taken by the Contractor. In case of any Mishap or Accident on the site CONTRACTOR will be full responsible for the incidence. All relevant Govt Rules & Regulations will be applicable in such cases. Compensation if any will have to be paid by Contractor only.
- ✓ In case of any Mishap or Accident on the site CONTRACTOR will be full responsible for the incidence. All relevant Govt Rules & Regulations will be applicable in such cases. Compensation if any will have to be paid by Contractor only.

### ITEMWISE TECHNICAL SPECIFICATIONS

**ITEM No 1 :- TWO DEPARTMENTAL VEHICLE MOUNTED RECYCLER MACHINE** - roviding services for Operation and comprehensive maintenance of Departmental Vehicle Mounted Suction cum Jetting Machine with recycling Facility fitted on 28 Tonne chasis for the cleaning/deslting of sewer lines with manpower, fuel, oil ,repair and maintenace etc for trouble free operation as per requirement and detailed specifications as directed by Engineer-In-Charge.

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**ITEM No 2 :- THREE DEPARTMENTAL VEHICLE MOUNTED GRAB BUCKET-** Providing services for Operation and comprehensive maintenance of Departmental Vehicle Mounted Grab Bucket specially designed to quickly and safely cleanout the silt and other waste matter from manhole and any other chamber located at depth up to 10 mtrs on hire basis without necessitating man entry with required adequate manpower, fuel, oil, repair maintainance etc for trouble free operation for Underground Drainage department as per requirement and detailed specifications as directed by Engineer-In-Charge.

**ITEM No 3 :- TWO DEPARTMENTAL RODDING MACHINE-** Providing services for Operation and comprehensive maintenance of Departmental Rodding Machine with required trained staff for removal of Chock up from Under Ground Sewer Pipe Lines by taking all safety precautions with required fuel & liubricants etc complete as per requirement and detailed specifications as directed by Engineer-In-Charge

**ITEM No 4 :- DEPARTMENTAL SUPER SUCKER WITH JETTING MACHINE** - Operating & Maintenance of Departmental Super Sucker Machine with High Pressure Jetting Machine with required trained staff for removal of Chock up from Under Ground Sewer Pipe Lines by taking all safety precautions with required fuel & liubricants etc complete as per detailed specifications & as directed by Engineer-In-Charge

All the repairs with required spare parts, repairing charges of Vehicle, Super Sucker Machine as well Jetting machine etc complete is on Contractor's part. To maintain properly the vehicle with Super Sucker & Jetting Machine is Contractor's responsibility. MBMC Engineer can check it at any time, at that time it should be in running as well good condition. After end of contract it should be handed over to MBMC in working condition.

The required running charges including Diesel, Lubricants, timely servicing is to be done by contractor time to time. If any damage found will be on Contractor's part.

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**ITEM No. 5 :- DE-SILTING OF SEWER PIPE LINE** - De-silting the Supply Well, Intake Well / Head Works, Sump of water supply /sewerage works etc. in wet or dry condition in wet or dry condition including lifts upto 9 M and lead upto 150 M as required beyond the work site, stacking, spreading, including necessary guarding, etc complete as per detailed specifications & as directed by Engineer-In-Charge

De-Silting in Sewer pipe lines and make it clear by removing any deposited material like Boulders, Stones, Sand, Gravel, Soft Murum, Gunny bags, Plastic Bags, Plastic, Derbis, Cloths, WBM, Asfalt anything whatever it may be in the sewer pipe line is to be removed to get Sewer Pipe line clean without any obstructions by using Pneumatic Gate, Sewerage Mud Pumps etc by taking all the Safety precautions of Labours by using all safety measures like Oxygen Mask, Gas Detector, Gas Monitor, Breathing Appratus, On Line Breathing Appratus, etc to get Sewer Pipe Line in 100% Clean as per detailed Specifications & as per instructions of Engineer-In-Charge.

**ITEM No. 6 :- TRANSPORTATION OF SILT** - Transportation charges including loading & unloading of soil of all types ,sand ,gravel and soft murum hard murum, boulders, Slushy soil, rock, solid waste etc complete for a lead for 5 km outside the work site at given dump yard as directed by the Engineer in charge.

The tenderer shall dispose all the surplus excavated stuff within a distance specified. The disposal shall include collecting and filling the material into truck/cart/tractor, etc. conveying it to the desired disposal site, unloading, leveling the disposed material, etc. complete. This item included detecting the site by the contractor itself for disposal of Excavated Stuff / Sludge & disposal thereof. This also includes payment of Royalty to the concern department, by the Contractor. If any dispute arises regarding disposal site & Royalty, then no payment will be admissible to the contractor on this account and the owner reserves the right to recover the cost of the material from the contractor at the prevailing market rate or supply of murum.

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If above work is not carried out as per above specifications then a penalty as per the rate mentioned in Schedule B will be imposed

**ITEM No 7 :- CONSTRUCTION of MANHOLES & RAISING OF HEIGHT**

- a) Providing Constructing on sewer BB masonry Circular manhole concentric cone 1.2 M Dia at Bottom and 0.5 M Dia. At top and up to depth of 2.0 M...
- b) Providing Constructing on sewer BB masonry Circular manhole concentric cone 1.5 M Dia at Bottom and 0.5 M Dia. At top and up to depth of 5.0 M...
- c) Providing Constructing on sewer BB masonry Circular manhole concentric cone 1.8 M Dia at Bottom and 0.5 M Dia. At top and up to depth of 9.0 M...

This item includes construction of BB machinery circular manhole concentric cone 1.5 mtr as per standard specification

If above work is not carried out as per above specifications then a penalty as per the rate mentioned in Schedule B will be imposed

**ITEM NO . 7 A – Manhole 1.2 mtr.**

Providing and constructing on sewer.BB masonry circular manhole with concentric cone 1.2 m dia at bottom and 0.5 m dia at top and upto a depth of 2.0 M with 23 cm brickwork, in CM 1:4 proportion with 20 mm thick smooth plaster on both side in CM 1:2 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.

**ITEM NO. 7 B - Manhole 1.5 mtr**

Providing and constructing on sewer.BB masonry circular manhole with concentric cone 1.5 m dia at bottom and 0.5 m dia at top and upto a depth of 5.0 M with 23 cm brickwork, upto depth of 2 m from top & 35 cm thick brickwork for balance depth in CM 1:4 proportion with 20 mm thick smooth plaster on both side in CM 1:2 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.

**ITEM NO. 7 C - Manhole 1.8 mtr**

Providing and constructing on sewer.BB masonry circular manhole with concentric cone 1.8 m dia at bottom and 0.5 m dia at top and upto a depth of 9.0 M with 23 cm brickwork, upto depth of 2 m from top & 35 cm thick brickwork for balance depth in CM 1:4 proportion with 20 mm thick smooth plaster on both side in CM 1:2 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.

**ITEM NO 8:-PROVIDING HEAVY DUTY RCC MAN HOLE COVERS**

Rectangular size 900mm x 600mm x 100mm thick/Circular size 500mm inner Dia and 750 mm outer dia and 100mm thick as per standard specification.

If above work is not carried out as per above specifications then a penalty as per the rate mentioned in Schedule B will be imposed

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## **ITEM No. 9 :- REMOVING CHOKE UP BY CONVENTIONAL METHOD**

9.A - Pipe Dia 200 mm. to 400 mm and depth up to 4.00 Mtr

9.B - Pipe Dia 500 mm. to 700 mm and depth up to 6.00 Mtr

9.C - Pipe Dia 800 mm. to 1000 mm and depth up to 9.00 Mtr

## **EXCAVATION IN ALL TYPE OF STRATA/MATERIALS**

### **GENERAL**

The specifications contained in the standard specification volume IIInd published by Public Works. Government of Maharashtra Chapter Bd.A Item No. 1 to 9. Shall apply in addition to above following specification shall apply . In case of any discrepancy between the two the below given specification shall govern.

### **SITE CLEARANCE**

The area to be excavated shall be cleared off all trees and bushes and rubbish and other objectionable materials removed and shall be burnt or disposed off as directed by the Engineer-in-charge. The cost of such clearing shall be deemed to have been included in the rate accepted for different items under excavation.

### **DEWATERING**

No distinction shall be made as to whether the materials being excavated is dry moist or wet. The item also includes bailing out of water by manually or by pumps to keep the trenches reasonable dry for all further works of lowering laying jointing and testing of the pipe line till the completion of the work.

### **SHORING AND STRUTTING**

The items include all shoring and strutting that may be required. On no account the width of trenches more than these mentioned here-in-after (pipe diameter + 0.6 meter) shall be

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measured if excavation width more than the specified is required for the purpose of keeping machinery, stepping due to loose material or for any other reasons the same be at the contractor's cost.

### **LIGHTING, BARRICADING AND GUARDING**

The items of excavation are including necessary lighting at night at suitable intervals but not more than 15 Meter along the excavated trenches and at all crossing and barricading the same by fencing so as to avoid any accident Chowkidars shall be employed at place where the trenches cross over any traffic road to caution the vehicles and pedestrians etc. the arrangements shall be maintained till completion of work and at the cost of contractor.

