

BID DOCUMENT

FOR

DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH.

VOLUME - I, II & III



**EXECUTIVE ENGINEER,
MUNICIPAL CORPORATION PUBLIC HEALTH DIVISION No 1,
SECTOR - 11, CHANDIGARH**

MUNICIPAL CORPORATION CHANDIGARH

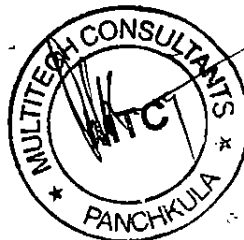


BID DOCUMENTS FOR

DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH.

VOLUME 1 : ELIGIBILITY & GENERAL CONDITIONS

Approx. Amount: To be quoted by Firm / Contractor
Earnest Money: 60.00 Lacs
Time Limit: 15 months for construction,
Start up & Stabilization period: 180 days or longer.
O&M Period after stabilization: 120 Months

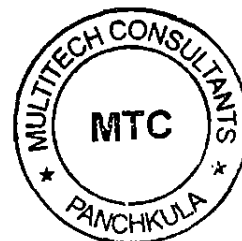


[Signature]
Executive Engineer,
M.C.P.H. Division No 1,
Chandigarh

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E- TENDER NOTICE

(FOR WORKS COSTING ABOVE Rs. 20.00 LACS TO ANY LIMIT)

(INFORMATION AND INSTRUCTIONS FOR CONTRACTORS FOR e-TENDERING FORMING PART OF NIT AND TO BE POSTED ON WEBSITE)

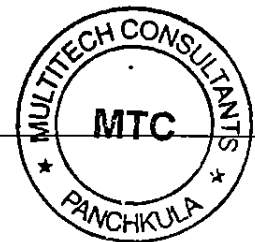
The **Executive Engineer, Municipal Corporation, Public Health Division No. 1, Chandigarh** on behalf of the **Commissioner, Municipal Corporation Chandigarh** invites online LUMP SUM RATE BIDS from the eligible reputed Firms / contractors FULFILLING THE ELIGIBILITY CRITERIA for the following work(s) on the prescribed form available at official website:-

NIT No.....	Estimated cost put to tender (Rs.)	Earnest Money (Rs.)	Period of Completion	Due date & time of :-	
				Submission of e-bids	Opening of e-bids
Name of work & Location					
Design, Construction, Supply, Installation, Testing and Commissioning of 5 MGD (22.73 MLD) capacity Sewage Treatment Plant (STP) & Main Pumping Station (Phase I), based on Sequential Batch Reactor (SBR) technology and all other works contingent thereto along with operation and maintenance for a period of 120 months after successful completion of trial run for a period of 180 days at Maloya Chandigarh.	To be quoted by Firm / Contractor	60.00 Lacs	15 months for construction, Start up & Stabilization period: 180 days or longer. O&M Period after stabilization: 120 Months	Milestone dates as per Tender Notice	Milestone dates as per Tender Notice

The bid documents consisting of plans, specifications, the tentative / indicative schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents can be seen from "website <http://mcchandigarh.gov.in> OR <http://etenders.chd.nic.in> free of cost.

MODE OF TENDERING/ ELIGIBILITY CRITERIA:-

The tender documents shall be uploaded in 3 covers / folder as under:-	
Folder-A	<p>It should contain the scanned copies of the following :-</p> <ul style="list-style-type: none">• EARNEST MONEY DEPOSIT of the requisite value & shape and in favour of the Executive Engineer, MCPH Division No. 1, Chandigarh by designation only.• The UNDERTAKING as per format prescribed under 4 (b) of E-Tender Notice regarding physical deposition of earnest money.



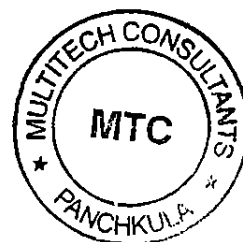
	NOTE: IT SHOULD BE NOTED BY THE INTENDING CONTRACTORS THAT THE DOCUMENTS AS MENTIONED ABOVE IF ARE NOT UPLOADED UNDER FOLDER A, THEN THE BID SHALL BE REJECTED STRAIGHTAWAY AND FOLDER B- SHALL NOT BE CONSIDERED FOR OPENING.
Folder-B	Shall contain scanned copies of POST QUALIFICATION DOCUMENTS as per E-Tender notice Clause – 11 & 13.
Folder-C	Shall contain E- PRICE BID (Financial Bid) as per prescribed format (BOQ).
<p>NOTE:- Folder-A: shall be opened on the due date of opening at hours as per Tender Notice.</p> <p>Folder-B: shall be opened only of tenderers /contractors whose scanned EARNEST MONEY AND REQUISITE UNDERTAKING under Folder-A is found to be in order. The tenderers will also see Volume -I, Part – III Scope of work / Bid Submission before uploading of tender.</p> <p>Folder-C: shall be opened only of those contractors who will be found qualified for the work as per eligibility criteria and DNIT parameters. THE DATE OF OPENING OF FOLDER-C SHALL BE AFTER OPENING OF FOLDER-B.</p>	

CONDITIONS:

1. **The intending bidder must read the terms and conditions of CPWD-6 carefully.** He should only submit his bid if he considers himself eligible and he is in possession of all the required documents.
2. **Information and Instructions for bidders posted on website shall form of bid document** i.e. the Corrigendum/Addendum issued if any, before the receipt of online bid will be uploaded /made available on the website. It will be the responsibility of the Contractors/ prospective bidders to make amendments in their bid accordingly.
3. The intending bidder must have valid digital signature to submit the bid.
- 4(a). The **Earnest Money** shall be in the shape of Demand Draft/Bankers Cheque/pay order only of any scheduled Bank payable at Chandigarh in favour of the Executive Engineer, Municipal Corporation, Public Health Division No 1, Chandigarh, which shall be scanned and uploaded to the E-Tendering website within the period of Bid Submission. Any form of EMD will be rejected straightaway.
- 4 (b) **The physical EMD of the scanned copy of EMD uploaded shall be deposited by the lowest Tenderers within a week after opening of Financial Bid(s), failing which the tender shall be rejected outrightly. While submitting the Earnest Money in original, the Tender ID and Name of work should be written on the reverse side of the same. Further the following undertaking, in this regard, shall also be uploaded by the Intending bidders:**

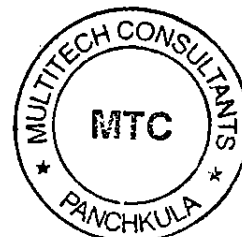
"THE PHYSICAL E.M.D. SHALL BE DEPOSITED BY ME/ US WITH THE EXECUTIVE ENGINEER CALLING THE TENDER IN CASE I/ WE BECOME THE LOWEST TENDERER (L-1) WITHIN A WEEK OF THE OPENING OF FINANCIAL BID(S). IN CASE THE L-1 FIRM FAILS TO DEPOSIT THE EARNEST MONEY IN ORIGINAL AS UPLOADED WITHIN THE STIPULATED TIME PERIOD OF 7 DAYS, THEN THE DEPARTMENT MAY REJECT THE TENDER AND CONTRACTOR SHALL BE DEBARRED FOR NEXT SIX MONTHS TO PARTICIPATE IN THE TENDERING PROCESS IN MUNICIPAL CORPORATION, CHANDIGARH"

Note : The sole responsibility shall rest upon with the contractual agency to check the status of the tender and submission of physical EMD. No separate letter will be sent by the Department regarding thereof.



5. The documents as specified above in the Notice shall be scanned and uploaded to the e-tendering website within the period of Bid submission.
 6. The Bidders shall have to submit their Bids online in Electronic Format with Digital Signatures. For participation in the e-tendering process the Bidders need to register themselves on <http://etenders.chd.nic.in/nicgep>.
 7. *Online bid documents submitted by intending bidders shall be opened only of those bidders, whose Scanned copy of Earnest money, requisite undertaking and other documents are found in order.*
 8. **The successful firm is required to obtain VAT Registration from competent authority in Chandigarh. No payment will be released in the absence of VAT registration as mentioned above.**
 9. **The contractor / firm will ensure that no Child Labour is engaged at the site of work.**
 10. **IT MAY BE NOTED BY THE INTENDING CONTRACTORS/FIRMS /BIDDERS THAT THE BID SUBMITTED SHALL BECOME INVALID IF :-**
 - i). If the bidder does not upload scanned copy of EMD of requisite value & mode and requisite undertaking under folder A, then tender will be rejected summarily.
 - ii). The bidder is found ineligible.
 - iii). **THE SUCCESSFUL TENDERER AFTER BECOMING LOWEST DOES NOT SUBMIT THE FOLLOWING WITHIN SEVEN DAYS:-**
 - a) The earnest money in physical form as per scanned copy uploaded with the bid
 - b) The hard copies of the documents as uploaded online with the bid.
- Each page of the hard copy so submitted should bear the stamp and signature of the participating firm. It may be noted that if any discrepancy is noticed between the documents as uploaded online at the time of submission of bid and hard copies as submitted physically by the lowest tenderer in the office of tender opening Authority, the bid shall become invalid. Further the Department shall, without prejudice to any other right or remedy, be at liberty to forfeit the earnest money as aforesaid. **FURTHER THE BIDDER SHALL NOT BE ALLOWED TO PARTICIPATE IN THE RETENDERING PROCESS OF THE WORK AND WILL BE DEBARRED FOR PERIOD OF ONE YEAR.**
11. **ELIGIBILITY CRITERIA for the Post Qualification of the intending contractors/firms shall be as follows and the scanned copies of the same shall have to be uploaded under folder B of E-Tender :-**
 - 11.1 The eligibility criteria apart from the deposition of the earnest money of requisite value shall be as under :-
 - a **AVERAGE ANNUAL FINANCIAL TURNOVER** during the last 3 years ending 31st March, ²⁰¹⁶~~2017~~ should be at least 15.00 Crores.

(scanned copy of certificate from Chartered Accountant should be uploaded and there is no need to upload entire voluminous Balance sheets)



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b **EXPERIENCE OF HAVING SUCCESSFULLY COMPLETED SIMILAR WORKS during last 7 years** ending last day of the month previous to the one in which the applications of tender are invited, should be either of the following and Joint ventures are not accepted in any case:-

i) Three similar completed works each of capacity not less than 09 MLD including maintenance of atleast 1 year.

OR

ii) Two similar completed works each of capacity not less than 14 MLD including maintenance of atleast 1 year.

OR

iii) One similar completed work of capacity not less than 18 MLD including maintenance of atleast 1 year.

AND

One completed work of similar nature (either part of i, ii or iii above or a separate one) of capacity not less than 9 MLD along with operation & maintenance of 24 months with some Central Government Department/ State Government Department/ Central Autonomous Body/ State Autonomous Body/ Central Public Sector Undertaking/ State Public Sector Undertaking/ City Development Authority/ Municipal Corporation of City formed under any Act by Central/ State

Government and published in Central/State Gazette. Only those plants shall be considered in which the contractor has done design, construction, commissioning, stabilization as well as operation and maintenance for minimum 24 months.

c **DEFINITION OF SIMILAR WORK:-**

SIMILAR WORK MEANS Designing, Construction, Commissioning & Stabilization of STP based on Conventional Activated Sludge Process/ Extended Aeration/ Sequential Batch Reactor (SBR)/ Moving Bed Bio Reactor (MBBR)/ UASB; and rapid sand filter (in same or separate contract) including maintenance for 24 months and the plant shall be working for the last 1 year fulfilling committed Treated Sewage Quality parameters.

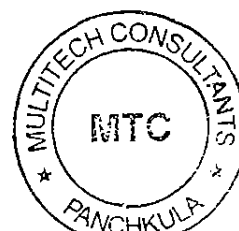
- The applicant shall necessarily tie up with a technology provider for providing design / performance guarantee / key equipments for SBR technology. The technology provider must have provided SBR technology for minimum of one Sewage Treatment Plant not less than 18 MLD capacity each, anywhere in world and these plants should have been completed and commissioned satisfactorily meeting standards of treated sewage / effluent quality mentioned at Page – 79. MOU must be as per the attached performa at page 72. The applicant will submit satisfactory performance certificate from concerned authority that effluent parameters are as per commitment.
- In case bidder and Technology Provider is the same no separate MOU is required.
- In case of STP constructed for clients other than the Government / Semi Government, in addition to the completion and performance certificate of the client, a certificate by the concerned State Pollution Control Authority regarding satisfactorily performance of the STP shall be required.

Works completed and commissioned after 31.12.2010 shall only be considered

THE COPIES OF PERFORMANCE CERTIFICATE(S) FROM CLIENT DEPARTMENTS OF EXPERIENCE OF HAVING SUCCESSFULLY COMPLETED SIMILAR WORK(S) MUST BE AS PER APPENDIX- 20 OF CPWD WORKS MANUAL 2014. The format for performance certificate is however enclosed in the DNIT as Form-E (Page – 51). The performance certificate other than the specimen shall not be entertained.

f **BANK SOLVENCY:** The intending contractor/firm should have solvency of amount equal to Rs. 12.00 Crores.

(NOTE: The BANK SOLVENCY CERTIFICATE should preferably be of latest date and issuance date should not be more than one year prior from the date of closing of the e-tenders).



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- g. The intending bidder/contractor alongwith the bid should furnish an AFFIDAVIT duly attested by Notary Public/ First class Magistrate ON STAMP PAPER in Folder "B" as per specimen given below:-

AFFIDAVIT

I/weProprietor/..... of M/s.....having registered address at do hereby solemnly declare and affirm as under:-

- That I/We have not been Black-Listed by any Govt. /Semi Govt./Board/Corporation/ Pvt. Organization during the last seven years.
- That I/We am/are not Debarred/Suspended by any Govt. /Semi Govt./Board/Corporation/ Pvt. Organization as on the date of submission of e-tender for the work.

- That no Criminal Proceeding is pending against me/our Company /Firm/Agency as on the date of submission of e-tender for the work.

AND FURTHER THAT

"I/We undertake and confirm that eligible similar work(s) has/have not been executed through another contractor on back to back basis. Further that, if such a violation comes to the notice of Department, then I/we shall be debarred for tendering in Municipal Corporation, Chandigarh in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-in-Charge shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee".

(DEPONENT)

VERIFICATION:

Verified on dated at that the above contents of Affidavit are true to best of my/our knowledge & belief and nothing has been concealed therein.

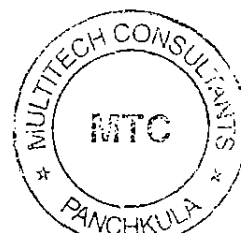
(DEPONENT)

NOTE:

Affidavit should be of latest date. The Affidavit of date prior to three months from the date of publishing the tender shall not be considered for qualification of Technical Bid.

13. THE LIST OF DOCUMENTS TO BE SCANNED AND UPLOADED WITHIN THE PERIOD OF BID SUBMISSION IS AS UNDER :-

- i. Scanned copy of EMD of requisite value & mode and requisite UNDERTAKING, the scanned copy of receipt issued by scheduled Bank showing the necessary details should be uploaded.
- ii. Performance Certificate of completed Works of similar nature as per CPWD Works Manual (format attached in the DNIT).
- iii. Certificate of Financial Turnover for last three financial years from Chartered Accountant.
- iv. Bank Solvency Certificate.