### **ALIGNMENT AND LEVELS**

Before the trenches excavation is commenced sight rails shall be erected at every 30 meters and at all points of change of direction gradient and at ends. The excavation works shall be proceeded by a detailed survey along the alignment of the main to obtain ground levels at every 30 meters or less distance. Temporary bench mark shall be constructed at every 30 meters distance along the alignment and shall be maintained till the completion of work. all labour and materials required for the survey work of fixing bench mark etc shall be provided by the contractor at his own cost for any mistakes in survey the contractor is fully responsible. He should not lay the pipes unless the alignment is thoroughly checked by the Engineer-in-Charge or his authorized representatives who is empowered to sign the work order book in token of checking the exact grade and level of the trench excavation.

Excavation at random places shall be measured and arrangements made available to the MBMC Engineer for checking. Any non technical parches during the excavation of the contracted work shall be viewed very sinuously by the MBMC and a note to that effect will be recorded against the contractor in his name.

### **DEPTH AND GRADES OF TREACHES**

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The trenches shall be excavated to the required grades and depths and on the lines as shown on approved drawings as directed by the Engineer-in-Charge. The depth of excavation and the levels of the pipe inverts shall be checked by means of boning rods of suitable lengths. Additional depths if required to be excavated for pipes for sockets collars specials joints and for any other working facility and shall not be measured and paid.

The contractor shall notify the Engineer when the trenches are ready for bedding so that the Engineer can inspect and record the depths only on explicit approval by Engineer the bedding shall be provided by the contractor.

Rates consider in this items of excavation for all lifts.

### **WIDTH OF TRENCHES**

The maximum width at top and bottom of the trenches admissible for payment shall be outer diameter of M.S. pipe at barrel + 600 mm thickness of outer coating in mm thus the maximum permissible widths or excavated width whichever is less shall be recorded and paid for. Extra widths for pits at sockets collars specials joints construction and also for working liabilities shall neither be measured nor aid for. However excavation required for providing and casting fixity block thrust blocks encasing etc will be measured and paid for under relevant item of excavation.

### **PRESSING AND CONSOLIDATING OF THE TRENCHES**

The bed of the trenches shall be well rammed before laying of the murum or sand for bedding. Hollows if any shall be filled with murum duly rammed and watered to required level and grade at cost of the contractor.

### **MODE OF MEASUREMENT AND PAYMENT**

The excavation shall be measured in Cubic Meters only Dimensions shall be measured correct to two decimal of Meter and quantity shall be calculated to two places of Decimal of Cubic Meters.

If above work is not carried out as per above specifications then a penalty as per the rate mentioned in Schedule B will be imposed

## **TIMBER SHORING**

The Timber Shoring shall be as per 3764-1966 safety code for excavation work.

a. Close timbering shall be done by completely covering the sides of the trenches and pits generally with short, upright members called 'polling boards'. The boards shall generally be placed in position vertically side by side without any gap on each side of the Excavation and shall be secured by horizontal walings of strong wood at maximum 1.2 m spacing and suitably strutted. If the soil is very soft and loose, the boards shall be placed horizontally against each side of the excavation and supported by vertical wallings, which in turn shall be suitably strutted. The lowest boards supporting the sides shall be taken into the ground and no portion of the vertical side of the trench or pit shall remain exposed, so as to render the earth liable to slip out.

b. The shoring material shall not be sizes less than those specified below unless steel sheet piling is used or unless otherwise

- Planks – 5 cm x 25
- Waling – 10 cm x 20
- Struts – 15 cm x 20

approved by the Engineer-in-Charge in writing:

- a) Timber shoring shall be 'close' or 'open' type, depending on the nature of soil and the depth of pit or trench. The type of timbering shall be as approved by Engineer-in-Charge. It shall be the responsibility of the Contractor to take all necessary steps to prevent the sides of excavations, trenches, pits, etc., from collapsing.
- b) Timber shoring may be required to keep the sides of excavations vertical to ensure safety of adjoining structures or to limit the slope of excavations, or due to space restrictions or for other reasons. Such shoring shall be carried out, except in an emergency, only under instructions from the Engineer-in-Charge.

- c) The withdrawal of the timber shall be done very carefully to prevent the collapse of the pit or trench. It shall be started at one end and proceeded systematically to the other end. Concrete or masonry shall not be damaged during the removal of the timber. No claim shall be entertained for any timber, which cannot be retrieved.
- d) In the case of open timbering, the entire surface of the side of trench or pit is not required to be covered. The vertical boards of minimum 25 cmX 5 cm sections shall be spaced sufficiently apart to leave unsupported strips of maximum 50 cm average width. The detailed arrangement, sizes of the timber and the spacing shall be subject to the approval of the Engineer-in-Charge. In all other respects, the specification for close timbering shall apply to open timbering.
- e) In case of large pits and open excavations, where shoring is required for securing safety of adjoining structures or for any other reasons and where the planking across sides of excavations/pits cannot be strutted against, suitable inclined struts supported on the excavated bed shall be provided. Load from such struts shall be suitably distributed on the bed to ensure no yielding of the strut.

### **M.S. PLATE SHORING**

Providing and fixing M.S plate shoring in trench consisting of 12mm thick M.S sheet, 1.5m wide MS channel 150x75mm, at 1.5m center to centre including removal after laying sewer as per Engineer-in-charge.

MS SHORINGS – Single Slide & Double Slide MS shoring should be make available on site, due to Marshy & Watery land. Design of MS Shoring should be as per SBH Shoring & it should got approved from MBMC. The procurement of MS Shoring should be done as per Approved Design only. Irrespective of Soil Conditions, contractor to provide appropriate Shoring Material suits to site condition as well work progress. MS Shoring should be suitable for safe excavation & work progress.

If procured MS Shoring is not proper & if not helpful in work progress, A penalty of Rs Rs. 25,000/- Per Day will be imposed.

If MS Shoring not procured within 2 months from the date of work order a penalty of Rs 10,000/- per day will be imposed.

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A Declaration regarding the availability of required MS Shoring should be submitted while submitting the tender.

1.1.1. SINGLE SLIDE MS SHORINGS– 2 SETs

(DESIGN SHOULD BE AS PER SBH SHORING ONLY)

- ✓ Plates 3.5M x 2.4M x 10 nos x 2 set = 20 nos.
- ✓ Plates 3.5M x 1.4M x 10 nos x 2 set = 20 nos.
- ✓ Rails-12 no, x 2 set = 24 nos.
- ✓ Rolling struts-12 no, x 2 set = 24 nos.
- ✓ Distance piece 0.5 mtr – 10 no, x 2 set = 20 nos.
- ✓ Distance piece-1.0 mtr-10 no, x 2 set = 20 nos.
- ✓ 4 leg chain – 2 no x 2 set = 4 nos.

1.1.2. DOUBLE SLIDE MS SHORING – 2 SETs

(DESIGN SHOULD BE AS PER SBH SHORING ONLY)

- ✓ Plates 3.5M x 2.4 M 20 nos x 2 set = 40 nos.
- ✓ Rails-12 no, x 2 set = 24 nos.
- ✓ Rolling struts-12 no, x 2 set = 24 nos.
- ✓ Distance piece 0.5 mtr – 10 no, x 2 set = 20 nos.
- ✓ Distance piece-1.0 mtr-10 no, x 2 set = 20 nos.
- ✓ 4 leg chain – 2 no x 1 set = 2 nos.

## **DEWATERING**

The dewatering items shall be measured and paid for extra only when separate provision for dewatering is made in the tender by an item. In all other cases the rate of the items requiring dewatering viz. excavation, foundation concrete, RCC of masonry shall be

deemed to be inclusive of provision of dewatering and no separate claim shall be entertained.

The specification hereunder shall cover diversion of streams, providing coffer dam, bund etc. as necessary for carrying out work and bailing out and pumping work as per requirement of the work.

The foundation trenches shall be kept dry by resort to pumping alone or pumping in combination with diversion, channels, cofferdams, bunds, diversion, weirs, drainage channels or other method suitable for the local condition, at the cost of the contractor. The responsibility of adequacy of dewatering arrangements quality and safety of work rests solely with the contractor.

Though the method to be adopted is the choice of the contractor, the scheduled programmed shall have to be strictly adhered to.

The contractor shall plan, construct and maintain necessary diversion and protective works, so as to keep the work safe at all stages.

Cement grouting or other approved method shall be used by contractor at his choice to reduce seepage for which no extra payment shall be made.

Adequate pumping arrangement shall be made for dewatering the foundation/ pipe trenches and other construction areas so as to keep them dry during the progress of work of excavation or concrete etc. The concrete work shall be kept dry for a period sufficient for enough setting of the work. The dewatering arrangement shall be enough and such as to preclude the possibility of movement of water to fresh concrete there by impairing the quality. The contractor shall make his own arrangement for labour. Material and equipment for pumps/engines and other machinery and services required for execution of the item.

The pumping shall be done in such a way as not to cause damage to adjoining property by blows or subsidence etc.

If pits are filled due to floods or blows or slips during progress of work or during rainy season or due to any other cause, the pumping required for dewatering pits and for desalting shall be done without making extra claims.

Shoring, strutting sumps and other protective works required for facility of dewatering shall be designed as provided by the contractor to ensure full safety of work, work men, machinery and property. The contractor shall be responsible for any damage and injury caused by execution of this item.

The works constructed such as sumps for facility of diversion and dewatering shall be removed after they have served their purpose. In the manner and to the extent directed by the Engineer. The stream shall be brought to the original position by filling any excavation done and/or removing deposited material in the bed. After the construction work is over.

The water being dewatered shall be disposed off in manner in conformity with the rules in force and as approved by the Engineer.

Water may be led to nearest natural drain and pond through properly laid and dug channels or pipes. The disposal shall be such as not to cause any inconvenience or nuisance to inhabitants of the area and also not cause damage to structure.

**PROVIDING DRY TRAP/ GRANITE / QUARTZITE/ GNEISS/ RUBBLE STONE SOLING THICK INCLUDING HAND PACKING AND COMPACTING ETC. COMPLETE.**

GENERAL

After excavating the trenches prior to providing bedding for pipe line or placing concrete for chairs thrust blocks pillar encasing etc. rubble soling is to be provided of required

thickness where loose starts. Marshy land will be met or as directed by the Engineer-in-charge.

#### MATERIALS

The stones to be used shall be broken rubble with fairly regular shape and free from weathered soft and decayed portion. The rubble shall be of sound stones of the type mentioned in the item and selected for their required size. Stones shall be of the full height of the soling and the length and width shall not generally exceed two times the height. The stones to be used for wedging in the joints between larger stones shall be chips of the lesser size possible to fit in the interstices. All sound and suitable rubble obtained from the foundation excavation and approved by the Engineer shall be necessarily made use of first unless otherwise directed.

#### CONSTRUCTION

The bed on which rubble filling is to be laid shall be cleared of all loose materials leveled watered and compacted and got approved by the Engineer before laying rubble soling.

Rubble soling shall be laid to the specified thickness closely packed by hand and firmly set with their broad cast face downwards. The interstices between adjacent stones shall be wedged in with stones of the proper size and shape and well driven in with wooden pallets to ensure tightly packed layer. Such wedging shall closely follow the placing of the larger stones. After hand packing and wedging compaction of the soling shall be done thoroughly with logrammers. Adequate care shall be taken by the contractor while laying and compacting the rubble soling to see that the masonry or any part of the structure is not damaged.

#### ITEM TO INCLUDE

Supplying broken rubble of approved quality and size at site. All labour material tools and equipment for handling laying hand packing and compacting the rubble.

Any other incidental charges to complete the work as per requirements.

## MODE OF MEASUREMENT AND PAYMENT

Rubble soling shall be measured in cubic meters limiting the dimensions to those shown on the drawings or as directed by the Engineer. The dimensions shall be measured correct to 2 places of decimal of a meter and quantities worked out correct to 2 places of decimals of a cubic meters No deductions shall be made for voids.

The contract rate shall be for a Unit of One Cubic Meter.

If suitable rubble is available from excavated is shall be issued to the contractor at the rate mentioned in Schedule 'A' and if there is no such provision the rate to be charged shall be that occurring in the Divisional Schedule or at a mutually agreed rate if there is no such rate in the Divisional Schedule/ Such rubble shall be used first and only additional rubble required shall be brought from outside unless otherwise directed.

If above work is not carried out as per above specifications then a penalty as per the rate mentioned in Schedule B will be imposed

## **LOWERING AND LAYING OF ISI STANDARD RCC PIPES**

lowering and laying of ISI standard RCC pipes NP-IV Classin standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges,transport to stores- sites, unloading and stacking etc complete as directed by the Engineer in charge.one rubber ring should be supplied with each full length socketed pipe, cost including in rates below

1. Contractor shall convey the pipes upto work site for use after checking and testing for soundness of the pipes and shall be held responsible for replacement of such materials of cracked or damaged materials are in advertantly fixed and jointed.
2. During laying the pipe line some time it may be necessary to cut the pipe to suit the site condition or to put in some special or valve or to have exact length of the section etc. The contractor at his cost shall do this cutting only. No claims for extra amount due to any

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particular type or individual length of cut pipes and specials being supplied or joints having been increased due to small lengths shall be entertained.

3. The payment for this item shall be admissible on the basis of actually laid at site including length occupied by all types of specials and incidental small pipe pieces or other types.
4. All the pipes and specials and valves to be taken into use shall be cleaned and brushed clear of rust and paint at both the spigot and socket ends.
5. Before the pipes and specials are lowered and laid in trenches, the contractor shall see that bedding is plane or the surface is brought to uniform grade and leveled with the help of cross sight rails and boning staff and approved in advance by the last 3 days by the Sub-Divisional Engineer.
6. The contractor shall provide and maintain cross sight rails and boning staff whenever required until the time of completion without any extra claim for cost, etc. and which shall be considered inclusive of the rates for excavation and lowering and laying.
7. The contractor shall provide temporary benchmarks if called upon at a minimum distance every 150 M without any claim for extra cost. These benchmarks shall be either of stone masonry or mass concrete not less than 0.03 Cum.
8. The contractor shall provide ladder for inspection of works at least 2 Nos at the time of inspection for all the trenches of depth greater than 1.2 M.
9. The pipes, specials and valves shall be lowered by means of ropes, reekels or pulley as ordered evenly and uniformly and shall be brought level with well consolidated hard masonry or wooden sleeper as ordered.
10. All the S & S pipes and specials shall be laid with sockets facing direction of flow, as per manual.
11. Materials to be used for jointing such as spun yarn, etc. shall be first get approved in advance from the Sub-Divisional Engineer.
12. No jointing operations shall be started unless the Sub-Divisional Engineer approves the grade and levels.
13. The pipes shall be laid in a complete straight line with center line ranged accurately by means of string stretched between marked centers in cross sight rails and no deviation will

be permissible without the permission of the Sub-Divisional Engineer. For deviation proposed by the Department from marks on sight rails. The contractor shall postpone the work of jointing without claiming extra cost. The spigot end of the pipe or special shall be inserted in socket and of the other pipe or special and shall touch squarely without any gap.

14. Under no circumstances, the C.I. and D.I. pipes and other water mains will be laid in black cotton soil or rock surface without murum cushioning.
15. The above murum cushioning of a depth of 150 mm thick or as specified shall always be provided in all formation within the rate of laying pipe line unless an item for murum bedding is provided for separately in the tender.
16. The murum bedding shall be of the full width of the trench. Murum bedding will be necessary in rock formation boulder formation and soft soils and black cotton soil but not in murum formation itself.
17. No brick bats or hard metal bigger than 20 mm gauge shall be allowed beneath the pipe line directly in touch with the pipe as in the murum bedding.
18. All sockets such as electric wires, water and sewer mains, manhole, natural drainage, culverts, storm water drains, gutters, poles, etc. coming in the way shall carefully be looked after and any damage be prevented to the same. Any work of removing, repairing and reducing such structures or obstacles in the process of laying, jointing and testing pipe line etc. should be carried out by the contractor wherever directed, without any claims for extra to the satisfaction of the Engineer in-charge. Contractor shall foresee all such situation and make necessary arrangement to overcome those in advance.
19. Wastage and breakage in pipes shall not be allowed. The total length of pipes provided shall tally with summation of pipes laid, returned to stores. The cost of pipes cracked due to fault of contractor beyond the above permissible limit shall be recovered from him at penal rate as prevailing market rate plus 20%. All wasted, broken pipe pieces having length less than 2 M shall be returned to store. The contractor shall keep an up to date account of pipes, specials and valves, etc. issued him free of cost/supplied by him, showing quantity received vide unstamped receipt No. and date, quantity used giving chainages as and

balance at hand and returned failing which the Engineer-in-charge shall reserve the right to keep bills pending till this account is finalized and contractor shall not claim any compensation in that case for delay in settlement of bills.

20. Pipes shall be laid in reasonably dry trenches. Under no circumstances, pipes shall be laid in slushy, marshy or water logged and filled up or yielding strata before getting it inspected from Engineer-in-charge and providing proper foundations.
21. Contractor shall make his own arrangements for obtaining permission for stacking of pipes, etc. on the road from the Land Owners, whether it is belonging to any other Government Department or Municipal or Local Bodies or Private Land Owners.
- 22.** For crossing obstacles natural or built up such as culverts, drains, gutters, cables, pipe line, poles, etc., contractor shall approach respective authorities to obtain permission for crossing them immediately at the time limit of acceptance of the tender and shall take into consideration all such difficulties for the time limit allowed for execution and completion of the work. Any such work left remaining to be carried out due to want of the tender without any claim for extra cost or compensation due to non receipt of permission or any other natural or unforced and until the date of completion of (the work shall be treated as incomplete). Contractor shall also not claim compensation, if work is delays on account of permission for road crossing, etc. not being received in time.
23. Before the work of laying pipe line is started, the contractor shall see that pipes are stacked length wise above the trench between road fencing in sufficient number and without causing any obstruction to the traffic. Necessary road diversion as directed shall be provided without any extra claims by the contractor for excavation the roads till completion of work, so that the traffic shall not be hampered. Necessary guide stones duly painted with white wash shall be provided on both sides of temporary diversions. Necessary sign boards, including diversions and road closed etc. shall be provided at prominent places along with red flags and red letters at night time and maintained till the crossing work is over and road opened for traffic. The diversion shall be removed after road surfaces are brought to original condition. Necessary storing planks for crossing the trenches shall be provided on the open trenches in the towns and wherever required without extra cost.

24. The contractor shall take utmost care in laying the pipe line along with roads and in towns in order to avoid accidents to human life and animal.

### **JOINTING OF PIPES**

All the jointing work shall be carried out by the contractor after giving written due intimation in advance at least for 4 days before jointing operation starts and laid pipes are approved for grade and cleaned of all inside waste material such as mud, etc. and in presence of responsible MBMC Servant, not below the rank of Junior Engineer.