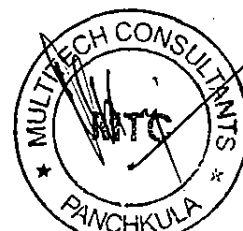
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- v. Any other Document as specified in the Press Notice etc.
- vi. Affidavit as per DNIT/E-Tender Notice.
- vii. **Registration of EPF and ESIC as applicable for dedicated labour contracts only.**
14. **Before submission of online Bids, Bidders must ensure that scanned copies of all the necessary documents have been uploaded with the Bid. The technical bids will be examined based only on the uploaded documents. NO CORRESPONDENCE OR PHYSICAL SUBMISSION OF ANY ADDITIONAL DOCUMENT THEREAFTER WILL BE ENTERTAINED BY THE DEPARTMENT.** However in case any scanned and uploaded documents is not clearly readable due to dim contents, then the Department may ask the bidder to submit the clear copy of the same but no additional document other than uploaded shall be accepted.
15. **Tenders without digital signatures will not be accepted by the Electronic Tendering System.** No Tender will be accepted in physical form and in case it has been submitted in the physical form it shall be rejected summarily.
16. **THE CONDITIONAL TENDERS SHALL BE REJECTED STRAIGHT AWAY.**
17. **The Department will not be responsible for any delay in online submission of the Bids due to any reason what-so-ever.**
18. **Municipal Corporation Chandigarh reserves the right to verify the particulars furnished by the applicant/ firm/ contractor independently.** If any information furnished by the applicant is found incorrect at a later stage, the firm/ contractor shall liable to be debarred for future tendering in Municipal Corporation Chandigarh.
19. For any technical issue related to electronic tendering portal, bidders may contact IT Cell, DIT, Additional Deluxe Building, 5th Floor, Sector-9, Chandigarh or email at **etenders.chd.nic.in. Phone No. 0172-2740641, 0172-2740003.**
- The Bidders may also contact Nodal Officer/Computer Programmer, Municipal Corporation, Chandigarh for any help/Assistance regarding e-tendering at 0172-5021530 during office hours.
20. Canvassing whether directly or indirectly, in connection with bidders is strictly prohibited and the bids submitted by the contractor(s) who resort to canvassing will be liable for rejection.
21. All disputes concerning in any way with this tender are subject to Chandigarh (India) jurisdiction only.

For and on behalf of
Commissioner, Municipal Corporation Chandigarh

Executive Engineer,
M.C.P.H. Division No 1,
Chandigarh
Address: Near Karuna Sadan,

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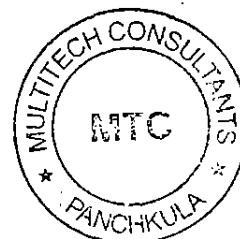
MUNICIPAL CORPORATION, CHANDIGARH
NOTICE INVITING TENDER
FORM - 6

The Executive Engineer, MC Public Health Division No 1, Chandigarh on behalf of the Commissioner Municipal Corporation, Chandigarh invites **LUMP SUM RATE TENDERS** through e-Procurement process from the Eligible Reputed Firms and contractors anywhere in India dealing with "Similar Type of works mentioned in E-Tender Notice" shall be uploaded and received on <http://mcchandigarh.gov.in> OR <http://etenders.chd.nic.in> to be opened at Hrs. on the same date for the work:

Name of Work: DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH

- 1.1 The work is estimated to cost _____. This estimate, however, is given merely as a rough guide.
- 1.2 The contractors should submit application alongwith certificate(s) from appropriate authority showing experience of having successfully completed works during last seven years ending last day of the month previous to the one in which applications are invited. The work completed upto previous day of last day of submission of tender shall be considered as mentioned in the bid documents.
2. Agreement shall be drawn with the successful tenderer on prescribed CPWD Form as per "General conditions of the contract of CPWD works-2014" (which is available as a Govt. of India Publication) and the Amendment/changes in clauses of the General Conditions of the contract for CPWD works attached in Section-I. Tenderer shall quote his rates as per various terms and conditions of the said form, which will form part of the agreement.
3. The time allowed for carrying out the work will be **15 months** from the date of start as defined in Schedule 'F' or from the first day of handing over of the site, whichever is later, in accordance with the phasing, if any, indicated in the tender documents.
4. The site for the work is available. : Yes
5. Earnest money in the form of Demand Draft (drawn in favour of Executive Engineer, M.C.P.H. Division No 1 Chandigarh by designation only) shall be scanned and uploaded to the E- Tendering website within the period of bid submission.
- b) Copy of certificate of work experience and other documents as specified in the Press Notice/ Bid Documents shall be scanned and uploaded to the e-Tendering website within the period of bid submission.

However, certified copy of all the scanned and uploaded documents as specified in press notice shall have to be submitted by the lowest bidder only.



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The bid submitted shall be opened atPM on,

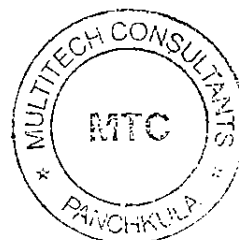
6. The bid submitted shall become invalid in case of discrepancies as mentioned in Tender Notice.
7. **The contractor whose tender is accepted will be required to deposit furnish Performance Guarantee of an amount equal to 5.00% (Five point Zero Percent) of the tendered amount with in the period specified in schedule F. The earnest money deposited alongwith the bid shall be returned after receiving aforesaid performance guarantee.**
8. The description of the work is as follows: -

Name of Work: DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH

Copies of other drawings and documents pertaining to the work will be open for inspection by the tenderer at the office of the Executive Engineer, MCPH Division No 1 Chandigarh.

Tenderers are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their tenders as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their tender. A tenderer shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charges consequent on any misunderstanding or otherwise shall be allowed. The tenderer shall be responsible for arranging and maintaining at his/her own cost all materials, tools and plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a tender by a tenderer implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which stores, tools and plant, etc. will be issued to him by the Government and local condition and other factors having a bearing on the execution of the work.

9. The competent authority on behalf of Commissioner Municipal Corporation, Chandigarh does not bind himself to accept the lowest or any other tender, and reserves to himself the authority to reject any or all of the tenders received without the assignment of any reason. All tenders, in which any of the prescribed conditions are not fulfilled or any condition including that of conditional rebate is put forth by the tenderer, shall be summarily rejected.
10. Canvassing whether directly or indirectly, in connection with tenders is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable to rejection.
11. The competent authority on behalf of Commissioner Municipal Corporation, Chandigarh reserves to himself the right of accepting the whole or any part of the tender and the tenderer shall be bound to perform the same at the rate quoted.
12. The contractor shall not be permitted to tender for works in the Circle (responsible for award and execution of contracts) in which his near relative is posted in any capacity. He shall also intimate the names of persons who are working with him in any capacity or are

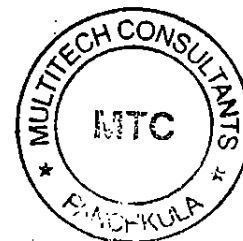


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subsequently employed by him and who are near relatives to any officer/official in Municipal Corporation Chandigarh. Any breach of this condition by the contractor would render him liable to be removed from the approved list of contractors of this Department as well as for future works.

13. No employee of Municipal Corporation Chandigarh is allowed to work as a contractor for a period of two years after his retirement from the service, without the previous permission of the Municipal Corporation Chandigarh in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of Municipal Corporation Chandigarh as aforesaid before submission of the tender or engagement in the contractor's services.
14. The tender for the works shall remain open for acceptance for a period of Ninety (90) days /from the opening of technical bid. If any tenderer withdraws his tender before the said period or issue of letter of acceptance, whichever is earlier or makes any modifications in the terms and conditions of the tender which are not acceptable to the department, then the Government shall, without prejudice to any other right or remedy, be at liberty to forfeit 50% of the said Earnest Money as aforesaid and to forfeit the whole of the Earnest Money if the tenderer fails to submit the Performance Guarantee in the prescribed time after issue of letter of acceptance. Further, the tenderer shall not be allowed to participate in the re-tendering process of the work.

In the event the tenderer whose tender is accepted and the award letter issued after the receipt of Performance Guarantee MOU signed with electrical associates in the prescribed form and time, fails to commence the work "along with change in scope, if any" in the prescribed time or abandons work before its completion, the Government shall without prejudice to any other right or remedy be at liberty to forfeit the whole of the Earnest Money and Performance Guarantee shall stand forfeited in full and shall be absolutely at the disposal of the Commissioner Municipal Corporation, Chandigarh.
15. This Notice Inviting Tender shall form a part of the contract document. The successful tenderer/contractor, on acceptance of his tender by the accepting authority, shall, within 15 days from the stipulated date of start of the work sign the different component part of the contract otherwise the same will be withdrawn and rejected.
16. The notice inviting tender, all the documents including additional conditions, specifications and drawings, if any, forming the tender as issued at the time of invitation of tender and acceptance thereof together with any correspondence leading thereto.
17. TENDER FORM: Standard C.P.W.D. Form 7 as per "General conditions of contract for CPWD Works-2014 shall be applicable for the contract.



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18. Current tender consists of four Volumes:

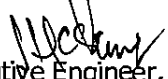
VOLUME 1 : ELIGIBILITY AND GENERAL CONDITIONS

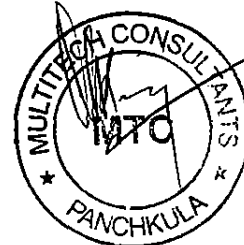
VOLUME 2 : DETAILED SCOPE OF WORK

VOLUME 3 : TECHNICAL SPECIFICATIONS

VOLUME 4 : PRICE SCHEDULE AND PAYMENT TERMS

**For and on behalf of
Commissioner, Municipal Corporation Chandigarh**


Executive Engineer,
M.C.P.H. Division No 1,
Chandigarh







**MUNICIPAL CORPORATION CHANDIGARH
LUMP SUM Rate Tender & Contract for Works**

(A) Tender for the work of:
DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH

- (i) To be submitted/uploaded by..... Hours on..... to..... /upload at <http://etenders.chd.nic.in/nicgep/app>
- (ii) To be opened in presence of tenderers who may be present at..... hours on..... in the office of.....

Issued to:*

Signature of officer issuing the documents*

Designation*

Date of Issue:*

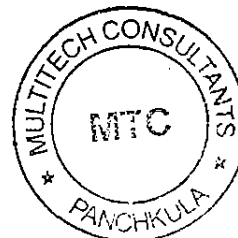
* Note Applicable for e-tendering

TENDER

I/We have read & examined notice inviting tender, schedule, A, B, C, D, E & F specifications applicable, Drawings & Designs, General Rules and Directions, Conditions of Contract, clauses of contract, Special conditions, Schedule of Rate & other documents and Rules referred to in conditions of contract & all other contents in the tender document for the work.

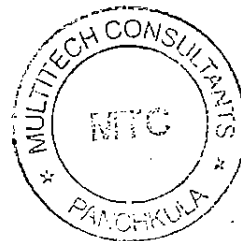
I/We hereby tender for the execution of the work specified for the Commissioner, Municipal Corporation Chandigarh within the time specified in Schedule 'F' viz., schedule of quantities and in accordance in all respect with the specifications, designs, drawing and instructions in writing referred to in Rule-1 of General Rules and Directions and in Clause 11 of the Conditions of contract and with such materials as are provided for, by, and in respect of accordance with, such conditions so far as applicable.

We agree to keep the tender open for ninety (90) days from the due date of its opening in case of single bid system / Ninety(90) days from the date of opening of technical bid in case tenders are invited on 2 bid system/ ninety (90) days from the date of opening of technical bid in case bids are invited on 3 bid for specialized work (strike out as the case may be) and not to make any modification in its terms and conditions.



A sum of Rs..... is hereby forwarded in demand draft/Bankers Cheque of a scheduled bank as earnest money.

A copy of earnest money in Demand Draft of a scheduled bank issued by a scheduled bank is scanned and uploaded (strike out as the case may be). If I/ We, fail to furnish the prescribed performance guarantee within prescribed period, I/We agree that the said Commissioner, Municipal Corporation Chandigarh or his successors, in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further, if I/We fail to commence work as specified, I/We agree that Commissioner, Municipal Corporation Chandigarh or the successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said performance guarantee absolutely. The said Performance Guarantee shall be a guarantee to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to those in excess of that limit at the rates to be determined in accordance with the provision contained in Clause 12.2 and 12.3 of the tender form. Further I/ we agree that in case of for future of performance guarantee aforesaid, I/ we shall be debarred from participation in the retendering process of the MC Chandigarh.:



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Further, I/We agree that in case of forfeiture of Earnest Money or Performance Guarantee as aforesaid, I/We shall be debarred for participation in the re-tendering process of the work at least one year.

I/We undertake and confirm that eligible similar work(s) has/have not been got executed through another contractor on back to back basis. Further that, if such a violation comes to the notice of Department, then I/we shall be debarred for tendering in CPWD in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-in-Charge shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee.

I/We hereby declare that I/We shall treat the tender documents drawings and other records connected with the work as secret/confidential documents and shall not communicate information/derived there from to any person other than a person to whom I/We am/are authorized to communicate the same or use the information in any manner prejudicial to the safety of the State.

Dated
Witness:

Signature of Contractor
Postal Address

Address:
Occupation:

ACCEPTANCE

The above tender (as modified by you as provided in the letters mentioned hereunder) is accepted by me for and on behalf of the Commissioner, Municipal Corporation Chandigarh for a sum of
..... (Rupees.....)

.)

The letters referred to below shall form part of this contract agreement:-

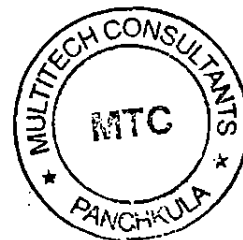
- (a)
- (b)
- (c)

For & on behalf of Commissioner, Municipal Corporation Chandigarh

Signatures.....

Dated:

Designation.....



A handwritten signature in black ink, appearing to be a stylized 'A' or similar character.



MUNICIPAL CORPORATION CHANDIGARH

STATE: UT Chandigarh CIRCLE: MC Public Health Circle
BRANCH: ENGG. DEPTT DIVISION: M.C.P.H. Division No 1,
ZONE: CHANDIGARH SUB DIVISION 10

CPWD FORM NO 8

LUMP SUM RATE TENDER & CONTRACT FOR WORKS Tender for the work of:-

DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH

to be submitted by.....on web site to Executive Engineer, M.C.P.H. Division No 1, Chandigarh to be opened electronically on..... in the office of the Executive Engineer.

TENDER

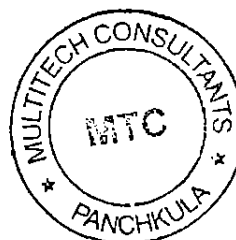
I/We have read & examined Notice Inviting Tender, Schedule A, B, C, D, E & F, specifications applicable, Drawings & Designs, General Rules and Directions, Conditions of Contract, Clauses of Contract, Special Conditions, Schedule of Rate and other documents and Rules referred to in conditions of contract & all other contents in the tender document for the work.