Unless otherwise mentioned in the wording of the item in Schedule 'B' of the Tender, all labour and materials required for jointing (depending upon the type of joint mentioned in Item) such as lead, spun yarn, grease, oil, S.B.R. quality rubber rings and gaskets, cement, sand, water, fire wood, nut-bolts, washers, rubber packing, RCC collars, etc. shall be produced and used by the contractor at his cost. All the materials to be used for jointing should be first got approved from ENGINEER IN CHARGE

No extra claims or compensation will be admitted for items of laying pipes etc. If the pipes are required to be laid up to a depth not greater than 3 times the maximum depth shown in the sanctioned longitudinal sectional drawings or estimate so also no compensation shall be paid if class of pipes to be laid is changed during execution.

If the lines are laid in separate detached sections and not continuous length due to any of the reasons such as non availability of specials or due to obstacles etc. contractor shall see that no end of any pipe length is kept open even temporarily and that all open ends are immediately covered up either by suitable blank flange or cap, plug or by means of a double layer gunny cloth tied properly by means of mild steel wires and without any claim for extra cost or compensation.

The contractor shall take utmost precautions to see that no extraneous matters such as lead, stones, brick bats or animals, such as rats, reptiles are allowed any access in to the pipe line and in case of their existence being detected in the pipe line, the contractor shall remove them by means of rodding etc. to the complete satisfaction of the Engineer in Engineer, without any claim for extra cost.

No extra cost will be allowed to fixing of D.I. specials and other unless provided for separately in the Tender. So also no extra cost will be paid for cutting the pipes and specials as and where required for negotiation of bend or fixing valve, branch tee or achieving exact length of the line etc. The cutting operation shall be carried out preferably by means of standard pipe cutter or hacksaw, unless cutting by chisel and hammer is allowed by the Engineer-in-charge. The end of pipe to be used for gasket joint shall be chamfered and if portion of pipe or specials is damaged rendered use less due to careless cutting of the contractor, the cost of the damaged portion as decided by the Executive Engineer will be recovered from the Contractor.

If necessary, the contractor shall have to carry out the work of laying pipes by keeping gaps here and there, if some pipes, specials and valves to be supplied by him would not be made available in time and the contractor shall not claim any compensation for being required to lay the pipe line in gaps and for excavating gap portion if it gets refilled, etc.

Insertion of gaskets shall be done by proper application of a thin film of lubricant (Vegetable oil only) to the butt seating inside the socket. The gasket shall be wiped clean, fixed and then the socket with the bulb towards the back of the socket. The groove in the socket must be located on the retaining board in the socket and retaining hole of the gasket firmly bedded in the seating. Contractor shall ensure to the satisfaction of the Engineer in Engineer that the gasket fits evenly around the full circumference removing any bluges which would prevent the proper entry of the spigot and for large diameter, the

operation should be assisted by forming a second loop in the gasket opposite to the first and then pressing the loops flat one after the other.

The thin film of lubricant (Vegetable Oil only) shall be applied to the inside surface of gasket which will be in contact with the entering spigot. A thin film of lubricant shall be also applied to the outside surface of the entering spigot for a distance of 25 mm from spigot end. The pipe line to be jointed, should be supported centrally by the tacks used for laying and balance, just clear of the trench bottom. The spigot of the pipe must be aligned and entered carefully into the adjacent socket until it makes contact with the gasket. Final assembly of the joints is completed from this position. At the time of proper jointing by pushing method, there is sound create, means joint is done properly.

The spigot end of the entering pipe shall be compressed until it reaches the bottom of the socket, if the assembly is not completed with reasonable force, the spigot end shall be removed and the position of the gasket examined and then the assembly is refitted properly to the satisfaction of the Engineer in Charge. The work shall generally be carried out as per instructions given in manufacturer's pamphlets. All the tools and tackles required for jointing, such as rack, and layer 3 mm dia, 5 M long wire rope, with thimble, hook and rope adjuster should be procured by the contractor at his own cost. The item includes all other necessary materials, including rings, etc. and labour.

### **HYDRAULIC TESTING**

The pipe line and valves should be tested hydraulically upto the required pressure as per IS: satisfactorily and all the leakages, if any should be repaired at the time of hydraulic testing. The 10% amount of the lowering, laying and jointing of pipe line shall be released after satisfactory hydraulic testing. Contractor Should make his own arrangements at his own cost for water for hydraulic testing of pipe line. He should not rely upon completion of any other sub-works for such testing.

In case of testing of non-pressur conduits the pipe line shall be subject to test for 2.50 meters head to water at the highest point to the section under test for 10 minutes. The

leakage o quantity of water to be supplied to maintain the test pressure during the period of 10 minutes should not exceed 0.20 liter per mm dia to pipes per Km. length per day.

### **MODE OF MEASUREMENT**

The item will be measured and paid on the Running Meter basis. 90% payment will be made after lowering and laying of pipe line and remaining 10% will be released after satisfactory hydraulic test

If above work is not carried out as per above specifications then a penalty as per the rate mentioned in Schedule B will be imposed

### **PROVIDING AND LAYING IN SITU CEMENT CONCRETE IN M15**

Providing and laying in situ Cement concrete in M15 of trap metal for foundation and bedding including , fromwrok, compacting and curing etc complete as per detailed specifications and as directed by Engineer-In-Charge.

- a) The specification contained in the standard specification volume 11 published by Public works and Housing Department Govt. of Maharashtra Chapter Bd.F.1 to F.2 and Bd.E.1 shall apply.
- b) This work shall be done in accordance with IS:456:2000 ( Revised )
- c) Proper curing be done for 21 days.
- d) This work shall be done in accordance with IS:456:2000 (Revised).
- e) Proper curing be done for 2l days.
- f) Reinforcement shall be paid separately under item of schedule B.
- g) The payment is on Cubic meter basis excluding cost of reinforcement.
- h) The measurement shall be measured correct upto two decimal of meter and calculations for volume shall be calculated correct upto two decimal of Cubic meter.

- i) Item of concrete includes Chairs, Thrust Blocks. Anchor Block. Encasement etc. of mass or reinforcement concrete shall be provided at places as mentioned under relevant items of Schedule-B or as directed by the Engineer-in-Charge.

If above work is not carried out as per above specifications then a penalty as per the rate mentioned in Schedule B will be imposed.

### **SAND BOXING**

Providing and filling sand boxing in the pipe line or for foundation trenches with sand of approved quality including watering compaction. Initial lead upto 5 km etc .complete

If above work is not carried out as per above specifications then a penalty as per the rate mentioned in Schedule B will be imposed

### **FILLING IN PLINTH**

Filling in plinth with and floor/trenches with contractor's murum for bedding in 15cm to 20 cm layers including watering and compaction royalty charges etc. complete as directed by the Engineer in charge.

If above work is not carried out as per above specifications then a penalty as per the rate mentioned in Schedule B will be imposed

### **REFILLING TRENCHES**

In no case the contractor shall refill the trenches in hard excavated portion by the boulders from the excavated stuff. This portion of trench shall be refilled by the soft murum of soft strata from excavated stuff from distant place. No extra cost shall be paid.

After the pipelines are laid, jointed and tested, the refilling to trenches with excavated stuff shall be done approximately 20 to 30 cms higher than road or natural ground lever to allow for sinking afterwards. This refilling shall be done in 15 cms thick layers duly

watering. Compacting each layer. The 15 cms thick layer immediately in contact on or under pipe shall have no stones or chips. But only soil or soft murum selected from the excavated stuff after refilling. If it is sunk below the road level after some time till completion of work, the contractor shall have to make it good at his cost.

Before lowering of all pipes in trenches a layer of murum selected from excavated stuff be provided below pipe line for proper grading and to act as suction etc.

Though the contractor is required to do refilling before hydraulic testing to avoid traffic hurdle. no payment for refilling of the trenches of pipe line shall be payable till satisfactory hydraulic testing is given. Re-excavation required. If any, during testing shall be done by the contractor at his cost.

If above work is not carried out as per above specifications then a penalty as per the rate mentioned in Schedule B will be imposed

#### **ITEM No. 10 - ROAD RESTORATION**

The Contractor shall be responsible to ensure that all existing roads are reinstated to their original condition after backfilling and testing has been completed. The road restoration shall be carried out immediately after completion of all the works. The finished levels of the completed reinstatement shall conform to the adjoining carriageway surface. Reinstated road shall match as nearly as practicable to the characteristics of the existing road. Providing, laying & compacting of WBM sub-base / base course including preparation and compaction of sub-base & spreading of crushed aggregate to proper grade and camber including application of screenings for interlocking, sprinkling of water & rolling with power roller as per instructions of the Engineer-in-charge. The agency has to do Tack coat , Bitumen Macadam & seal coat. If required & instructed by MBMC agency has to do BBM grouting also.

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**Mode of Payment:-**

The mode of measurement shall be as per usual practice of Public Works Department of Govt. of Maharashtra. The payment for restoration of road works shall be under the relevant item in the Bill of Quantities.

If above work is not carried out as per above specifications then a penalty as per the rate mentioned in Schedule B will be imposed

**ITEM NO 10.A –**

Supplying trap / granite / quartzite / gneiss / laterite stone metal at the road side for metal including conveying & stacking etc. complete.

a) By Blasting (Hand broken)

i) 80 mm metal

ii) 40 mm metal

**ITEM NO 10.B –**

Supplying crushed metal of trap / granite / quartzite / gneiss stone aggregate at the road side, including conveying and stacking etc. complete for use in bituminous road surface.

i) 6 mm

Spreading oversize 40mm / 60mm metal including sectioning etc. complete.

**ITEM NO 10.C –**

Compacting sub grade / gravel / oversize metal (200mm loose) layer 2 to 7 m wide with static roller, including necessary, labour, materials and artificial watering etc. complete.

**ITEM NO 10.D –**

Spreading gravel / hard murum / soft murum & stone dust over the rubble soling, oversize and size metal layer / blandage on W.B.M. surface etc.,. complete.

**ITEM NO 10.E-**

Compacting the size metal (150 mm loose) layer up to 2.00m width with static roller , including necessary labour, materials and artificial watering etc. complete.

**ITEM NO 10.F –**

Providing and laying bituminous tack coat, @ 50 Kg/100 m<sup>2</sup> over B.T. surface by manual/mechanical sprayer including supplying all materials, preparing the existing tack coat evenly on the surface etc. complete. (using 60/70 grade) surface, heating bitumen and applying tack Coat evenly on the surface etc., complete

**ITEM NO 10.G –**

Providing and laying hot mix hot laid bituminous macadam 50/75 mm average thickness with 3.3% bitumen content by weight of total mix on prepared surface with specified graded crushed aggregates for the base / binding course including loading of aggregates with F.E. loader, heating of stone aggregates and bitumen and mixing in modern drum mix type of hot mix plant, transporting the mixed material to work site laying the mixed material with sensor paver finisher to the required grade, level and camber, rolling by power roller and vibratory roller to achieve the desired density ( Grade of Bitumen should be 60/70) and cost of all materials, bitumen from refinery etc. complete. (excluding tack coat)

**ITEM NO 10.H –**

9 MM SEAL COAT: Providing and laying of Type A9 mm premix sealcoat with HMP of appropriate capacity crushed stone chipping 6.7 mm size and penetration bitumen of specified grade @ 1.2 kg/Sq.m, preparing existing road surface by mechanical means, spreading chips and rolling, by static roller having weight 8 to 10MT. etc. complete.  
(VG-30 bulk bitumen rates are considered to arrive at rates)"

**ITEM No. 11**

**DEWATERING**

.Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches, well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer -in-charge ( including cost of machinery,

## **CONDITIONS OF SCHEDULE- B**

The wording of items in Schedule 'B' shall be taken as guidelines for general provisions and coverage under the item. The detailed specifications as laid down in various chapters of standard specifications Volume-II published by Government of Maharashtra Public Works and Housing Department. Shall apply as relevant to every individual items. In addition to printed general and special specifications. Applicable for civil works. Order of Maharashtra Jeevan Pradhikaran shall apply. These specifications can be referred in the office of the Executive Engineer.

The Indian Standard Institution Code of Practice as available upto date shall apply in addition to above specification as supplementary one.

The materials required for various items shall confirm to I.S. Code wherever applicable. The latest edition of I.S. Code shall be applicable.

This clause covers scope of material and application of cement mortar lining on the inside surface of the pipeline. The application of mortar lining covers lining of straight pipe sections. Long, short radius bends. Vertical shafts and all against the pipe surface and mechanically trowels it to obtain smooth lining of uniform thickness having smooth transition at joints. The lining of bends. Specials and area adjacent to valves shall be appropriately dealt with according to the best practice of the trade for the diameter concerned. The contractor should specify what is the best practice and produce acceptable evidence therefore.

All access openings and feed opening or manhole for feeder holes shall be re-welded in position with doubler plates of minimum 10 mm thickness after lining them. The line will be restored to the satisfaction of the owner. Item specified in Bill of Quantities provides for welding. Including cost of doubler plates over the access openings. Feed openings or manholes for feeder holes.

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The scope further includes mobilization of equipment. Making access openings wherever required and curing of the mortar lined pipe including testing. Patching access loss etc. as described in the following pages. The main items of work will be generally as follows.

- a) Mobilization of equipment. Plant and machinery.
- b) Deciding access openings in the main and providing temporary access upto opening wherever necessary.
- c) Making trenches of suitable depth, width and length for making access opening in case of under ground (U.G.) pipes which has P.C.C./R.C.C. encasing OR pipe coating/grunting including dewatering and refilling.
- d) Breaking grunted concreted or removing pipe coating surface of U.G. pipe and cutting the top portion of pipe (under ground as well as above ground) to provide for access opening.
- e) Providing necessary platform for installation of mixing machinery.
- f) Remove and re-fix appurtenances. Provide additional ventilation openings and plugs. If required. Take suitable measures for adequate ventilation in case of U.G. pipes.
- g) Maintaining the pipe temperature between 50° F and 90° F.
- h) Cleaning the pipe surface internally.
- i) Mortar lining the internal surface of the pipe lines.
- j) Curing the mortar lining.
- k) Inspection and testing of mortar lining.
- l) Hand lining with cement mortar for top and bottom portion of pipe removed for access opening.
- m) Closing of access openings referred in (d) above and welding doubler plates for the access opening manholes/feeder openings. Carry out external grunting/concreting/pipe coating for such opened portions in case of U.G. pipe line.
- n) Painting near expansion joints internally and externally paintings of patch plates.
- o) For curing, depth of 15 to 20 cm of water to be maintained in the flat portion of the pipe line to maintain adequate humidity in the pipe.

p) Carrying out performance test for 'C' value.

### **PROGRAMME OF WORK**

As soon as award of the contract is made. The contractor shall collect the data. Is of the extent of laying of pipe line completed by him immediately and give work plan for mortar lining.

The whole pipe line shall be divided in suitable lengths (sections) and the contractor shall decide access opening of the sections and plan his work. It is expected that every day on an average 200m of pipe line shall be mortar lined and steps taken to cure the mortar lining either by sealing by plastic sheets or any other suitable steps. Access openings shall be closed back in position by welding. Hand lined cut portion of the pipe line and the pipe line shall be partially or as required fully flooded with water to protect the cement mortar lining before the same is commissioned. The contractor shall himself arrange for water required for the work and for drinking purpose for his labours and staff etc. Only for 'C' value test water will be made available free of cost at MBR at Shill Phata. Contractor has to make arrangements for taking water.

### **POWER**

The contractor shall have to make available electrical power for his works (power and lighting) from concerned authorities at his cost and pay energy and other charges, if any. To the concerned authority. The Maharashtra Jeevan Pradhikaran may on request by the contractor render necessary assistance as is possible but without any financial and contractual obligations.

### **WATER**

The contractor shall have to make his own arrangement for water supply both for construction and for drinking water to labours. However, water will be supplied 'free of cost' through the existing 1590 mm dia pipe line of completion of entire lining work and

during the actual operation of the Scheme when it will be commissioned For 'C' value test only.

The contractor shall have to make his own arrangements to take water during 'C' value test work of cement mortar lining done by him.

### **SITE CLEAN UP**

During the course of work the contractor shall keep the site of work clean and neat. As the work progress, the contractor should clear away and remove from the site construction plant. Surplus material, rubbish and temporary works of any kind and leave whole of the site as in original condition to the satisfaction of the Engineer. Wastage and rubbish shall be disposed off to the satisfaction of the Engineer.

### **MATERIAL FOR CONSTRUCTION**

The material used for the process shall conform to the following specification

1.	AWWA Standard for Cement Mortar Lining	AWWA C 602-83 (Latest Revision)
2.	Indian Standard Specification	ISS:11906:1986
3.	Indian Standard Specification	ISS:8112:1989 For Cement

Wherever any reference is made to the above or any other Standard Specification. It is understood that the latest revision thereof shall take precedence over the above mentioned specifications or any other quoted by the tenderer.

### **APPROVAL TO THE MATERIALS**

The term material shall mean all materials, goods and articles of every kind whether raw, processed and manufactured which will be used by the contractor on this work. All materials shall be free and of the kinds and qualities prescribed below and shall be of approved quality. Material shall be transported, handled and stored in such a manner as to prevent deterioration, damages or contamination. All materials furnished by the contractor

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shall be subject to inspection and approval by the Engineer. The materials rejected by the Engineer shall be immediately removed from the work site entirely at the cost of the contractor.

The contractor shall furnish all labour and other facilities for handling. Testing and inspecting the material to the Engineer at no extra cost. The Engineer may carry out the tests on the materials brought by the contractor before beginning and even during the progress of the work to verify that these conform to the specifications. All cost of sampling, packing, transporting and testing shall be borne by the contractor. The contractor shall use 43 grade ordinary Portland cement conforming to IS 8112 1989. The cement of brands as per approved list of Maharashtra Jeevan Prahikaran such as I. & T. A.C.C., Ambuja, Birla Gold etc. should only be used.

## **MATERIALS**

### **SANDS**

Sand shall consist of inert granular materials. The grains shall be strong durable and uncoated. The Sand shall be well graded and shall pass No. 16 mesh with not more than five percent, passing BS. No. 100 sieve. (Refer to ASTM E-11 Specification for wire cloth sieves for testing purposes.

### **DELETERIOUS SUBSTANCES IN SAND**

Sand shall be clean and free from injurious amounts of dusts, clay, lumps, shale. Soft or flaky particles, mica, loam oil, alkali and other deleterious substances. The total weight of such substances shall not exceed three percent of the combined weight of the substances and the sand that contains them. In addition the following limitations shall apply to specific substances.

Sr. No.	Substance	Max. allowable percentage by weight
1.	Shale	1

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2.	Clay	1
3.	Mica and deleterious substance other than shale and clay lumps	2

**Organic Impurities**

Sand shall not show a colour value darker than the reference standard colour solution prepared as required in ASTM C40 (revised).