I/We hereby tender for the execution of the work specified for the Commissioner Municipal Corporation, Chandigarh within the time specified in Schedule 'F', viz. Schedule of Quantities and in accordance in all respects with the Specifications, Designs, Drawings and instructions in writing referred to in Rule-1 of General Rules and Directions and in Clause 11 of the Conditions of Contract and with such materials as are provided for, by and in respects in accordance with, such conditions so far as applicable.

We agree to keep the tender open for ninety days from date of opening of financial bid and not to make any modifications in its terms and conditions.

A sum of Rs **60.00 Lacs** is hereby forwarded has been deposited in Demand Draft/ Bankers Cheque/ pay order of a Scheduled Bank only as Earnest Money. If I/we fail to furnish the prescribed Performance Guarantee within prescribed period, I/we agree that the said Commissioner Municipal Corporation, Chandigarh or his successor in office shall without prejudice to any other right or remedy be at liberty to forfeit the said Earnest Money absolutely. Further, if I/we fail to commence the work as specified, I/we agree that Commissioner Municipal Corporation, Chandigarh or his successors in office shall, without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the Performance Guarantee absolutely, otherwise the said earnest money shall be retained by him towards security deposit to execute all the works referred to in the tender

16



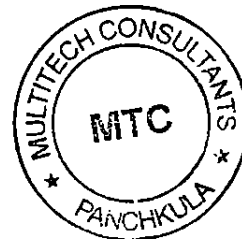
documents upon the terms and conditions contained or referred to therein and to carry out such deviations as may be ordered, upto maximum of the percentage mentioned in Schedule 'F' and those in excess of that limit at the rates to be determined in accordance with the provision contained in Clause 12.2, 12.3 and 12.5 of the tender form. Further, I/We agree that in case of forfeiture of earnest money or both Earnest Money & Performance Guarantee as aforesaid, I/We shall be debarred for participation in the re-tendering process of the work.

I/We hereby declare that I/we shall treat the tender documents, drawings and other records connected with the work as Secret / Confidential documents and shall not communicate information / derived there from to any person other than a person to whom I/we am/are may authorized to communicate the same or use the information in any manner prejudicial to the safety of the State.

Dated.....
Witness.....
Address.....
Occupation.....

Signature of Contractor.....
Postal Address.....

Telephone No
Fax:-
E-Mail:-



A handwritten signature in black ink, appearing to be a stylized letter 'P' or similar.

ACCEPTANCE

The above tender (as modified by you as provided in the letters mentioned hereunder) is accepted by me for and on behalf of the Commissioner Municipal Corporation, Chandigarh for a sum of **Rs..... (Rs.....)**

The letters referred to below shall form part of this contract agreement.

For & on behalf of the Commissioner Municipal Corporation, Chandigarh

i)


Signature.....

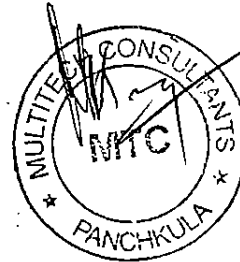
ii)

iii)

iv)

Dated.....


Executive Engineer





SCHEDULES

SCHEDULE 'A'

SCHEDULE OF QUANTITIES (in case of composite tender):

Description of items	Quantity			
	Civil Work	P.H. Work	Electrical work	Total
a) DSR Items	-Not Applicable since this is Lump Sum Work-			
b) N.S. Items				

Note : P.H. Work refers to Piping & Valves work

SCHEDULE 'B'

Schedule of materials to be issued to the contractor

Sr. No.	Description of items	Quantity	Rate in figures & words at which the material will be charged to the contractor	Place of issue
1.	2.	3	4.	5.
-- -To be arranged by the contractor - - -				

SCHEDULE 'C'

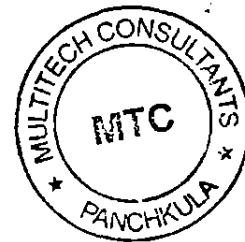
Tools and plants to be hired to the contractor

Sr. No.	Description	Hire charges per day	Place of issue
1.	2.	3	4.
-- -N A - - -			

SCHEDULE 'D'

Extra schedule for specific requirements/ documents for the work, if any

1.	Amendments/ Changes in Clauses of the General Conditions of Contract to CPWD Works – 2014	Page No.....
2.	Special Conditions	Page No.....
3.	Particular Specifications	Page No.....
4.	Annexures	Page No.....

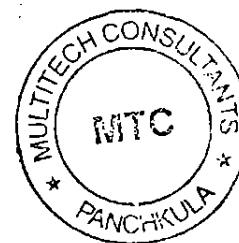


④

Schedule of component of other materials, Labour, POL etc. for price escalation:-

CLAUSE 10 CC

Component of civil (Except materials covered under clause 10CA)/ ——— 'Xm' — Nil %
Electrical construction materials expressed as percent of total value of work. — Nil %
Component of labour expressed as percent of total value of work. ——— 'Y' — Nil %
Component of P.O.L. expressed as percent of total value of work. ——— 'Z' — Nil %



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SCHEDULE 'F':-

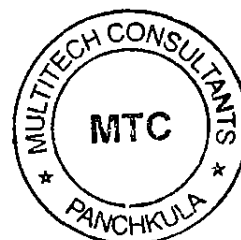
Reference to General Conditions of Contract. _____

- 1.1 Name of Work: DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH
- 1.2 Estimated Cost of work: - -----
- 1.3 Earnest Money: - **Rs. 60.00 Lacs**
- 1.4 Performance Guarantee 5.00 % of amount of contract
(Capital Cost + O & M Cost)
- 1.5 Operation and Maintenance Guarantee 1.00 % of amount of contract
(Capital Cost + O & M Cost)
- 1.5 Security Deposit 5.00% of running as well as final bill
- 1.6 Time Allowed **15 months**
- 1.7 The following expressions shall unless the context otherwise require have the meanings hereby specifically assigned to them.
- 1.7.1 Executive Engineer Executive Engineer
M.C.P.H. Division No 1,
Chandigarh.
Or Successor thereof
- 1.7.2 Superintending Engineer Superintending Engineer
M.C.P.H. Circle,
Chandigarh.
Or Successor thereof
- 1.7.3 Chief Engineer Chief Engineer
Municipal Corporation,
Chandigarh
Or Successor thereof
- 1.7.4 Delhi Schedule of Rates (DSR) DSR-2014 with upto date
corrections/ amendments
- 1.7.5 CPWD Specifications CPWD Specifications 2014 with upto
date amendments.

General Rules & Directions:-

Officer Inviting Tender: -

Executive Engineer,



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Maximum percentage for quantity of items of work to be executed beyond which rates are to be determined in accordance with Clauses 12.2, 12.3 & 12.5

As per clause 12 (Detail given below)

21:-

Engineer-In-Charge

Executive Engineer,

Accepting Authority for original works

Chief Engineer above **Rs** 90 lacs
Superintending Engineer above 15 lacs but upto **Rs** 90 lacs
Executive Engineer upto Rs 15 lacs

Percentage on cost of materials and labour to cover all overheads and profits

10%

Standard Schedule of Rates

Delhi Schedule of Rates 2014

Department

Public Health Wing of Municipal Corporation, Chandigarh

The order of preference:

In case of discrepancy between schedule of quantities, the specifications and/ or the Drawings, the following order of preference shall be observed:-

- (i) Nomenclature of item as per Schedule of Quantities
- (ii) Special Conditions.
- (iii) Particular Specifications.
- (iv) CPWD Specifications.
- (v) Architectural Drawings.
- (vi) Indian Standard Specifications of B.I.S.

Standard CPWD Contract Form:

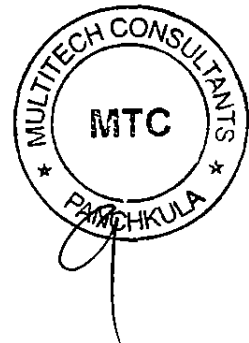
CPWD Form 7/8 as modified & corrected upto date with amendments as per Section-I.

Clause-1:-

- (i) Time allowed for submission of Performance guarantee after date of issue of letter of acceptance
- (ii) Maximum allowable extension with late fee @ 0.1% per day of performance Guarantee amount beyond the period as provided in (i)

7 days

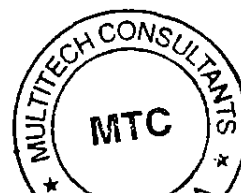
1 to 7 days



Clause -2:	Authority for fixing compensation	Executive Engineer
	i. Under clause-2. (For Original Works)	As per appropriate clause of CPWD Work Manual 2014
	ii. Whether clause-2A shall be applicable	No
Clause-5:		
	Time allowed for execution of work	15 months
	Authority to give fair and reasonable extension of time for completion of work.	As per appropriate clause of CPWD Work Manual 2014
	Mile Stone	Refer Para (A) Table of Milestones
Clause-6:		Applicable.
Clause - 6A:		Not Applicable.
Clause-7:-	Gross work to be done together with net payment / adjustment of advances for material collected, if any, since last such payment for being eligible to interim payment	Refer Para (B) Table of Milestones
Clause-10A:		
	List of testing equipment to be provided by the contractor at site lab	Yes
Clause-10-B (i)		
	Whether clause 10-B (i) shall be applicable	Yes
Clause-10-B (ii)		
	Whether clause 10-B (ii) shall be applicable	No
Clause-10C:		
	Component of labour expressed as percent of total value of work.	NA

Clause 10 CA

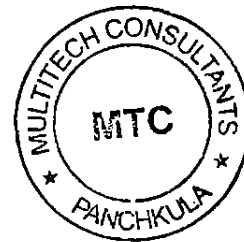
Materials covered under this clause:	Nearest material (other than cement, reinforcement bars and structural steel) for which All India Wholesale Price Index to be followed	Base Price of the materials covered under 10 CA issued vide CPWD No 1237 dated 23.7.2015
--------------------------------------	--	--



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		Basic price	Corresponding Period
.....NOT APPLICABLE.....			

Clause-10-CC:	Clause 10CC to be applicable in contracts with stipulated period of completion exceeding the period	N.A.
Clause-11:	Specifications to be followed for Execution of original work	C.P.W.D. Specifications
Clause-12:		
Clause-12(a)	Accord sanction of substituted items.	Appropriate clause of CPWD Works Manual 2014
Clause 12(b)	Accord sanction of extra items	-do-
12.2 & 12.3	Deviation limit beyond which clause 12.2 & 12.3 shall apply for building work	Any quantity increased/decreased shall be carried out by contractual agency at contractual rate. **
12.5	Deviation limit beyond which clause 12.2 & 12.3 shall apply	Any quantities increase/ decreased shall be carried out by the for foundation works contractual agency at contractual rate**
NOTE:	(**) 12.2 & 12.3 and 12.5 will not be applicable in case Nature of contract is supply of manpower for the work. Overall cost of the agreement shall not exceed 1.25 times (One point twenty five) of tendered amount.	
Clause-16:-	Competent Authority for deciding reduced rates.	As per appropriate clause of CPWD Works manual 2014 with latest modification.
Clause-18:	List of mandatory machinery tools & Plants to be deployed by the Contractor at site.	Upto date



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Type of Work:

Original Work (During Construction)

Clause-36


Sr. No	Minimum qualification of technical representative	Discipline	Designation (Principal Technical/ Technical Representative)	Minimum Experience	Number	Rate at which recovery shall. be made from contractor in the event of non deployment
1.	B.E./ B.Tech	Civil / Environment	Project Manager	10	1	40,000/- per month
2.	Diploma	Civil	Civil Engineer	5	2	18,000/- per month
3.	Diploma	Mechanical	Mechanical Engineer	5	2	18,000/- per month
4.	Diploma	Electrical	Electrical Engineer	5	1	18,000/- per month

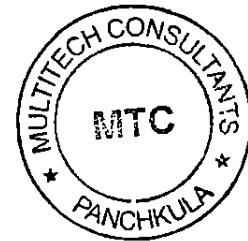
Assistant Engineers retired from Government Services that are holding Diploma will be treated at par with Graduate Engineers.

Clause-42:-

Not Applicable


SDE-16


EE MC PH-1





ANNEXURE – B
DECLARATION OF CONTRACT DOCUMENT BY THE CONTRACTOR/ BIDDER

1. I/We _____ have read the General and Special Conditions of the Contract which are appended to the bid and I/we agree to the conditions laid therein, if the Contract is awarded to me/us.
2. I/We have also read the specifications, studied the preliminary drawings and understood the scope of work included in the bid and to be executed by us.
3. I/We have visited the site of works and am/are well acquainted with the local practices, availability of the materials and labour and their prevailing market rates
4. I/We agree to abide by the departmental rules regarding deductions made in the bills like Income Tax, VAT, Labour Welfare Tax, Cess, Water charges (1.5% on total agreement amount) Security Deposits and Cost of Materials issued by the department etc.
5. I/We shall not ask for revision of rates due to any escalations in rates of materials or labour in the rates quoted by me/us in this offer through out the period of construction and completion of the works.
6. I/We undertake to complete the work and hand over the same within the stipulated/allotted time for the completion of the work in good workmanlike manner.
7. The offer is valid for a period of ~~90~~ days from the last Date of Submission of e-tender.
8. I/We stand guarantee for the rectification of the defects in the work, if any to the full satisfaction of the Engineer-in-charge as per clauses of agreement.
9. I/We have no doubts or un-cleared ambiguities regarding the specifications, details in the preliminary drawings, scope of work and have fully understood our responsibilities in executing and completing the work to the full satisfaction of the Engineer-in-charge.
10. I/We have based our Bid having the full knowledge of the statements and facts.

Place : _____

Signature _____

Date _____

Name _____

Address _____

Witness :

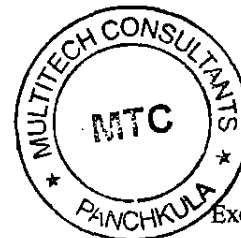
Name _____

Address _____

Contractor

Witness

26



Executive Engineer

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ANNEXURE 'C'
DEFINITIONS AND CLAUSES OF CONTRACT

Definitions:

In this contract as here in after defined, the following words and expressions shall have the meanings hereby assigned to them (except where the context requires otherwise):

1. The "Work" means the works as desired in the tender documents issued for the purpose of bidding including the start up/stabilization for 90 days or longer till stabilization.
2. The "Contract" means the documents forming the tendered offer and acceptance thereof constituting a binding contract between the Commissioner, Municipal Corporation Chandigarh and the contractor/bidder. The tender documents including the conditions, the drawings, design, the specifications supplemented with instructions issued from time to time by the Engineer-in-charge shall be binding on the parties in the stated order of precedence. All these/documents taken together with the tendered offer and its acceptance shall be deemed to form the contract and shall be complementary to one another.
3. The "Delhi Schedule of Rates" shall mean a printed document containing rates of different items of works published by Director General (Works), Central Public Works Department (CPWD), Nirman Bhawan, New Delhi 110011.
4. **"Completed Works" shall mean, the work completed in all respects as per laid down specifications, drawings, approved N.I.T. and Stabilization of MPS/STP for 180 days to the entire satisfaction of Engineer-in-charge. Operation & Maintenance of the plant for 120 months shall start after stabilization of the plant.**
5. The "contractor" / "bidder" shall mean the individual or firm or company whether incorporated or not, under taking the work and shall include the legal personal representative or the persons comprising such firm or company or the successors of such firm or company as well as the assignees of such individual or firm or company whose tendered offer has been accepted.
6. The "Completion date" is the date when the Engineer-in-charge certifies that the work including start up, stabilization and operation & maintenance has been completed satisfactorily.
7. "Communication" between parties are the written a signed letter, notices, reminders, memoranda and instructions recorded in the instructions book or books kept at site.
8. "Days & months" are calendar days and calendar months.
9. The "Engineer-in-charge" / "EIC" means The Executive Engineer, who shall supervise the work and administers the contract with the assistance of his authorized subordinates, who shall be in Charge of the work and who shall sign the contract on behalf of the Commissioner, Municipal Corporation Chandigarh.
10. The "Government" shall mean the Govt. of India / Commissioner, Municipal Corporation Chandigarh.
11. The "Site" shall mean the land and or other places in, on, into or through which work is to be executed under the contract or any adjacent land, path or street, which may be allowed to be used for the purpose of carrying out the contract.
12. The "Start date" is the date when contract came into existence upon the issue of "letter of acceptance" by the Engineer-in-charge and as notified in the letter of allotment.
13. The "Works or work" shall unless the context otherwise requires mean what the contractor is required to execute and hand over to the department.
14. "Scope of Work" shall mean the items of work to be executed at site of work pertaining to work allotted to the contractor/bidder.

Contractor

Witness

27



Executive Engineer

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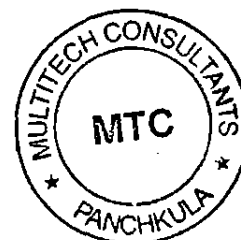
15. "Tender" means the documents downloaded by the contractor in e-tender.
16. 'Bid' means the documents submitted by contractor/bidder to whom tender has been issued.
17. "Contractor/Bidder" means the contractor/bidder/agency who submits the bid against the invitation for bid.
18. 'Award' means the written acceptance of bid by the department, to the successful contractor/Bidder.
19. 'Owner' or 'Client' or 'Department' means the Chandigarh Municipal Corporation. The words department; Executive Engineer, Public Health Division No 4; Engineer-in -Charge and his representatives have been used interchangeably at places and mean the same, i.e., the Executive Engineer, or his representatives.
20. "Consultant" means the consultant appointed by the department for the purpose of providing consultancy services.
21. "MPS" means Main Pumping Station.
22. "STP" means Sewage Treatment Plant.
23. "Drawings" means the drawings referred to in the list of drawings attached to the tender and any modification of such drawings approved/issued in writing by the Engineer-in-charge and such other drawings as may from time to time be furnished or approved in writing by the Engineer.
24. The "contract sum" means the sum identified in the contract for the completion of works as per contract.
25. "contractor/bidder's equipment" means all appliances or machinery of whatsoever nature materials or other things intended to form or forming part of the works.
26. "Portion of the work" means a part of the work or section of the work.
27. "Specifications" and "particular specifications" means the regulating guidelines contained in the CPWD specifications, Manual of Sewerage and Sewage Treatment, Manual on Water Supply and Treatment published by the Central Public Health and Environmental Engineering Organization (CPHEEO) under the Ministry of Works and Housing, Indian Standard specifications and codes, all of latest editions and those contained in the tender documents and also those based on good engineering practices.
28. "Time for completion" means the time as stipulated for completion of the works or any section or portion there-of as stated in the contract or as extended under clause and shall be calculated from the date specified in the contract. It will be the date when the contract enters into force for fulfillment of any obligation as per necessary legal, financial or administrative requirements.
29. "DEFECT LIABILITY PERIOD" i.e. 12 months means the period after actual completion of the work **(as mentioned at Sr. no.4above)** during which the contractor/bidder will carry the full liability to make good to the complete satisfaction of the Engineer-in-charge, any defects in the completed work or any bad work.
30. "Cost" means the amount which shall be deemed to include all overhead costs whether incurred on or off the site, all taxes, excise duties, royalties etc. as applicable on the materials, labour or any other item which is required to complete the works.
31. "Temporary Works" mean temporary works of every kind required in or about the execution of works.
32. "Permanent Works" mean the permanent works to be executed and maintained in accordance with the Contract.
33. "Construction / Working Drawing of a particular component / item / equipment of the Sewage Treatment Plant" means the detailed engineering drawing of that item submitted by the

Contractor

Witness

28

Executive Engineer



contractor/bidder and approved by the Engineer-in-charge prior to construction / fabrication / erection of that component, and based on which the same shall be carried out.

34. "As-built Drawing of a particular component / item / equipment of the Sewage Treatment Plant" means the engineering drawing submitted by the contractor/bidder prior to commissioning, showing the actual details on which the construction / fabrication / erection of that particular item has been carried out.

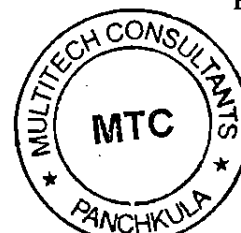
Note: In interpreting these "Clauses of Contract", singular also means plural, male means female and vice versa.

Contractor

Witness

28-A

Executive Engineer



DNIT FOR THE WORK OF:

DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH.

SECTION – II:

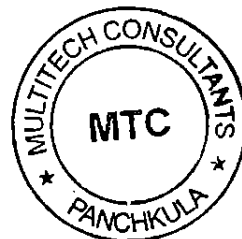
SPECIAL CONDITIONS

GENERAL:

1.0 General

- 1.1 Except for the items, for which Particular Specifications are given or where it is specifically mentioned otherwise in the description of the items in the schedule of quantities, the work shall generally be carried out in accordance with the "CPWD Specifications" (Refer Para 1.7.5 of Schedule F at **Page – 21** and as per instructions of Engineer-in-Charge. Wherever CPWD Specifications are silent, the latest IS Codes / Specifications shall be followed and the rates should be all inclusive.
- 1.2 Any reference made to any Indian Standard Specifications, shall imply to the latest version of that standard, including such revisions / amendments as issued by the Bureau of Indian Standards upto last date of receipt of tenders. **The Contractor shall keep at his own cost all such publications including relevant Indian Standard applicable to the work at site.**
- 1.3 **The work shall be executed and measured as per METRIC DIMENSIONS given in the Schedule of Quantities, drawings etc.** (FPS units wherever indicated are for guidelines only).

1.4 The work should be planned in a systematic manner so that chase cuttings in the walls, ceilings and floors is minimized. Wherever absolutely essential, the chase shall be cut using chase cutting machines. Chases will not be allowed to be cut using hammer / chisel. The electrical boxes should be fixed in walls simultaneously while raising the brick work. The contractor shall ensure proper co-ordination of various disciplines viz. sanitary & water supply, horticulture & electrical etc.
- 1.5 All the hidden items such as water supply lines, drainage pipes, conduits, sewers etc. are to be properly tested before covering.
- 1.6 Samples including brand / quality of materials and fittings to be used in the work shall be got approved from the Engineer-in-Charge, well in advance of actual execution and shall be preserved till the completion of the work.
- 1.7 Equipment like concrete pump excavators/Trains mixer etc. shall be allowed to be moved away from the site when, in written opinion of Engineer-in-charge, the same are no longer required at site work.



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The contractor his agents/representative workman etc. shall strictly observe orders pertaining to fire precautions prevailing in the area.

Contractors shall study the soil investigation report for the site available in the office of the Engineer-in Charge and satisfy about complete characteristics of soil and other parameters at site. Also, he shall get the soil investigation done independently to re-confirm the soil data. However, no claim on the alleged inadequacy of incorrectness of the soil data supplied by the department shall be entertained.

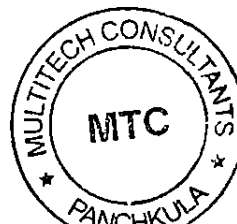
The tendered shall see the approaches to the site. In case any approach from main road is required at site or existing approach is to be improved and maintained for cartage of material by the contractor the same shall be provided improved and maintained by the contractor at his own cost.

Contractor shall take all precautionary measures to avoid any damage to adjoining property. All necessary arrangement shall be made at his own cost.

The contractor shall take all precautions to avoid accidents by exhibition necessary caution board day and night speed limit boards, red flags, red lights and providing barriers. He shall be responsible for all damages and accidents caused to work due to negligence on his part. No hindrances shall be caused to traffic, during the execution of the work.

The contractor shall take instructions from the Engineer-in-Charge regarding collection and stacking of materials at any place. No excavated earth or building rubbish shall be stacked on areas where other building roads compound wall services etc. are to be constructed.

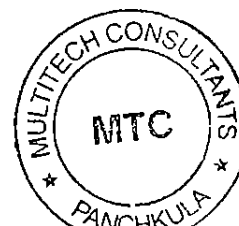
- 1.7.1 The contractor shall provide at his own cost suitable weighing, surveying and leveling and measuring arrangements as may be necessary at site for checking. All such equipments shall be got calibrated in advance from laboratory, approved by the Engineer-in-Charge. Nothing extra shall be payable on this account.
- 1.8 Contractor shall provide permanent bench marks, flag tops and other reference points for the proper execution of work and these shall be preserved till the end of work. All such reference points shall be in relation to the levels and locations, given in the Architectural and plumbing drawings.
- 1.9 The Architectural drawings other than those indicated in nomenclature of items are only indicative of the nature of the work and materials/fittings involved unless and otherwise specifically mentioned.
- 1.10 Other Agencies may also simultaneously execute and install the works and the contractor shall afford necessary facilities for the same. The contractor shall leave such recesses, holes, openings, trenches etc. as may be required for such related works (for which inserts, sleeves, brackets, conduits, base plates, clamps etc. shall be available as specified elsewhere in the contract) and the contractor shall fix the same at the time of casting of concrete, stone work and brick work, if required, and nothing extra shall be payable on this account.
- 1.11 The contractor shall execute his work, so as not to interfere with or hinder the progress or completion of the work being performed by other contractor(s) or by the Engineer-in-Charge



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and shall as far as possible arrange his work and shall place and dispose off the materials being used or removed so as not to interfere with the operations of other contractor or he shall arrange his work with that of the others in an acceptable and coordinated manner and shall perform it in proper sequence to the complete satisfaction of others.

- 1.12 All material shall only be brought at site as per program finalized with the Engineer-in-Charge. Any pre-delivery of the material not required for immediate consumption shall not be accepted and thus not paid for.
- 1.13 **The contractor shall procure the required materials in advance so that there is sufficient time for testing of the materials and approval of the same before use in the work.**
- 1.14 Existing drains, pipes, cables, over-head wires, sewer lines, water lines and similar services encountered in the course of the execution of work shall be protected against the damage by the contractor at his own expense. The contractor shall not store materials or otherwise occupy any part of the site in a manner likely to hinder the operation of such services. In case temporary supporting/shifting of such services is required to facilitate the work, the same shall be done by the contractor at no extra cost.
- In case the existing services are to be shifted permanently, then before dismantling the existing services, alternate/diversion of service lines has to be laid by the contractor so that there is no interruption in use of existing services. The contractor has to plan the alternate suitable route for diversion/shifting of service lines and get the same approved from the Engineer-in-Charge before starting shifting of services. Nothing extra shall be paid except the payment of dismantling and laying of new service lines as per conditions of contract.
- 1.15 The contractor shall be responsible for the watch and ward / guard of the buildings/services, safety of all fittings and fixtures including sanitary and water supply fittings and fixtures provided by him against pilferage and breakage during the period of installations and thereafter till the building is physically handed over to the Department. No extra payment shall be made on this account.
- 1.16 The contractor shall be fully responsible for the safe custody of materials brought by him/ issued to him even though the materials may be under double lock key system.
- 1.17 For construction works which are likely to generate malba / rubbish to the tune of more than a tempo / truck load, contractor shall dispose of malba, rubbish & other unserviceable materials and wastes at his own cost to the notified specified dumping ground and under no circumstances these shall be stacked / dumped even temporarily, outside the construction premises.
- 1.18 The excavated surplus earth shall be disposed off by the contractor as per directions of Engineer-in-Charge.
- 1.19 In case, of an accident during the execution of work or at the time of testing, the compensation for loss of human life or material shall be borne by the contractor and nothing extra shall be payable to him on this account.
- 1.20 **The work during its progress and subsequently at any stage can also be inspected by the Chief Vigilance Officer/Chief Technical Examiner on behalf of Engineer in charge and agency shall responsible for compliance of the**



observations raised by the Chief Vigilance Officer/Chief Technical Examiner including any recoveries proposed thereof.

- 1.21 All disputes concerning with this work/tender are subject to the Chandigarh jurisdiction.
- 1.22 The contractor should have / obtain ESI / EPF registration/ Labour License from the concerned department of Chandigarh Administration and shall submit proof of the same to the department before the start of O&M period.
- 1.23. During Operation & Maintenance Period, the contractor will pay prevailing DC labour rate and ESI/EPF to the manpower for O&M and shall submit the proof of the same to the department, failing which the department shall deduct the labour rate and ESI, EPF etc from the running bills of the contractor. All payments to the manpower shall be made through cheques / RTGS only.

2.0 Unless otherwise specified in the schedule of quantities, the rates for respective items shall be all inclusive and apply to the following: -

(i) All lifts & all heights, floors including terrace, leads and depths.

(ii) All labour, material, tools and plants and other inputs involved in the execution of the item.

(iii) Any of the conditions and specifications mentioned in the tender documents.

(iv) Performance test of the entire installation(s) before the work is finally accepted.

(v) All incidental charges for cartage, storage and safe custody of materials brought to site.

(vi) Pumping/building out surface water/ rain water/ sub soil water if necessary for any reason.

3.0. **TESTING OF MATERIAL: -**

3.1 Samples of materials required for testing shall be provided free of charge by the contractor. The cost of tests shall be borne by the contractor / department in the manner indicated below: -

- a) By the contractor, if the results show that the material does not conform to relevant specifications.
- b) By the department, if the results show that the material conforms to relevant specifications.

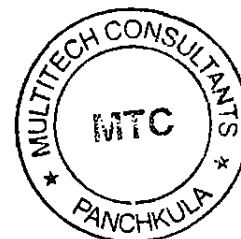
All other expenditure required to be incurred for taking samples; conveyance, packing etc. shall be borne by the contractor himself.

4.0 **SECRECY**

4.1 The contractor shall take all steps necessary that all persons employed on any work in connection with the contract have notice that the Indian Official Secrets Act 1923 applies to them & will continue so to apply even after the execution of such works under the contract.

4.2 The contract in confidential and must be strictly confirmed to the contractor's own use (except so far as confidential disclosure to sub-contractors or suppliers as necessary) and to the purpose of the contract.

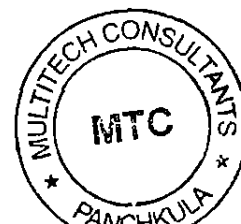
4.3 All documents, copies thereof & extracts there from furnished to the contractor shall be returned to the Engineer-in-Charge on the completion of the work ; works or the earlier determination of the contract.