Filed tests as approved by the Engineer shall be adopted for (1) determining silt in the sand and (2) determining organic impurities.

**Sand Grading :**

The grading of sand when analysed by the method of sieve analysis shall be within the limits given below.

U. S. Standard Sieves	Indian Standard	Sieve Size in mm	Percentage by weight passing
16	120	1.20 mm	100
20	85	850 Micron	95-100
30	60	600 Micron	85-95
40	42	420 Micron	45-60
60	25	250 Micron	5-25
100	15	150 Micron	2-5

The following two field tests for ascertaining the percentage of clay lumps and impervious organic material shall be carried out by the contractor when ordered by the Engineer.

**Test for determining silt in Sand :**

Fill a calibrated tumbler with the sand to be tested half its volume and add water until the tumbler is three quarters full. Shake up the mixture vigorously and allow it to settle for about an hour. The volume of silt visible on top of the sand shall be measured. If the

volume of silt standing over the sand excess 3% of the total volume of the sand. Then the sand shall be rejected.

***Colorimetric test for organic impurities :***

The samples of sand shall be mixed with an equal volume of 3% solution out (30 gms. In 1 liter of water) of caustic soda (Sodium Hydroxide). Placed in a plain glass, and allowed to stand for 24 hours. The liquid standing above the sand at the end of the Sand shall not be darker than light straw (pale yellow) colour. Or the reference standard colour solution prepared as required in ASTM C40 "Test for organic impurities in sands for concrete" (revised). If the colour is marked yellow or brown. The presence of organic material in an excessive amount is indicated.

***Availability of Quartz Sand :***

The sand locally available in Thane and Raigad District is not considered suitable for mortar lining as it contains silicon. Gritty material obtained from fragments. However, the quartz sand which is available at places near Godhra, Baroda. Wadi which sources are about 300 to 400 Kms. away from work site is considered suitable after properly grading and blending the sand. The Contractor, therefore, should procure dry Sand in gunny bags HDP bags or above. And suitable grad and blend it to meet the specifications. Expenses towards testing and all other expenses from procurement stage to final use shall be borne by the Contractor. The sand shall be stored under cover and off the ground and shall be kept dry at all times. No transportation charges however for sand shall be paid for the work.

The type of sand to be used shall not be changed by the Contractor without the prior approval of the Engineer.

***Water***

Water shall not be salty or brackish and shall be clean, clear and free from mud. Objectionable quantities of salt. Traces of oil, acids, alkalis, organic matter and other deleterious materials. The Contractor shall ascertain the quality of water if water, and shall ascertain its suitability. He will have to arrange for water of required quality from any other

source at his cost. The sources of water shall be approved by the Engineer and the containers for conveyance. Conducted using the water intended to be used in comparison with those adding distilled water to check the quality of water. The water for curing shall be within pH range 6.5 to 8.5 Generally, potable water is fit for mixing and curing.

### **PLANT AND EQUIPMENT**

The Contractor shall use plant and equipment which will be efficient. Appropriate to secure satisfactory quality of work and maintain the required rate of progress which will ensure the completion of work within stipulated period.

If, at any time, in the opinion of the Engineer. Such plants appear to be inefficient, inappropriate, insufficient in executing good quality work with required progress. The same shall be replaced, supplemented as directed by the Engineer.

Failure of the Engineer to give such orders shall not however, relieve the Contractor of his obligation to secure the required quality of work and rate of progress.

The contractors equipment for leaning. Applying and troweling cement mortar in the pipe and for curing the cement mortar lining, shall be of foreign make and in good condition so as to permit the workers to follow the procedure and obtain the result as specified.

### **ADMIXTURES**

To improve workability, density and strength in the mortar, admixture conforming to the latest edition of ASTM – C- 494 may be used at the option of the Contractor, subject to approval of the Engineer provided that the ratio of admixture of Portland cement does not exceed that used in the qualification tests of ASTM-C494. No admixtures shall be used that would have a deleterious effect on potable water flowing in the pipe after the lining has been placed.

### **WORKMANSHIP**

All work shall be performed in a thorough and work man like manner by trained personnel under the supervision of experienced persons skill din the application of cement mortar lining to pipe line in place.

### **ELECTRODES & WELDING**

Electrodes used for welding work shall conform to IS: 814 and welding shall conform to IS: 816:822 and 823.

### **GENERAL CEMENT MORTAR LINING DESIGN**

#### **COMPOSITION**

Mortar for the lining shall be composed of cement, sand and water that have been well mixed and are of such consistency as to produce a dense, homogenous lining. Unless otherwise specified by the Owner, the mortar may also include admixtures.

#### **PROPORTIONS**

The approximate proportions of cement and sand in the mortar for the lining shall be 1 part of Portland cement to 1 part of Sand by volume. The exact proportions shall be determined by the characteristics of the sand used. Adminiatures, if added, shall be used compliance with the manufactures recommendations.

The Contractor should specifically state as to the cement proportion that he proposes to use having regard to his experience (to be stated) and the practice or specifications and his principles followed generally and recommended in this particular case.

#### **WATER CONTENT**

The water content shall be the minimum quantity that produces a workable mixture, with full allowance made for moisture collecting on the interior of the pipe surfaces. Slump tests should be made periodically on freshly mixed mortar water cement ration shall not exceed 0.35. The test results of slump test should indicate slump of mortar required consistency or as per directives of the Engineer-in-charge.

#### **MIXING**

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Mortar shall be mixed long enough by machine to obtain maximum plasticity. The mortar shall be used before initial set.

## **FIELD TESTS**

The following field test shall be carried out by the Contractor for determining the quality of mortar.

### ***Slump test and compressive strength of mortar:***

Slump test should be made once in a day on the freshly mixed mortar immediately prior to the mortar being fed to the lining machine. The test should be made in accordance with IS 1199. After the slump test is carried out, test cubes of sixes (10cm x 10cm) are taken. These cubes shall then be tested for 3 days and 28 days for finding out the crushing strength of mortar at the Cost of the Contractor.

The test shall be carried out twice a week or as Engineer may direct.

The minimum compressive strength of mortar for the designed mix by volume shall be 180 kg. Per Sq. Cm. after 3 days test.

The minimum compressive strength of mortar for the designed mix by volume after 28 days shall be 315 kg. Per Sq. Cm.

The contractor shall by trial and error method design the mix of mortar by varying the different grades of Sand proportion, water content with specified limits so as to give minimum compressive strength as stated above.

Sieve analysis shall be carried out twice every week to ensure that the sand conforms to the desired sieves analyses. Contractor shall provide required sieves as well as sieve analysis apparatus for taking tests.

## **THICKNESS OF LINING**

### **GENERAL REQUIREMENT**

The lining shall be uniform in thickness within the allowable tolerance, except at joint or deformation seen in the pipe line. Cement mortar lining thickness shall be 12 mm for 1590 mm pipe dia. The tolerance for lining shall be 2.5 mm for pipe and +5.0mm for specials as per IS: 1 1906:1986 with no minus tolerance. The mortar lining work shall be by single application.

### **WELDING OF ACCESS OPENING**

The access openings in the laid pipe line in the form of access into the pipe line taken out for the work of mortar lining shall be closed by welding the old pieces taken out from the pipe line before mortar lining of the pipe. Before welding, these pieces shall be hand mortar lined using chi enmesh as requirement to required thickness and curvature. The edges of the plates shall be cut to level shape and inserted in the opening by keeping a gap of 3 to 4 mm and tacked in sequence conforming to ISS:523 (12.3) or in sequence as per BSS. The renewal filed welding shall comply with ISS: 816. A dabbler strengthening. M.S. plate of 10 mm thickness to be procured by Contractor and at least 0.15 M extra over the size of opening on each side shall be fixed and welded property over the access of opening. As regards the welding work. The following points shall be borne in mind by the contractor. No extra cost shall be paid for M.S. doubler/strengthening Mr.'s. plates.

### **ELECTRODES**

The contractor shall use standards electrodes of manufacturer approved by MJP depending on the thickness of plate and the type of joint. The contractor shall also use standard current and ac voltage required for the machine in use as per the manufacturer's directions. Welding joints shall be of butt lap welded type welded both internally and externally. Two runs from inside and one run from outside after cleaning the internally welded material by goosing with gas flame. Account of wastages in plates shall be given. All required welding as directed by the Engineer shall be borne by the contractor and the rate of mortar lining shall be inclusive of fixing of old plate providing and fixing access closing plate, all required welding etc.

### **EXCAVATION FOR PROVIDING ACCESS OPENING IN UNDER GROUND PIPES.**

Excavation shall be carried out to the required depth and width at the locations where opening are to be provided. During excavation, care should be take to see that the pipe protection is not damaged.

All excavations shall suitably and effectively be provided with shoring and strutting wherever necessary to prevent collapse of excavated sides. And also to prevent settlement or damage to structures adjacent to excavation.

Necessary dewatering arrangement shall be made and it should be ensured that the excavated part is kept dry while the work is in progress. Method such as pumping or any other device suitable for local conditions shall be made use of for the purpose. Pumping shall be done in such a way as not to cause damage to adjoining property by blows or subsidence etc.

Excavation shall be refilled after closing the access opening as described elsewhere using suitable materials selected from excavation carried out on site. Or if such materials are insufficient or unsuitable, then contractor will have to bring material from outside at his cost.