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5.0 LABOUR AND SECURITY

- 5.1 Contractor should provide his plan for labour huts as per his requirement and get it approved from the Engineer-in-Charge. The contractor will be provided space for labour huts etc. inside the campus but the space requirement and location, as assessed by Engineer-in-Charge shall be final and binding.
- 5.2 Contractor has to follow the security requirement of the campus and obtain necessary entry passes for the labour and vehicles and follow security checks at entry / exit gates, restriction on movement of vehicle, restricted timings of working etc. The Department however shall assist the contractor in obtaining such passes for movement of vehicles and labour. No claim whatsoever shall be entertained on account of delay in entry of vehicles and labour including restrictions in working hours, if there is any.
- 5.3 The contractor shall employ only Indian Nationals after verifying their antecedents and loyalty. The contractor shall, on demand submit list of his agents, employees and work people concerned & shall satisfy as to the bonafides of such people.
- 5.4 The contractor & his work people shall observe all relevant rules regarding security promulgated in which work is to be carried out by the Controlling Administrative Authority of the campus/area (hereinafter referred to as "Administrator").
- 5.5 The contractor, his representative, workman shall be allowed to enter through specified gates & timing as laid down by the controlling authority. They shall be issued an identity card or an individual pass in accordance with the standing rules & regulations & they should possess the same while working. The contractor shall be responsible for the conduct & actions of his workman, agents / representatives.
- 5.6 Normally contractor shall be allowed to carryout work between 7 AM to 6 PM. However, he may also be allowed to carryout the work beyond 6 PM & upto 7 AM if the site conditions / circumstances so demand with prior written permission from the "Administrator". However, if the work is carried out in more than one shift or at night, no claim on this account shall be entertained.
- 5.7 Normally contractor's material / vehicles etc shall be allowed to move in / go-out between 7 AM to 7 PM only & no movement of material / vehicles out of site of work shall be allowed during night hours unless specific permission is obtained from the Competent Authority.
- 5.8 In case if a separate entry has been allowed, the contractor has to make all arrangement for making a separate entry gate and barricading of the working area to segregate/separate the same from other areas. All these have to be done by the contractor at his own cost including safeguarding any untoward incident in the restricted area due to separate entry gate and barricading arranged by the contractor. No extra amount on this account shall be payable by the department.



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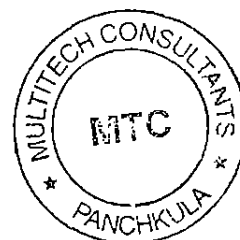
6.0 TRANSPORTATION AND OFFICE INFRASTRUCTURE:

- 6.1 In order to complete the work within the scheduled time if the contractor shall be required to do the work in more than one shift and accepted by the department the contractor will provide vehicular facilities to the CPWD site staff to reach the site and their residence at his own cost for their services required beyond the normal office hours. In case the contractor fails to provide the facilities Engineer-in-Charge shall be at liberty to make the arrangement themselves and deduct the respective cost from the contractor's bills.
- 6.2 For Quality Control Measures, Preparation of Bills and Monitoring the Quality, the contractor should have (min. one number) Computer having MS-Windows XP, A-3 Coloured Inkjet & A-4 Laserjet Printers, Scanners, UPS etc. with required number of data entry operator in the site office.

7.0 PROGRAM CHART: -

- 7.1 The Contractor shall prepare an integrated program chart for the execution of work, showing clearly all activities from the start of work to completion, with details of manpower, equipment and machinery required for the fulfillment of the program within the stipulated period or earlier and submit the same for approval of the Engineer-in-Charge within **15 days** of the issue of letter of acceptance for the contract.
- 7.2 The work has to be completed in stages as indicated in the **Milestones under Schedule 'F'** and the program should be prepared in such a manner to achieve these Milestones as indicated therein or earlier.
- 7.3 The program chart should include the following: -
- a) Descriptive note explaining sequence of various activities.
 - b) Network (PERT / CPM / BAR CHART) which will indicate resources in financial terms, manpower and specialized equipment for every important stage.
 - c) Program for procurement of materials by the contractor.
 - d) Program of procurement of machinery / equipments having adequate capacity, commensurate with the quantum of work to be done within the stipulated period, by the contractor.
- 7.4 If at any time, it appears to the Engineer-in-Charge that the actual progress of work does not conform to the approved program referred above, the contractor shall produce a revised program showing the modifications to the approved program by additional inputs to ensure completion of the work within the stipulated time.
- 7.5 The submission of revised program or approval by the Engineer-in-Charge of such program or the furnishing of such particulars shall not relieve the contractor of any of his duties or responsibilities under the contract. This is without prejudice to the right of Engineer-in-Charge to take action against the contractor as per terms and conditions of the agreement.

Notwithstanding the fact that the contractor will have to pay to the labourers and other staff engaged directly or indirectly on the work according to the provisions of the labour regulations and the agreement entered upon and/or extra amounts for any other reason.



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8.0 PROGRESS AND MONITORING OF WORK:

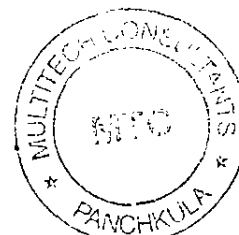
Contractor shall give the Engineer-in-Charge on the 10th day of each month, progress report of the work done during the previous month. Such progress report will include the project progress summary, work progress (planned v/s. actual), PERT chart, milestone status, financial progress status, manpower deployment status, important materials consumed, materials at site at the beginning of the month, materials consumed during the month and the balance quantities at the end of month and progress of the work stating the reasons for shortfall, if any including the steps and measures to be taken for making good the shortfall in the succeeding period. Non submission of aforesaid progress report shall make contractor liable for action under breach of contract conditions.

9.0 SAMPLE OF MATERIALS:-

- 9.1 All materials and fittings brought by the contractor to the site for use shall conform to the samples approved by the Engineer-in-Charge which shall be preserved till the completion of the work. If a particular brand of material is specified in the item of work in Schedule of Quantity, the same shall be used after getting the same approved from Engineer-in-Charge. Wherever brand / quality of material is not specified in the item of work, the contractor shall submit the samples as per **List of Preferred Makes as at Page No.** for approval of Engineer-in-Charge. For all other items, ISI Marked materials and fittings shall be used with the approval of Engineer-in-Charge. Wherever ISI Marked material / fittings are not available, the contractor shall submit samples of materials / fittings manufactured by firms of repute conforming to relevant Specifications or IS codes for the approval of Engineer-in-Charge.
- 9.2 To avoid delay, contractor should submit samples as stated above well in advance so as to give timely orders for procurement. If any material, even though approved by Engineer-in-Charge is found defective or not conforming to specifications shall be replaced / removed by the contractor at his own risk & cost.
- 9.3. BIS marked materials except otherwise specified shall also be subjected to quality test besides testing of other materials as per the specifications described for the item/material. Wherever BIS marked materials are brought to the site of work, the contractor shall, furnish manufacturer's test certificate or test certificate from approved testing laboratory to establish that the material procured by the contractor for incorporation in the work satisfies the provisions of specifications relevant to the material and / or the work done.
- 9.4 For certain items, if frequency of tests is neither mentioned in the CPWD Specifications & BIS, then tests shall be carried out as per decision of Engineer-in-Charge.

10.0 CONSULTANT FOR QUALITY CONTROL

It is expected that every contractor will have proper quality control staff and procedure in order to insure quality. They are also expected to improve their procedure in line with ISO 9000 and get certification. **For all works amounting to more than Rs. 2.00 crores**, the contractor shall engage a competent and independent quality control consultant as approved by Superintending Engineer-in-Charge of work to exercise effective control over the construction operation in the field so as to produce quality works. The fully equipped



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laboratory shall be set up at site of work and trained staff shall be employed by the said consultant. The contractor shall supply to the Engineer-in-Charge a copy of his agreement and fee for quality control shall be 1.5% of the contract value. The payment to quality control consultant shall be made by the Engineer-in-Charge direct as per the copy of the agreement supplied by contractor. This payment will be recoverable from the contractor. The consultant will guide the contractor for production of quality works at all stages and shall maintain records, reports and test results so as to indicate the extent of quality achieved the consultant will also supply a copy of all these reports, test and check to Engineer-in-Charge regularly. The contractor shall also attach a copy of these report, test and check with his bill without which no payment shall be made. The Engineer-in-Charge can also order the change of consultant if in his opinion they are not performing competently. The Engineer-in-Charge will be free to conduct surprise, random or in-situ checks so as to have cross check on quality. In case the contractor fail to employ for the whole of part of the period of execution a quality control consultant, Engineer-in-Charge may order employment of a consultant at the cost of the contractor or may order the departmental staff to carry out the quality control checks and a deduction at the rate of 1.5% of the total cost of the work shall be deducted from the bill of contractor even if the actual expenditure included in private consultant or departmental quality control is less, Nothing in this clause shall reduce the overall responsibility of the contractor regarding quality and he shall remain liable for any defect in the execution.

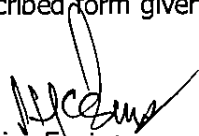
CONDITIONS

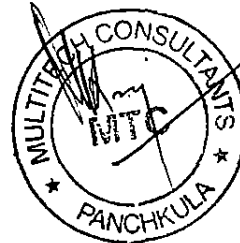
1. All items will be supported by the rate as per DSR 2014 with upto date amendments whereas the same will be applicable to the items taken in the schedule of items of work in the DNIT. The rates of non DSR items shall be as per market rates as the case may be.
2. No objection will be entertained from the contractor in case any mistake in description, rate or units occurs in any of the items in the schedule, while preparing this schedule on account of typing or comparison or over sighting. If there will be any such mistake the same shall be rectified at any time as per Delhi Schedule of Rates along with the amendments received from time to time by the Engineer-in-Charge.
3. If any non schedule item will be carried out by the contractor on the order of the Engineer-in-Charge that will be paid as approved by the competent authority of the Department.
4. The item of work can be decreased or increased by the Engineering-in-Charge at any time keeping in view the scope of work at site. No objection will be entertained from the contractor on this account.
5. **The conditional tenders are liable to be rejected.**
6. **The contractor will rectify the defects free of cost till the handing over of the project to the department.**
7. The Executive Engineer reserves the right to add or delete any of the items of the DNIT and no claim from the contractor will be entertained on this account.

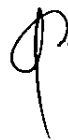


8. **In case the contractor fails to submit the COMPLETION PLAN (in duplicate) after completion of work, he shall be liable to pay a sum of equivalent to 1.0% of the value of the work.**
9. That the contractor shall comply with the provision of the contract labour (Regulation and Abolition) Act, 1970 and the rules made there under as extended by the Contract labour (Regulation and Abolition) Rules, 1974.
10. **No MOBILIZATION ADVANCE shall be paid to the contractor** as per instructions vide Home Secretary, U.T. Chandigarh No. 62845 dt. 13.07.04 and Technical Examiner Govt. of India CVC No. 4CC-1-CTE-2 dated 8.6.2004.
11. VAT (WCT) will be deducted from the contractor as per clause 27 of chapter-V of notification date 15.2.2005 of Govt. of India Regarding value Added Tax Act 2005 as applicable.
12. The undersigned reserve the right to reject any or all the tenders without assigning any reason.
13. The Contractor should provide proper fencing/parapet for all digging works with minimum required height to avoid any accident at his own cost.
14. The Contractor will obtain Registration Certificate under the Building and other construction worker's Act and Rules made there under from Registering Officer / Officer and Assistant Labour Commissioner UT Chandigarh to comply with all the provision of Act and Rules made there under mentioned.
15. **The payment on account of water charges @ 1.5% of the value of the work done and labour cess @ 1.0% of the value of the work done shall be recovered from running bills.**
16. The completion cost of agreement for maintenance works including works of up-gradation, aesthetic, special repair, addition/alteration. Extra/substituted items if required to be executed at site shall be paid as per Clause 24.2 Section 24 of CPWD Manual 2014.
17. **PERFORMANCE GUARANTEE**
 1. The successful tenderer, hereafter referred to as the contractor, shall deposit an amount equal to 5% of the tendered and accepted value of the work (without limit) as performance guarantee in one of the following forms:-

An irrevocable Bank Guarantee Bond of any scheduled bank in the prescribed form given in Annexure.


Executive Engineer,
M.C.P.H. Division No 1,
Chandigarh





DNIT FOR THE WORK OF:

DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH

SECTION – III:

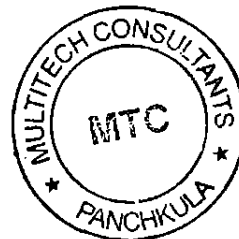
SCOPE OF WORK

1. The scope of work shall include but not limited to the following:

- (i) Planning, designing and construction of civil engineering works for all the units and all the ancillary structures.
- (ii) Planning, designing, supply, erection, testing & commissioning of all the mechanical equipments.
- (iii) Planning, designing, supply, erection, testing & commissioning of all the electrical and instrumentation equipments.
- (iv) Planning, designing, supply, erection, testing & commissioning of all the piping, valves and specials etc.
- (v) Hydraulic testing of all the water retaining structures.
- (vi) Operation & Maintenance of Main Pumping Station and Sewage Treatment Plant for a period of 120 months after successful Stabilization Period of 180 days.
- (vii) Defect liability for a period of twelve (12) months after completion of works.
- (viii) Supply of equipment drawing, technical specification / catalogue.
- (ix) Supply of as-built drawings after completion.
- (x) Manufacturer's Manual for Operation & Maintenance of the equipment supplied.


2. Time Schedule and Earnest Money Deposit

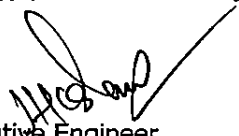
Sr. No.	Description	Completion Time	Earnest Money Deposit
	Design, Construction, Supply, Installation, Testing and Commissioning of 5 MGD (22.73 MLD) capacity Sewage Treatment Plant (STP) & Main Pumping Station (MPS) based on Sequential Batch Reactor (SBR) technology and all other works contingent thereto along with Operation and Maintenance for a period of 120 months after successful completion of Trial Run for a period of 180 days at Maloya Chandigarh.	15 months	60.00 Lacs (Rupees Sixty Lacs Only)
	Start-up and Stabilization Period	180 days	
	Operation and Maintenance Period after Start-up and Stabilization	120 Months	

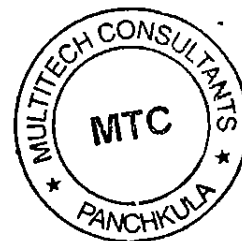


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MOU with Technology Provider: The bidder shall submit, along with his bid, Memorandum of Understanding / Agreement signed with the technology provider, as per the Performa given in the tender document. If any technology provider enters into MoU with more than one bidder, he shall be bound to give same terms, conditions and rates to all bidders who wish to enter into MoU with this technology provider. In such case, the department shall be at liberty to request the technology provider to provide proof thereof. Also, MoU between the technology provider and the contractor shall be made part of the bid / contract. Both the contractor and technology provider shall be jointly and severally responsible for the performance of the plant.


Sub Divisional Engineer,
M.C.P.H. Sub Division No 16,
Chandigarh.


Executive Engineer,
M.C.P.H. Division No 1,
Chandigarh





**SECTION – IV:
GENERAL TERMS & CONDITIONS**

(A) GENERAL TERMS & CONDITIONS:

1. The quantity given against such item in the schedule can be reduced or increased by the EIC at any time; no objection or any claim from the contractor will be entertained on this account.
2. No claim will be entertained from the contractor in case of mistake in description, rates, units, taken in the schedule during preparation or on account of typing or comparison or over sighting, if there is any mistake in DNIT regarding description, rates, units, taken in the schedule that will be rectified at any stage.
3. ~~If any non-DSR item is required to be carried out by the contractor on the order of E.I.C. its rates will be approved by the competent authority.~~
4. The Engineer-in-charge reserves the right to accept or reject any/all tenders without assigning any reason.
5. The contractor shall comply with the provision of the contractor labour (Regulation & Abolition) Act, 1970 and the rules made under as extended by the contractor labour (Regulation & Abolition) Rules, 1974.
6. The contractor will be responsible for the damage caused to the cable of P&T or any other agency's cables during the execution of work. He should inviolably inform to authority in-charge of cables in writing prior to taking excavation works failing which the debit raised by the P&T/other agency/Department for such damage caused by the contractor will be recoverable from him.
7. The agency will provide caution tapes/ signs around the work/ excavated trenches/ pits, manholes / *roof edges* etc. with his own cost otherwise 1% (one percent) Penalty of total work will be deducted and in case of any mishap due to non providing the cautionary measure, the agency will be responsible for the same.
8. **The payment on account of water charges @ 1.5% of the value of the work done and labour cess @ 1.0% of the value of the work done shall be recovered from running bills. Any revision in rates will be applicable during contract period.**
9. The payment would be made as per component-wise payment break-up to be submitted by the contractor after award of work after deduction of 5% security and other charges etc.
10. The income Tax and other statutory taxes/charges shall be deducted from the contractor's bills as per Govt. rules.
11. No material of any kind will be issued by the Department for execution of the work.
12. The rates quoted should be firm inclusive of all taxes duties and other statutory taxes etc. Any variation in the statutory charges shall be borne by the contractor without any extra cost to the Deptt.
13. The department reserves right to choose any one of the make while placing the work order. The department also reserves the right to change the make of any item of supply provided the same is found to be equally suitable from performance point of view and price wise etc. Make of any other item not specified above shall be subject to the approval by the E.I.C.



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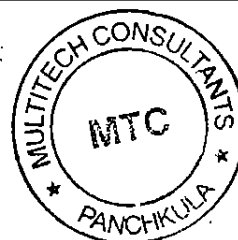
14. The work shall be carried out as per CPWD/IS specifications with latest edition amended up to date.
15. The dispute if any shall be settled only at Chandigarh and decision of Engineer-in-charge shall be final and binding on the contractor.
16. The intending contractors are advised to visit the site before tendering. No claim on account of ignorance of site conditions shall be entertained later on.
17. In case of failure or default in the performance or responsibilities or breach of terms and conditions of DNIT or agreement, action as per "Policy on blacklisting, 2009" issued vide Finance Department, Chandigarh Administration Notification No. 1927-F& PO (3)-2009/1170 dated 27.02.2009 shall be taken.
18. The quoted rates should remain valid for 90 days from the date of opening of tenders. Any contractor who withdraws or modifies offer within this period is liable to be blacklisted and earnest money forfeited.

(B) TECHNICAL TERMS & CONDITIONS

22. The work shall be carried out as per CPWD/IS specifications with latest edition amended up to date.
23. The scope of work to be carried out by the Contractor is as mentioned under SECTION-III of the DNIT i.e. DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH.
24. Guarantee period: The installations covered under contract shall operate satisfactorily and the performance and efficiency of all components shall be guaranteed till the taking over by the department. The services of the contractor's personnel, if requisitioned, during this period of such works, shall be made available free of any cost to the department. If defects are not remedied within the defect liability period, the Engineer-in-charge shall proceed to get the defects remedied at Contractor's risk and cost. The contractor would provide a performance bank guarantee for all components of the project to be free from any defects such as defective material, bad workmanship and defective designs @5% of the contractor cost of this guarantee period.

SCOPE MATRIX

SNo	Description	Time	Contractor Scope	Department Scope
1	Construction upto completion	As per time limit specified in tender	Water, Electricity, Diesel, Manpower etc	-Nil-
2	Commissioning and Trail Run	6 months or more after successful commissioning till full satisfaction of Engineer-in-charge	Chemicals, Manpower, Repair, Spares & Maintenance, Disposal of sludge.	Water, Sewage, Electricity & Diesel for Genset



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3	Defect Liability Period along with O&M	2 years after successful trail run	Manpower, Chemicals Repair, Spares & Maintenance, Disposal of sludge.	Water, Sewage, Electricity & Diesel for Genset
4	Operation & Maintenance (O&M)	8 years after successful defect liability period	Manpower, Chemicals, Repair, Spares & Maintenance, Disposal of sludge.	Water, Sewage, Electricity & Diesel for Genset

Note : Payment for above shall be as per Volume-4 Price Schedule.

25. Inspection: The major components for bonafide use of the work shall be tested at manufacture's premises, as per provision laid down in the relevant IS code with up to date amendments. The tenderers will have to give reasonable advance notice after making adequate testing arrangements with them for the equipments to be supplied. The inspection will be carried out by the Executive Engineer-in-charge of work or any his representative as fixed by the Circle/Chief Engineer office and after conduct of the inspection by the authorized officer, a detailed copy of the inspection note (clearly mentioning the test conducted and results thereof) shall also be submitted to circle office in addition to the inspection note to be submitted to Executive Engineer. Any deviation from above may result in rejection of the material/ equipments. The copy of inspection report should also accompany the running bill so as to release the payment against supply. The department will also have the right to get the material inspected from the 3rd party. 3rd party inspection charges, if any, will be borne by the department.

(C) FINANCIAL TERMS & CONDITIONS

26. TERMS OF PAYMENT

THE TERMS OF PAYMENT ARE MENTIONED IN VOLUME-4 OF THIS TENDER

27. No secured advance or mobilization advance shall be paid by the Department.

28. After the issuance of letter of intent, the performance guarantee @ 5% of the contract value as per CPWD works manual shall have to be deposited by the successful contractor to the Department. The allotment letter shall be issued only on receipt of Performance Guarantee.

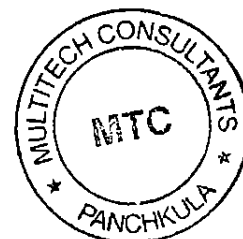
29. The payment on account of work done on the allotted rates shall be made to the contractor after deduction of security deposit @ **5.00%** and other charges etc from running bills as well as the final bill of the contractor.

30. The Security Deposit and Performance Guarantee shall be refunded after the completion of work done. 5% security deducted from running bills shall be refunded after 3 months of completion of successful trial run.



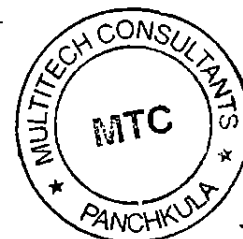
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31. Service Tax as/if applicable shall have to be deposited by the Contractor directly to the concerned authority and the same if due, shall be reimbursed as per actual on by the Department to the Contractor on production of documentary evidence of having depositing the same with the concerned authority.
32. The tenderer shall bear all costs associated with the preparation and submission of his tender and the department shall in no case be liable for these costs.
33. Each tenderer shall submit only one tender. Any tenderer / contractor who submits or participates in more than one tender, will be disqualified.
34. Unless otherwise stated, the contract shall be for the whole work as described in the Scope of work and the approved drawings. The contractor shall be bound to complete the whole work as described in the scope of work and the approved drawings including the additional items if any as per approved drawings and instructions. The certificate of completion as issued by the Engineer-in-charge shall be the conclusive proof of completion of work.
35. Wherever required under Government regulations, it shall be incumbent on the successful contractor/bidder to pay stamp duty on the contract agreement as per ruling on the date of execution of the contract agreement.
36. At any time prior to the deadline for submission of bids, the Executive Engineer may, for any reason, whether at his own initiative or in response to clarification requested by prospective bidders, modify the tender documents by issuing Addenda. Such Addenda will be sent to all prospective bidders who have received the tender documents and will be binding upon them. The bidders shall duly sign and return the Addenda along with their bids which shall form a part of their bids. Non-receipt of Addenda by the bidders will not form basis for any claim whatsoever.
37. In order to afford prospective bidders reasonable time in which to take such Addenda into account in preparing their bids, the Executive Engineer may, at his discretion, extend the deadline for the submission of bids.
38. The contractor/bidder shall quote for the entire works on a "single responsibility" basis such that the total Lump Sum Price covers all the obligation mentioned in or to be reasonably inferred from the tender documents in respect of the design, drawings including procurement, delivery, construction, erection and completion of works. This includes all requirements under the contractor's responsibilities for testing and commissioning of the works.
39. No interest shall be paid on Earnest Money / Security Deposit.
40. In exceptional circumstances, prior to expiry of the original bid validity period, the Executive Engineer may request the bidders for a specified extension in the period of validity. The request and the response thereto shall be made in writing. A bidder agreeing to the request will not be permitted to modify his bid on his own but will be required to extend the validity of his bid and Bid Security correspondingly. The provision regarding discharge and forfeiture of Bid Security shall continuously apply during the extended period of bid validity.
41. If a bid is made by a limited company or a limited corporation, it shall be signed by a duly authorized person holding Power of Attorney for signing the bid in which case, a certified scope of the Power of Attorney shall accompany the bid.
42. To assist him in the examination, evaluation and comparison of bids, the Executive Engineer may ask bidders individually for clarification of their bids including breakdown of unit rates / price. The request for clarification and the response shall be in the writing, but no change in the price or substance shall be sought, offered or permitted on bidders' desire except as required to confirm the correction of arithmetical errors discovered by the Executive Engineer during the evaluation of bids.



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43. The contractor/bidder should note that this is a Lump Sum Price Turnkey tender. The bidder shall give rate for complete work and also give unit wise/sub-unit wise rate just to facilitate Schedule of Payments. However, his proposal is subject to scrutiny and approval. He shall, therefore, take utmost precaution to offer standard equipment manufactured by only reputed manufacturers (wherever the makes are specified in the DNIT, only the same shall be offered).
44. The bidder should note that after the tenders are opened, all modifications, corrections, changes shall be carried out entirely to the satisfaction of the Engineer-in-charge at no extra cost to Government. The contractor/bidder shall not be allowed to change the Price quoted on his own.
45. All initial defects shall be rectified to the entire satisfaction of the Engineer-in-charge. Damaged or non-working parts shall be replaced at no extra cost to Government. The equipments supplied and erected by the bidder shall be guaranteed for 12 months from the Date of Stabilization of MPS & STP.
46. Contractor shall arrange water & electricity connection (including cost of establishment of electric connection) at his own expense during execution of the project. Service Water during stabilization and O&M period shall be taken by the contractor through existing water supply line near the STP site as mentioned in the DNIT. Water required for hydro testing of various structures shall also be taken by the contractor through existing water supply line near the STP site as mentioned in the DNIT.
47. The work will be carried out strictly in accordance with CPWD Specifications with up-to-date amendments / relevant IS codes.
48. The Department shall not issue any material.
49. The performance of the plant operated under design conditions as specified in the bid documents shall be guaranteed for its process performance i.e. performance of the individual units and the total treatment plant, ultimate quality of the treated effluent for the influent conditions, guarantee for utilities including power and chemical consumption as specified in the process. In the event that certain of the guaranteed performance have not been met during the performance guarantee period, the bidder shall make suitable additions, deletions or modifications, if required to the process and the plant to ensure the guaranteed results without making any change in consumable items. All the costs incurred for such additions, deletions or modifications as mentioned above shall be borne by the contractor without any liability on the part of the Department.
50. The successful bidder shall furnish 5% of the Contract Amount as Performance Guarantee during construction period and 1% of the Contract Amount as Performance Guarantee during operation & maintenance period. Out of this, the technology provider shall provide 20% Performance Guarantee in shape of Bank Guarantee during construction period and operation & maintenance period as well. The balance shall be provided by the bidder.
51. Submission and Approval of Drawings :
 - a. Time Schedule for Submission of drawings from Letter of Acceptance:
 - i. Submission of process design for approval : Within 4 weeks of allotment of work.
 - ii. Submission of structural design based on approved process design : Within 6 weeks of approval.
 - iii. Mechanical / Electrical design and drawing shall be submitted by the agency within 2 weeks complete in all respects.



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- b. Approval of design / drawings:
All the drawings / design shall be got vetted from Punjab Engineering College (PEC), Sector 12, Chandigarh or any NIT / IIT before the approval by the department. The process, structural, electrical, mechanical design shall be designed strictly according to tender document, Contractor's bid and Manual of Sewerage and Sewage Treatment (Latest Edition) quoting reference number as well as structural, electrical and mechanical design strictly according to latest relevant IS Codes.
52. Contractor can make his site office, labour colony etc within the STP premises as shown in Site Survey Plan. This will be purely on temporary basis till completion of construction of the project.
53. Mobilization advance shall not be provided by the department.
54. Any other aspect not covered above shall be applicable in accordance with the relevant clause(s) of the CPWD works Manual.

NOTE : IN CASE OF ANY AMBIGUITY / DISCREPANCY DURING EXECUTION RELATING TO ANY TECHNICAL, FINANCIAL OR ANY OTHER CLAUSE, THE DECISION OF ENGINEER-IN-CHARGE WILL BE FINAL AND BINDING.

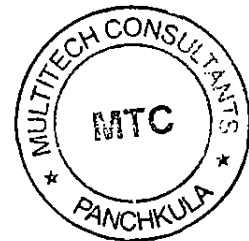

Executive Engineer,
M.C.P.H. Division No. 1,
Chandigarh



DNIT FOR THE WORK OF:

DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH

ANNEXURES



R

FORM OF PERFORMANCE SECURITY
BANK GUARANTEE BOND

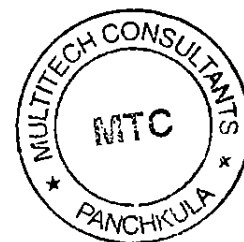
In consideration of the Commissioner, Municipal Corporation Chandigarh (hereinafter called "The Government") having offered to accept the terms and conditions of the proposed agreement between _____ and _____ (hereinafter called "the said contractor(s)" for the work _____ (hereinafter called "The said agreement") having agreed to production of a irrevocable Bank Guarantee for _____ (_____ only) as security/guarantee from the contractor(s) for compliance of his obligations in accordance with the terms and conditions in the said agreement.

1. We _____ (hereinafter referred to as "the Bank) hereby undertake to (indicate the name of the bank) pay to the Government an amount not exceeding _____ (_____ only) on demand by the Government.
2. We _____ do hereby undertake to pay the amounts due and payable (indicate the name of the bank) under this Guarantee without any demure, merely on a demand from the Government stating that the amount claimed is required to meet the recoveries due or likely to be due from the said contractor(s). Any such demand made on the Bank shall be conclusive as regard 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 _____ (_____ only).
3. We, the said bank further undertake to pay to the Government any money so demanded notwithstanding any dispute or disputes raised by the contractor(s) in any suit or proceeding 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 there under and the contractor(s) shall have no claim against us for making such payment.