Soft material free from stones larger than 20mm size shall be used. Care should be taken to avoid damage to the pipe and any sheeting while refilling is in progress. Back filling may consist of coarse material including broken rock from excavation in rock less than 150 mm in size provided that the compacted back fill is sufficiently dense to prevent material from the superimposed layers being washed into the void in such backfill. Back filling shall be carried on layers exceeding not more than 150 mm. each layer shall be adequately watered and compacted.

No separate payment shall be made for this item i.e. excavation etc. and shall be included in the rate quoted for mortar lining in item of the Bill or Quantity.

### **METHOD OF CONSTRUCTION**

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## **ACCESS OPENING FOR LINING**

Access to the pipe line for placing field applied cement mortar lining shall be obtained by the Contractor as below:

By use of temporarily omitted short 'roll-out' sections of pipe, wherever possible and as approved by the Engineer.

B cutting 'half-cap' openings in the completed pipe line.

As soon as tender is awarded to the contractor. He shall determine the progress of the pipe laying mark and advice in respect of location of such openings to the Engineer, who in turn, shall finalize work plan for such openings with the contractor for pipe laying wherever feasible.

## **PREPARATION OF PIPE SURFACES**

The interior surface of the pipe line shall be cleaned prior to placement of cement mortar lining. The interior surface shall be free of oil. Grease and accumulations of water. All loose mill scale. Dirt, rust and construction debris shall be removed from the interior surface of the new steel pipe line. This may be accomplished by use of stiff street broom or a drag brush. Shot or sand blasting is not required. Waste and rubbish material removed shall be disposed as directed by the Engineer.

## **MACHINE APPLICATION OF MORTAR LINING**

### ***Clean-up ahead of Machine***

Immediately prior to the travel of the lining machine through the pipe line. All foreign material shall as sand, loose mortar might have accumulated shall be removed.

### **Inspection Pipe Line before lining**

The lining shall not be started until the Engineer inspects the cleaned pipe line and given his permission to start lining process. Any lining done without obtaining the prior permission of the Engineer shall be rejected and shall not be considered for payment. The

Contractor shall have to remove the same and clean up the pipe line again at his risk and cost before such portion is lined after permission subsequently.

### **Lining Procedure**

Lining procedure be done by spray coating with cement mortar by means of rotation head. The lining shall be applied in one course by a machine traveling through the pipe and discharger the mortar over all pipe sections and long radius bends. The Discharger shall be from the rear of the machine so that the newly applied mortar will not be marked. The rate of travel of the machine and the rate of mortar discharger shall be mechanically regulated to produce a smooth surface and uniform thickness throughout. The mortar shall be densely packed and adhere where applied. There shall be no injurious rebound.

### **Procedure at Joints**

Joints shall be packed with mortar before lining where necessary to provide a smooth surface across the joint. Such mortared area shall be moist and checked before placement of machine applied lining. Over the joint area.

### **SURFACE FINISH**

The Mortar lining shall be mechanically toweled except for the places where hand toweling or the placement of an untowelled lining of expressly allowed.

### **Toweled Lining**

The lining machine shall be provided with attachment for mechanically toweling the mortar. Both the application and toweling of the mortar shall take place at the rear of the machine so that the freshly placed and toweled mortar will not be damaged. The trowel attachment shall be such that the pressure applied to the lining will be uniform and produce a lining of uniform thickness with a smooth finished surface. Free of spiral

shoulders. The finished surface, of machine placed toweled lignin shall be examined according to the procedure stated below.

Ten (10) places shall be selected in straight section of the pipe which has been lined in each day's run according to a predetermined sampling method agreed on by the Engineer and the Contractor. In each of the 10 places, a 12-in (300 mm) straight edge shall be laid parallel to the axis of the pipe. In nine of the 10 places the space between the lined surface and the straight edge shall at no points be greater than 1/16 in (1.6mm)

### **Untowelled Linings**

The finished surface shall be smooth and regular except, that it may exhibit a slightly dimpled appearance similar to the surface of an orange. Ridges or uneven built-up caused by irregularity in the travel rate of the machine shall be allowed.

Untowelled lining may be allowed in section of a pipe line where the pipe is to be lined in excessively out o round, in dead end section, in segments containing sharp bends and angle points.

The section in which pipes are out of round by more than 2% shall be allowed to remain untowelled provided the finish is orange peel finish.

Before mortar lining work in any section is taken in hand. The contractor jointly with the Engineer's representative shall check for, out of round conditions of the pipe in that section and jointly record observation for out of round condition of more than 2%

### **HAND APPLICATION MORTAR LINING**

Hand –placed mortar shall have a uniform surface with smooth transitions to adjacent machine-placed lining.

### **Allowable Hand Placement**

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In place where machine placing of cement mortar lining is impractical. Such as sharp bends, specials or areas closely adjacent to valves etc. lining shall be performed by hand.

### **Material**

Cement mortar for hand work shall be of the same materials as the mortar for machine placed lining.

### **Cleaning**

Areas to be lined be thoroughly cleaned as specified above and if necessary, shall be moistened with water immediately prior to placing the hand applied mortar.

### **Toweling**

Steel finishing trowels shall be used for the hand application of cement mortar, except at bends. The outer edges of hand towelled area may be brushed in order to reduce the abutting offset.

### **Timing**

All hand lining work in a section of the pipe line shall be completed within 24 hours after completion of the machine application of mortar lining by machine. The mortar lining by machine for further portion shall be delayed or stopped to ensure compliance with this schedule.

## **SPECIAL REQUIREMENTS AT OPENING**

Laterals and connections to the pipe being lined shall not be left obstructed by the lining operations. Openings in the pipe line for manholes, outlets and blow offs etc. shall be temporarily closed and covered with removable coverings or other suitable devices to prevent the intrusion of the cement mortar into such opening. On completion of the lining the Contractor shall remove all such covers and shall repair any lining damaged in the process.

## **CURING**

### **General Requirements**

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Curing operation shall begin immediately following completion of the machine placement of the mortar lining in a section of the pipe line. The section of pipe shall be closed with air tight covers over all openings and the lining shall be maintained in a moist condition. The pipe line shall remain close and moist atmosphere until the pipe line is filled.

### **Curing by Contractor**

When a section of pipe line has been completed, the contractor shall be responsible for careful curing of the mortar lining until the pipe line has been taken over by the Owner.

### ***Sprinkling Exterior***

The exterior surface of pipe exposed to sunlight shall be sprinkled with water and kept moist in the day time during the period of lining. Finishing and curing when such sprinkling is required. As determined by the Contractor or the Engineer to prevent cracking to the lining.

## **INSPECTION, GUARANTEES & PAYMENTS**

### **RESPONSIBILITY OF OWNER AND CONTRACTOR**

The entire procedure of applying cement mortar lining shall be subject to continuous inspection by the Owner, but such inspections shall not relieve the Contractor of the responsibility to furnish material and perform work in accordance with the specifications. All cement mortar lining not applied in accordance with the specifications shall be subject to rejection by the Owner. Lining so rejected shall be removed and placed or repaired by the Contractor at the expense of the Contractor.

### **ALL PLACES ACCESSIBLE TO ENGINEER**

The Engineer shall have free access to all areas, places or facilities concerned with the furnishing of material or the performance of work.

### **CONTRACTOR TO ASSIST ENGINEER**

The Contractor shall furnish the Engineer reasonable assistance without charge. In carrying out the inspection duties and specifically in obtaining information with respect to the character of material used and the progress and manner of the work.

## **PIPE INSPECTION PROCEDURE**

The Owner shall inspect the pipe line following the application of the cement mortar lining to identify defective areas in the lining, to determine compliance with the specification.

### **Pipe inspection**

A manual visual inspection of the lined pipe interior shall be made by the Owner to determine the quality of the lining and to identify defective areas in the lining for repair. For rendering layer thickness test, the Contractor will keep a daily account of the work done in Sqmt. And the quantity of mortar used in Cum., accounting for bulk age of mortar with reference to sand volume. At the close of the day's work the theoretical thickness will be calculated and the details submitted to the Engineer.

## **DEFECTIVE LINING**

Defects in the cement mortar lining includes but are not limited to sand voids, over sanded areas, excessively cracked and dummy areas and areas of unsatisfactory surface finish.

## **REPAIR OF DEFECTIVE LINING**

Small defective areas shall be repaired by manual removal of defective lining and by hand re-application of mortar lining. Defective areas encompassing the full diameter of the pipe where lining shows evidence of failure. Undue irregularity of inferior workmanship requires excessive patching or show segregation of or deficiency in cement content. the Contractor shall remove the mortar lining in such faulty section. Re clean the pipes and reline in accordance with the specifications such portion at no extra cost. Engineers decision regarding the above shall be final and binding on the Contractor.

### **Lining Cracks**

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Temperature and shrinkage crack in the mortar lining less than 1/16 in (1.6 mm) need not be repaired. Cracks wider than 1/16 in (1.6 mm) need not be repaired if u can be demonstrated to the specification of the Owner that the cracks will heal autogenously under continuous soaking in water. The autogeneous healing process may be demonstrated by any procedure that keeps the lining of the pipe continually wet or moist.

### **PROTECTION OF LINING**

Every precaution shall be taken to prevent injury to the lining. Should the lining be damaged through the fault of the contractor, at any time prior to completion of the contractor. such damage shall be repaired conforming to the specifications at the Contractor's expense The repair of damaged lining not auributable to the Contractor shall be carried out and paid for as an extra work basis.