4. We _____ further agree that the guarantee herein contained shall (indicate the name of the Bank) 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 Government under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till Engineer-in-Charge on behalf of the Government certified that the terms and conditions of the said agreement have been fully and properly carried out by the said contractor (s) and accordingly discharges this guarantee.

We _____ further agree with the Government that the government (indicate name of the bank) shall have the fullest liberty without our consent and without effecting in any manner our obligations hereunder 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 Government 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(s) or for any forbearance, act of omission on the part of the Government or any indulgence by the Government to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

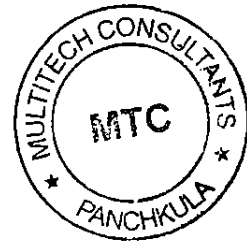


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6. This guarantee will not be discharged due to the change in the constitution of the Bank or the contractor(s).
7. We _____ lastly undertake not to revoke this guarantee except (indicate the name of Bank) with the previous consent of the Government in writing.
8. This guarantee shall be valid upto _____ unless extended on demand by Government. Notwithstanding anything mentioned above, our liability against this guarantee is restricted to ` _____ (_____ only) and unless a claim in writing is lodged with us within six months of the date of expiry or the extended date of expiry of this guarantee all our liabilities under this guarantee shall stand discharged.

Dated the _____ day of _____ for _____

(Indicate the name of Bank)



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**TABLE OF MILE STONE(S)
DNIT FOR THE WORK OF:-**

DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH.

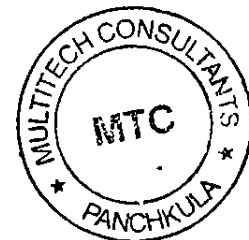
MILE STONE PROGRAMME

Sr. No.	Gross work done of Total work allotted	Time allotted (From date of start)	Amount to be withheld in case of non achievement of mile stone
1.	20%	3 Months	As per clause 39 (Page -- 61)
2.	30%	4 Months	As per clause 39 (Page - 61)
3.	30%	4 Months	As per clause 39 (Page - 61)
4.	20%	4 Months	As per clause 39 (Page - 61)
5.	-	-	-
	Completion of work including testing, stabilization etc. complete	6 Months	

Para (B):

Gross work to be done together with net payment/adjustment of advances for material collected if any, since the last such payment for being eligible to interim payment.

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FORM 'E'
PERFORMANCE REPORT OF WORKS

Name & address of the Client.....

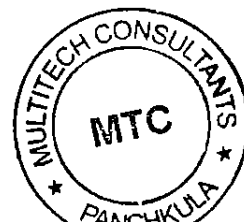
Detail of works executed by Shri /M/s.....

1. Name of work/project & location :
2. Agreement no. :
3. Estimated cost :
4. Tendered cost :
5. Completion Cost :
6. Date of start :
7. Date of Completion :
- i) Stipulated date of completion :
- ii) Actual date of completion :
8. Amount of compensation levied for delayed completion, if any :
9. Amount of reduced rate items, if any :
10. **PERFORMANCE REPORT:**
 - i) **Quality of work:**
Very Good/ Good/ Fair/ Poor :
 - ii) **Financial soundness:**
Very Good/ Good/ Fair/ Poor :
 - iii) **Technical Proficiency:**
Very Good/ Good / Fair/ Poor :
 - iv) **Resourcefulness:**
Very Good/ Good/ Fair/ Poor :
 - v) **General Behaviour:**
Very Good/ Good/ Fair/ Poor :

Dated:

Executive Engineer or Equivalent

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DNIT FOR THE WORK OF

DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH

SECTION V : GENERAL SPECIFICATIONS

1.) INSURANCE IN RESPECTS OF DAMAGE TO PERSONS & PROPERTY:

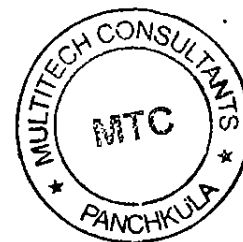
- a) The contractor shall indemnify the Engineer-in-charge against all claims which may be made against the Engineer-in-charge by any member of the public or other third party in respect of anything which may arise in respect of works or in consequences arrangement to effect and maintain, until virtual completion of the contract. A policy insurance in the joint names of the Engineer-in-charge and the contractor be got done against such a risk and deposit such policy with the Engineer-in-charge from time to time during the currency of this contract.
 - b) **FIRE INSURANCE:** The contractor shall at time of signing of the contract, insure the work and keep it insured until the virtual completion of the work against the loss or damages by fire at the place of erection joint names of the Engineer-in-charge and the contractor for the full amount of the contract and at his own expenses effect and maintain such policy until virtual completion of the work.
- 2.) The successful tenderer will have to supply the details of actual labour, skilled/ unskilled and **technical** personnel for the execution of the work along with every running/ final bill.
 - 3.) The contractor must quote the price for supplying and erection separately the work will execute strictly in accordance with I.S. Codes, CPWD Specifications and DNIT specification, drawings, terms and conditions.
 - 4.) **Discrepancy between drawing and specification:** Any error in description, quantities or rate in schedule of work for the item or any omission there from shall not vitiate the contract or release the contractor from the execution of the whole or any part of the work comprised therein according to drawings and specifications or from any of his obligations under the contract. In case of dispute, the decision of the Chief Engineer, M.C. will be final.
 - 5.) **Equipment, Tools and Plants:-** The contractor shall give a detail of the equipments, tools and plants available with him for the successful completion of the work. A detail of all the machinery to be employed by him at the site should be submitted along with the tender documents.
 - 6.) **Obligation of the contractor under Guarantee Period. :** The period of guarantee will be considered/ calculated from the date of completion of all the works, as defined in the DNIT duly certified by the Engineer (Executive Engineer, Municipal Corporation, Public Health Division No 1,). This period should be twenty four (24) months. The contractor shall remain liable for any of the works or part thereof of the pipes, specials etc. supplied, executed under this contract, which in the opinion of the Engineer-in-charge fails to comply



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with the requirements of the contract or in any way is unsatisfactory or defective. The contractor would execute a performance bond in the shape of Bank Guarantee amounting to 5% (Five percent) of contract value in favour of the Executive Engineer, Municipal Corporation, Public Health Division No.1, Chandigarh for the full period of guarantee. The completion certificate will not be issued, until and unless a performance bond as specified about is furnished to the Executive Engineer, Municipal Corporation, Public Health Division No.1, Chandigarh. The contractor will repair/ replace the damaged portion of the pipes line/ specials within 6 hours from the time of its occurrence, failing which the Executive Engineer would get the damage repaired/ replaced at the risk and cost of the contractor, without giving any notice. It is, therefore, essential that the representative of the contractor, employees competent staff to ensure that the repair of the pipe line is taken in to hand within 6 hours of its occurrence. All such works shall be carried out by the contractor to repair and re-commission of the pipe line at his own expenses. If the contractor shall fail to do any such work as aforesaid and as required by the Engineer-in-charge, and the same is carried out by the Engineer-in-charge himself at the risk and cost of the contractor, then the amount spent by the Executive Engineer for such work shall be deposited by the contractor within 15 days of the written notice given to him. Notwithstanding the aforesaid, if the contractor remains in default for one calendar month after the Executive Engineer has given written (Registered) instructions the Executive Engineer may encash the performance Bank Guarantee and it shall become payable to the Executive Engineer, who will deduct the cost plus overhead expenses of such works, as has been necessary to rectify the contractor's default. The overhead expenses would be charged @14% of the cost of work done at the risk of the contractor. The balance amount if any, shall be disbursed to the contractor on expiry of successful guarantee period i.e. 24 months from the taking over.

- 7.) **SUBLETTING OF THE WORK :-** Subletting of the work to some other executing agencies/ petty contractors would not be permitted at all. The complete job work would be carried out by the firm/ contractor to whom the work is allotted.
- 8.) **NOTICE OF TESTS:-** The contractor shall give to the Engineer-in-charge seven (7) days notice in writing for the date after which he will be ready to make the Tests on completion, unless otherwise agreed the tests shall take place within seven (7) days as the Engineer-in-charge shall notify the contractor in writing.
- 9.) **TIME FOR TESTS:-** If the Engineer-in-charge fail to appoint in time after having asked so to do or to attend at any time and place duly appointed for making the said tests, the contractor shall be entitled to proceed in his absence and the said test shall be deemed to have been made in the presence of the Engineer-in-charge and the results of the tests shall be accepted as accurate.
- 10.) **DELAYED TESTS:-** If the opinion of the Engineer-in-charge the tests are being unduly delayed he may, by notice in writing, call upon the contractor to make such tests with 21 days from the receipt of the said notice and the contractor shall make the said tests on such days, within 21 days as the contractor may fix and of which he shall give notice to the Engineer-in-charge may himself proceed to make the tests. All tests so made by the Engineer-in-charge shall be at the risk and cost of the contractor.



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11.) **REPEAT TESTS:-** If any portion of the works, fails to pass the tests, test of the said portion shall, if required by the Engineer-in-charge by contractor, be repeated within a reasonable time upon the terms and conditions, all reasonable expenses to which the Engineer-in-charge may put by the repetition of the tests shall be deducted from the contract sum.

12.) **CONSEQUENCE OF FAILURE TO PASS TESTS ON COMPLETION:-** If the works or any Section thereof shall fail to pass the tests on the repetition thereof under Clause 27 the Engineer-in-charge shall be entitled.

(a) to order further repetition of the tests under the conditions of Clause 27 to reject the work or Section thereof :-

If the results of the tests shown that the works of the Section fail to meet the performance guaranties or the agreed tolerance specified in the contract or if there are no such guaranties or tolerance, the results show that the works or the Section are not in accordance with the contract or

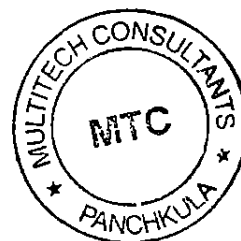
(b) to issue a Taking over Certificate, if the Engineer-in-charge so wished, subject to such reduction of the contract sum as may be provided in the contract or failing such provision, as may agreed by the Engineer-in-charge and the contractor or failing agreement, as may be determined by arbitration.

13.) TAKING OVER CERTIFICATE:-

As soon as the supplies, execution works have been completed in accordance with the contract (except in minor respects that do not effect their use for the purpose for which they are intended and have passed the Tests on completion, the Engineer-in-charge shall issue a certificate to the contractor (herein called a Taking over Certificate) in which he shall certify the date on which the works have been so completed and have passed in said, tests and the Engineer-in-charge shall be deemed to have taken over the works on the date so certificate where upon title to and risk of loss or damage to the works or any section or portion thereof shall subject to the provision of Clause 22 passed to the Engineer-in-charge but the issue of Taking over certificate shall not operate as an admission that the works have been completed in every respect. The taking over certificate will, however, be issued on production of performance Guarantee in the shape of Bank Guarantee for 5% (Five percent) of contract to the Engineer-in-charge.

14.) USE BEFORE TAKING OVER:-

If by reason of any default on the part of the contractor, a taking over certificate has not been issued in respect of every portion of the works within one month after the time for completion the Employer shall be at liberty to use the works or after the Time for Completion the employer shall be at liberty to use the works or section or portion thereof in respect of which a Taking over Certificate has not been issued if and so long as the works or the portion so used as aforesaid shall be reasonably capable of being used provided that the contractor shall be afforded the earliest possible opportunity of taking such steps as may be necessary to permit the issue of the Taking over Certificate.



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15.) COMPLETION DRAWINGS:-

The contractor shall furnish to the Engineer before the works are taken over, the drawings of works as completed insufficient detail to enable staff to maintain dismantle, reassemble and adjust all the parts of the works. The works shall not be considered to be completed until such instructions and drawings have been supplied to the Engineer.

16.) OPERATING AND MAINTENANCE INSTRUCTIONS:-

The contractor shall furnish to the Engineer-in-charge or before the delivery of the pipe to the operation and maintenance instructions together with the detailed drawings of spares and units and other sketches sufficient detail to enable Executive Engineer and his staff to operate the pipe line in a smooth and trouble free manner and to maintain, dismantle, reassemble and adjust all the parts or units. The contractor shall also furnish the maintenance manual (six copies) of the pipe line. The pipe line shall not be considered as taken over by the owner until the operating and maintenance instructions have been supplied to the owner (Department)

17.) FINAL INSPECTION/ ACCEPTANCE:-

Upon written notice from the contractor that the entire supply work required by the contract documents is complete and that all submissions required of his are made, and after the contractor had delivered the certificates of Inspection, Guarantees, Warranties, Releases and other documents, all as or by law the Engineer-in-charge will make final inspection and 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 in writing of any deficiencies in the submissions and other documents required of him. The contractor promptly shall make such correction as are necessary to remedy all defects or deficiencies. After the contractor has completed any such corrections to the satisfaction of the Engineer. The Engineer-in-charge will issue a written final acceptance of the work and file any notice of completion required by law or otherwise.

18.) The Site:-

The exact location of the sites may be obtained from the Engineer-in-charge. The sites shall be investigated by Tendering contractors, who must judge for themselves the conditions under which the work is to be carried, access to the sites availability of aggregates, water and labour, available storage area etc. climatic conditions. The nature of the ground, the general ground water table, levels and other such like condition. The construction works before submitting the tender. Arrangements for filling water for the testing of the pipe lines will be made by the contractors. However, the water for flushing of the pipe line shall be supplied by the Department free of cost.

19.) DAMAGE TO ROADS:-

The Engineering (Wing of Municipal Corporation, Chandigarh) Department, Chandigarh Administration will not accept any liability for damage to roads in the city, any damage arising during the contract and maintenance periods from the use of contractors un sound and imperfect lorries and other plant shall remain the liability of the contractor in accordance with the condition of the contract. Similarly, the contractor shall repair the road wherever be cuts to lay the pipe line or otherwise. The repair of the road shall be exactly according to original design and to the full satisfaction of the Engineer-in-charge or any other authority in



charge of the area. The contractor is to regulate the character of transport to ensure that no damage beyond fair wear and tear is occasioned thereby. We must comply with the requirement of the Engineer-in-charge as the routes to be traversed and limitations of ways specifications and class of vehicles.

20.) TEMPORARY ACCESS ROADS:-

The contractor shall provide any necessary temporary roads of light gauge tracks for access to works and maintain alter and adopt as required and remove on completion and reinstate the surface. The routes of such roads are to be agreed by the Engineer-in-charge. Temporary roads for access to various sites are to have proper foundation rolled and blinded with find stuff as required. Every effort is to be made to restrict the route on such roads to the lines of future permanent roads out where roads so provided are not required for future use, such formation is to be taken up on completion of the works and the site reinstated to the satisfaction of the Engineer-in-charge.

21.) PROTECTION AGAINST CLAIMS BY LOCAL & OTHER AUTHORITIES:

On obtaining directions in writing from the Engineer-in-charge to proceed to enter any given area or to excavate across open public roads etc. the contractor is empowered to do such works as he may have been directed in writing and he is protected against all claims from other authorities or private owner provided the adheres to the written directions given by the Engineer-in-charge and complies with the conditions of contract. If he does otherwise, he is not protected and acts on his own responsibility.