### **GURANTEE AND PERFORMANCE CRITERIA**

#### **GUARANTEE**

The tenderer shall stand guarantee for the defect liability period of the work carried out by him as guaranteed in the guarantee form attached. The 10% of security Deposit deducted by the MBMC shall be released only after satisfactory performance during guarantee period. If on examination of the cement mortar lining work by the owner. Within a period of two year after final completion and acceptance of the contractor work reveals evidence of defective materials or workmanship as defined in the specification. Then the Owner may order such remedies as set forth in the specification. The Contractor shall bear the expense and perform the work in a manner acceptable to the Owner. His Security Deposit will be refunded only after this requirement is satisfied.

#### **PERFORMANCE CRITERIA SURFACE FINISH**

The Hazen williams 'C' factor shall be the criteria for determining the acceptability of surface finish of cement mortar lining. For acceptable performance guaranteed 'C' hw shall not be less than 130.

If in any section of the cleaned and mortar lined pipe, the coefficient 'C' as determined for the loss of head test fails to meet the guaranteed figures. The unit prices for cleaning and lining be reduced as below :

- a. If the 'C' value is deficient by 5 units less below the guaranteed coefficient, contract price shall be reduced by ½% of the cost of that particular section per deficient unit of 'C' value.
- b. If the 'C' value is deficient by 10 units or less but above 5 units below the guaranteed co-efficient. The contract price shall be reduced by 1% of cost of that particular section. per deficient unit of 'C' value.
- c. If the 'C' value is deficient by more than 10 units below the guaranteed 'C' value. The work shall be considered unsatisfactory and shall be rejected. The Contractor will have to remove the mortar lining carried out and again carry out the mortar lining work to improve 'C' value to the desired values. At his cost.

For the purpose of establishing 'C' value in such main where it is not practicable to carry out the loss of head test through full extent of the cleaned and cement mortar lined section of mains. Several sections therefore shall be tested and weighted average 'C' co-efficient from tests be tested and weighted average 'C' co-efficient from tests of such portion shall be considered to be acceptable for whole of the cleaned and cement mortar line pipe.

However, this procedure shall not be applicable to the whole length of the pipe line as such of the particular diameter. The weighted average 'C' shall be calculated as under

$$C = \frac{L_1C_1 + L_2C_2 + L_3C_3 \dots \dots \dots L_nC_n}{L}$$

C1, C2, C3.....Cn are Co-efficient for length

L1, L2, L3.....Ln are length for section 1,2,3,4,.....n

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$$L=L1 + L2 + L3 + L4..... Ln$$

### **Measurement of 'C' Value :**

The 'C' value will established by section between two consecutive Sluice Valves.

The flow tests will be conducted by the Contractor either by himself. If he could produce evidence having conducted such test satisfactorily in the past. Or through a testing agency well experienced and equipped to the approval of Engineer.

Before undertaking such tests. The Contractor and his agency will furnish a write-up fully detailing the test is proposed to be carried. Adequacy of the procedure, reliability of the results, etc., giving reference to contemporary literature and theoretical background quoting authorities etc. to satisfaction of the Engineer.

OR

MBMC may allow to give the 'C' Value test of mortar lining, by testing the piece of mortar line in laboratory minimum one sample per Kilometer of mortar lining length is to be tested. However the Engineer-incharge, if he felt that the quality of mortar lining is not upto mark at certain places, at such places he may ask to test the sample more than one per kilometer. The location of sample to be tested will be decided by the Engineer-in – charge or his representative.

### **MODE OF MEASUREMENT FOR PAYMENT**

The measurement shall be taken jointly by representatives of the Contractor and the Engineer.

The length of the pipe line (including tapers, bends, etc.) actually cleaned. Mortar lined in accordance with the specifications and accepted by the Engineer will be measured along the centre line of the pipe line in running meter and the inner diameter of the bare pipe ( i.e. before mortar lining) shall be measured to workout the cement mortar lined area for

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making payment. No deduction shall be made for small opening at manhole. Air valve, cross connection etc. The Contractor shall provide all assistance to the Engineer for taking measurements.

The rate quoted shall be on square meter basis, and shall include mobilizing of machinery for work, supply of material, manpower, access openings in the pipe line by cutting (above ground as well as underground pipe line) for machine feeding the mortar, providing operational platform. Cleaning the pipe line and removing the debris from the pipe line. Machine mortar lining and mechanically towelling, curing and controlling temperature in the pipe line during the progress or work. Welding the removed portion of the removed for access opening. Gunitting /concreting such portion of underground pipe line. Establishing working condition in the pipeline and thereafter preventing damages to Mortar lining. Inspection and testing, commissioning and any other incidental items of works as per scope of work and specification including painting. Length shall be measured upto unit of Cm.

Area shall worked out correct unto two decimals of a square meter

### **VARIATION IF QUANITTY**

The length of pipe line to be mortared lines as shown in Bill of Quantities is estimated length. The rates quoted by the Tenderer shall not vary if the actual work carried out is +- 25% of quantity shown in the Bill of Quantities.

### **CEMENT CONSUMPTION**

For calculating theoretical cement consumption mean area of mortar will be worked out by considering, diameter of bare pipe plus one thickness of mortar lining. The rate of cement consumption is 0.021 bag/Sqm/mm ie. For 12 mm thickness it will be 0.252 bags/Sqm.

All M. S. portion of gravity main including specials shall be mortar lined by use of machine lining. Where machine lining is not possible. Hand lining should be done and where hand

lining is not possible, the portion should be protected by 3 coats of epoxy paint of approved make. No extra payment for epoxy painting will be made.

**ALIGNMENT AND FIXING DOUBLER PLATES**

The doubler/strengthening plates shall be properly aligned and fixed in position over access manhole. Manhole and feed opening. Size of double/strengthening plate shall be minimum 0.15 m more than the size of access opening, feed opening etc. Work shall be carried out as per relevant IS Code/Standard Specification and current practice in MJP and as directed by the Engineer-in-charge.

ANNEXURES

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ANNEXURE-A  
MEMORANDUM OF UNDERSTANDING (MoU)  
FOR CLEANING /JETTING MACHINE TECHNOLOGY SUPPORT  
(To be executed on Non-Judicial Stamp Paper of Rs. 500/- and duly Notarized)

THIS MEMORANDUM OF UNDERSTANDING is executed on this \_\_\_ day of \_\_\_20\_\_.

BETWEEN

M/s. [Name of the Bidder], having its registered office at [Address], hereinafter referred to as the "BIDDER / O&M OPERATOR" (which expression shall, unless repugnant to the context or meaning thereof, be deemed to include its successors and permitted assigns), hereinafter referred to as the Party of the First Part.

AND

M/s. [Name of Experienced Partner / Agency], having its registered office at [Address], hereinafter referred to as the "TECHNICAL PARTNER / SERVICE PROVIDER" (which expression shall, unless repugnant to the context or meaning thereof, be deemed to include its successors and permitted assigns), hereinafter referred to as the Party of the Second Part.

WHEREAS:

1. Mira Bhaindar Municipal Corporation (MBMC) has invited tenders for Operation & Comprehensive maintenance of Sewerage treatment plants and underground drainage system in Mira Bhaindar Municipal corporation area. (hereinafter referred to as the "Project").
2. As per the tender conditions, bidders are required to possess prior experience in Operation and Maintenance of Truck Mounted High Flow Suction-cum-Jetting Machines.
3. The Technical Partner possesses the requisite technical expertise and qualifying experience in operating such Machines.
4. The Bidder intends to associate with the Technical Partner solely for the purpose of meeting the aforesaid eligibility requirement and for ensuring safe, efficient, and damage-free operation of Machines during the contract period.

NOW, THEREFORE, THIS MoU WITNESSETH AS FOLLOWS:

1. SCOPE OF ASSOCIATION

- 1.1 Deployment of skilled and trained operators and supervisory personnel for operation of MBMC departmental Machines.
- 1.1 Providing technical guidance related to operation, maintenance, and troubleshooting of systems.
- 1.1 Sharing and transfer of Standard Operating Procedures (SOPs) for silt extraction.

2. ASSET OWNERSHIP, PROTECTION & LIABILITY

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2.1 The Machines to be operated under this arrangement are the exclusive property of Mira Bhaindar Municipal Corporation.

2.1 The Technical Partner shall ensure that all personnel deployed or trained by them are competent and adequately skilled to operate such high-value assets.

2.1 In case of any major breakdown, damage, or failure caused due to operational negligence, improper handling, or lack of technical expertise, the Technical Partner shall be jointly and severally liable along with the Bidder to rectify the same at their own cost, to the satisfaction of MBMC.

3. VALIDITY & EXCLUSIVITY

3.1 This MoU shall remain valid from the date of submission of bid till completion of the Contract Period awarded by MBMC.

3.1 The Technical Partner confirms that all experience credentials submitted for the said tender are true, correct and valid.

4. DECLARATION & UNDERTAKING

The Parties hereby declare that the Technical Partner has successfully executed similar works covering approximately [Insert Length] kilometers using Machines.

The Parties further understand and agree that submission of any false, misleading, or fabricated information shall render both the Bidder and the Technical Partner liable for rejection of bid and blacklisting by MBMC, without prejudice to any other legal action.

IN WITNESS WHEREOF, the Parties hereto have executed this MoU on the day, month, and year first above written.

For the BIDDER

Authorized Signatory

Seal:

For the TECHNICAL PARTNER

Authorized Signatory

Seal:

Witnesses:

1. \_\_\_\_\_

2. \_\_\_\_\_

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