22.) SCAFFOLDING:-

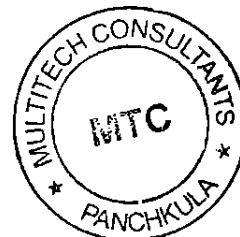
The contractor shall provide, erect, maintain, dismantle and clear away at completion proper and adequate scaffolding wherever required in connection with this work including that required in connection with the work including that required for sub contractor and specialists. Holes shall be made good to match the adjacent surface in the scaffolding is dismantled. The contractor shall be entirely responsible for all precautions in connection with the scaffolding.

23.) WATER TO BE REMOVED:-

The contractor is to keep the works at all time well drained and excavations whether above or below the normal water level from storm and percolating water which may accumulate on the site which may interfere with progress or construction or has or is likely to have deleterious effect on the work in progress or the use thereof, by the provision of temporary open drains diversion of ditches and other surface water channels etc. or by other means of as required. The cost of this works shall be considered to be including in the rates as quoted in the schedule of quantities and rates.

24.) FACILITIES FOR ENGINEERING WING OF M.C., CHANDIGARH AND OTHER CONTRACTORS:-

The contractor is to afford free access and use of ladders, scaffolding and plant etc. in use on the site to the Engineering Wing of Municipal Corporation, Chandigarh and other contractors executing other works during the course of this contract and protect execution of their works to such contractors employed in connection with the formation of roads and other works and water is clear of the roads, approaches and such contractor sites so as to



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cause no obstruction, interruption or other interference with this work undertaking by such contractors.

25.) INFORMATION ABOUT THE TENDERER:-

The tenderer must fill in the enclosed Form "E" failing which it will not be possible to make a qualitative analysis and therefore the tender would be rejected.

26.) PROGRAMME FOR THE EXECUTION, SUPPLY OF THE PIPE AND SPECIALS:-

The tenderer must submit a detailed programme of supply/ execution of the contract and attach the same with his offer. The programme should be prepared showing the starting and completion of each item of the "Schedule of Item & Rates". However, the Engineer-in-charge will fix the priority of each item for execution during the period of contract.

27.) APPROVAL OF MATERIALS :-

The successful tenderer shall submit the samples of all materials which are proposed to be used in the project sufficiently in advance to the Engineer-in-charge of the project and obtain his written approval and not to the specifications (CPWD Specifications) shall be rejected and the contractor shall replace the same at his own cost.

28.) SIGNATURE AND STAMP OF TENDERER:-

The tenderer shall sign and stamp all the pages of the contract documents including instructions to the Tenderers. Form of Tender, General Conditions of Contract, General Technical Specifications, Schedule of Requirements, Schedule of Quantities and Rates etc. Tenderer shall include sufficient information and drawings to describe what is offered and to enable qualitative assessment to be made.

- 29.) The tender documents shall be signed by authorized person on behalf of the Tenderer and proof of such authority duly authenticated shall be attached with the offer. Where no specifications are mentioned, the material/ work shall be generally according to I.S/ P.W.D. Specification (latest amendment)/ DNIT specification.
- 30.) The contractor shall quote his rates for all items mentioned in the Schedule of Rates. Any additional items as proposed by the contractor shall be given on a separate sheet.
- 31.) The payment shall be made as per actual supply/ execution of individual item according to specifications and contract conditions. The Engineer-in-charge is authorized increase/ decrease the scope of work or withdraw any item as per site conditions and the contractor can not claim any damages on this account.
- 32.) In case the Tender is being submitted by an individual, the "Original" offer on Tender Forms, Contract Conditions, Drawings, Specifications, Schedule of Rates and other contract documents shall be signed by the Tenderer, giving his full Name and Address. If the tender is signed by or on behalf of a company or firm or partnership of the firm etc. the name of the persons signing the contract shall be clearly mentioned and a copy of Power of Attorney in his name, duly attested by Court shall be attached. The copy of "Trading & Contracting", license and agreement for partnership shall be attached with the offer. The offer not accompanied with the above information and signed contract documents drawing and specifications shall be considered as incomplete and may be rejected.



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33.) The Engineer-in-charge will have the right to inspect the pipes and specials to be used at manufacture's premises. This inspection shall, however, not absolve the contractor of its obligation regarding testing/ commissioning etc.

34.) SITE ACCOMMODATION AND OTHER SERVICES:-

(a) Site Area for Contractor:-

The contractor will be allocated an area for his plant, stores, compound, workshops and site office with the site area. The contractor shall provide constantly available labour, transport and materials and maintain the cleanliness and tidiness of the site and to attend to the protection and temporary covering and barricading of open excavations, trenches, pipe and other hazards, to safety as directed by the Engineer-in-charge.

(b) Site Office for Contractor:-

The contractor shall provide and maintain an office on the site for the accommodation of his agent and site staff and such office shall be open at all reasonable hours to receive instructions notices or other communications.

(c) Temporary Roads:-

An adequate access road will be provided to the site by the contractor from the main road system. The contractor shall be responsible for the maintenance of their access road as directed by the Engineer-in-charge.

The preparation and maintenance of temporary roads within the site area shall be the contractor's responsibility and the contractor shall take such measures as are thought to be necessary and as are directed by the Engineer-in-charge to reduce and control dust nuisance including spraying temporary roads with the water or road oil.

(d) Electricity Power:-

For construction, department will only assist the contractor in arranging adequate connection of electricity power and all one time charges as well as recurring charges shall be payable by the tenderer. This is also made clear that any loss/ damage to the work on account of interruption of electricity for short or long duration will be contractor's responsibility. He may, therefore, make his own arrangements for stand by generating set according to his requirement.

(e) Water:-

For construction, department will only help in contractor in getting water connection. All the charges involved in getting connection and subsequent recurring charges during construction on account of consumption of water shall be borne by the contractor.

(f) First Aid facilities:-

The contractor shall provide and maintain first aid facilities on the site to be approval of the Engineer-in-charge.



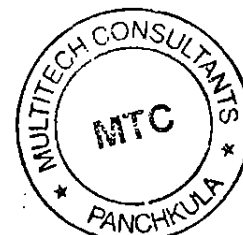
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- 35.) Any realignment or change in alignment for angle less than 30° shall not be considered as bend and the same shall be executed by the agency through long distance adjustment of the pipe alignment.
- 36.) **GUARANTEE / RESPONSIBILITY OF THE CONTRACTOR :** The design provided by the contractor will be approved by the department. However, all responsibility of safety, soundness and performance of the system lies on the contractor. During execution of work and in exceptional circumstances, in case the contractor feels that the design needs to be changed, he shall submit the revised design along with proper justification to the department and in case the department feels that the revision in design is required, approval shall be provided by the Chief Engineer. It is again reiterated that all responsibility of safety, soundness and performance of the system lies on the contractor

37.) ADDITIONAL SPECIFICATIONS:-

The following additional specifications shall be read in conjunction and CPWD with upto date corrections. Any provision in these additional specifications if varies with the provision in the CPWD, additional specifications shall be deemed to take precedence there over.

- 1.) A preliminary alignment plan has been attached with the tender documents. No claim shall be entertained for any change in the alignment whatsoever.
- 2.) Where bottom of a trench is found to be uneven or soft, the excavation shall be carried out to 15cm below the invert level of the pipe and the bottom of the trench upto invert level of the pipe shall be filled with sand or good earth and compacted well before laying pipes over it.
- 3.) The trenches shall be kept free from water accumulation by bailing or pumping out water by the contractor at his own cost.
- 4.) Each pipe shall be cleaned thoroughly from inside before laying it. The pipes shall not be rolled into the trenches but lowered in position with the help of chain pulley arrangement accurately.
- 5.) The end of the last pipe laid at the close of the day shall be blocked with suitable plug so as to ensure that the entrance of animals into the pipes is stopped. After the pipes are laid, jointed the trenches shall be filled with earth upto one foot above the top of the pipe line. The balance portion shall be filled with earth as decided by the Engineer-in-charge. The filled earth will be watered and suitably to avoid settlement.
- 6.) Under the roads, the trenches shall be filled with sand as soon as the mains are laid and jointed in the stretch. Such trenches shall not be kept open for more than 24 hours.
- 7.) Where the lines are tested after refilling of earth and the joints are found leaking, the contractor shall excavate the earth and refill the same at his own cost after carrying out repair of the leaked joints and other defective parts.
- 8.) The rates for fixing of Specials such as Butterfly valves, air valves, scour valves etc. shall include the cost of M.S. Bolts, Nuts, rubber insertion etc. whatsoever required for jointing the specials and shall include the cost of the transportation of these specials if they are issued from the departmental store.
- 9.) The contractor shall normally start the work from one end of the line but in the interest of work the Engineer-in-charge may decide to execute work in any particular reach or reaches. The contractor shall not be entitled to any compensation as a result of such decisions.

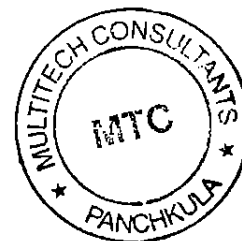


- 10.) It shall be the responsibility of the contractor to barricade the trenches at road crossing by putting up suitable sign board and blocks for safety of human and animal life.
- 11.) All the stone metal obtained from the cutting of roads during excavations shall be properly stacked for its re-use as directed by the Engineer-in-charge.
- 12.) Any damage to the work due to bursting of pipe line, leaking of joints, valves, specials etc or otherwise due to any other reason during the period of maintenance shall be set right and made good by the contractor at his own cost.
- 13.) Necessary equipment such as Generating Set, Pumping Sets, Cranes and Trucks, Pick Ups and all other equipments shall be arranged by the contractor. He shall also make his own arrangements for filling up of water in the main. The payment shall be made by the contractor. The tests shall be carried as per IS standards. Leaking joints shall be made good and defective pipes replaced at no extra cost. In case, of an accident during the execution of work or at the time of testing, the compensation for loss of human life or material shall be borne by the contractor and nothing extra shall be payable to him on this account. If there is any damage to the adjoining crops, property as a result of laying of pipe lines, the contractor shall be responsible for payment of compensation and no claim on this account be entertained.
- 14.) Any extra work not included in the N.I.T. and required to be done in relation to the laying of pipe lines, it shall be done by the contractor and the payment shall be made to him on the basis of Delhi Schedule of Rates (DSR 2014).
- 15.) All concrete work shall invariably be done with the help of mechanical mixer and vibrator and the contractor shall have his own arrangement for running of mixer and vibrators.

38. Performance Guarantee and Security

The contractor/bidder, whose tender is to be accepted shall furnish:

- (i) A bank Guarantee of Schedule Bank in the prescribed format (specimen form attached) in favour of the Executive Engineer-in-charge for an amount of 5% of the amount of contract valid up to 6 (Six) months beyond the date of completion i.e. after stabilization period to cover the amount of liquidated damages and/or the compensation of the breach of contract. The Technology provider shall provide 20% of this Performance Guarantee in the shape of Bank Guarantee. The balance 80% is to be provided by the bidder. No payment for work done of any kind shall be released till such Guarantee is furnished. The Performance Guarantee shall be released on completion of works (as defined in Annexure C) and acceptance of works by the Engineer-in-charge. 50% performance guarantee shall be released after completion of defect liability period. Remaining performance guarantee shall be released @10% after completion of 4,6,8 year and remaining after 10th year.
- (ii) A cash Security to cover the cost that may be involved in removal of defects, imperfections, or taking remedial measures in the work, which has been executed to be progressively deducted @ 5% in all payments. Security will be refunded after 3 month of the successful trial run as certified by the Engineer-in-charge with respect to satisfactory removal of all defects, imperfections, short comings and taking remedial measures, that may be necessary and after recording of final measurements of work done, for which the certificate of the Engineer-in-charge would be conclusive.



The contractor shall furnish O & M Bank Guarantee prior to start of O & M of plant from Schedule Bank in the prescribed format (specimen form attached) in favour of the Executive Engineer-in-charge for an amount equal to 1% of Amount of Contract (Capital Cost + O&M Cost). The guarantee shall be valid for entire maintenance period of 120 months. Technology provider shall provide 20% of this performance guarantee in the shape of bank guarantee and balance 80% shall be provided by the bidder. The Bank Guarantee shall be released after completion of O & M period.

(iii) The bank guarantee shall be encashable at Chandigarh.

39. Compensation for Delay

The time allowed for carrying out the work shall be the essence of the contract and shall be strictly observed. It shall be reckoned two months after (for approval of drawings) the date on which the order to commence the work is given to the contractor/bidder who shall ensure all due diligence to achieve progress of work not less than indicated below:

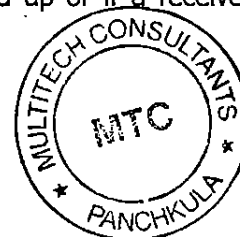
- (i) On lapse of 25% contractual time: 20%
- (ii) On lapse of 50% contractual time: 50%
- (iii) On lapse of 75% contractual time: 80%
- (iv) On lapse of full contractual time: 100%

In case of default, the contractor/bidder shall not withstanding issuance of a prior notice in this regard, pay prospectively as liquidated damages, an amount up to 1% of the amount of contract or such lesser amount that the Engineer-in-charge may levy, for every week that the work remains un-commenced after the time specified in the acceptance letter or the minimum progress of work stated above is not achieved or the work remains unfinished after the completion date. In case of continued default or shortfall in progress, the Engineer-in-charge may go on enhancing the levy, of liquidated damages prospectively, each time limited to 1% of the total estimated amount of work per week of further default subject to maximum limit of five percent of the amount of the contract. The Superintending Engineer or his successor in Charge of the work on representation from contractor/bidder after hearing both the parties i.e. Engineer-in-charge and contractor/bidder may reduce the amount of liquidated damages and his decision in writing shall be final.

40. Breach of Contract Levy of Damages

The Engineer-in-charge may, without prejudice to other right and remedies, under the provisions of the contract or otherwise after issuing a notice in writing and getting the final bill prepared absolutely determine the contract after levying compensation for damages of 5% of the amount of the contract, if the contractor/bidder commits breach of contract under any clauses of the contract or in any of the following cases: -

- (i) If the contractor/bidder suspends the execution of the work and inspite of having been given a notice in writing by the Engineer-in-charge fails to resume the work within ten days of the issue of the said notice.
- (ii) If the contractor/bidder, having been given a notice in writing by the Engineer-in-charge fails to rectify, reconstruct or replace any defective work or continues the execution of work in an inefficient, improper, unworkman-like manner or not in accordance with sound Engineering practices or without complying with the directions and requirements within a period of 10 days of the issue of said notice.
- (iii) If the contractor/bidder being a company shall pass a resolution or a court shall make an order to the effect that the company shall be wound up or if a receiver or a manager on



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behalf of the creditor/Department shall be appointed or if circumstances shall arise which entitle the court or creditor to appoint a receiver or manager to make a winding up order.

- (iv) If the contractor/bidder commits any of the acts or defaults mentioned in clause 21 and 24 thereof.

Provided further, that in case action under clause 2 as aforesaid levy of liquidated damages is also taken, total amount of liquidated damages and compensation for breach of contract under both the clauses shall be limited to 7.5 percent of the amount of the contract or the amount available with the Department including Bank Guarantee which ever is less. The requisite amount for which the contractor/bidder may become liable shall be realized by en-cashing the Bank Guarantee furnished by the contractor/bidder, as specified in Clause 1 above and/or from other amounts due to the contractor/bidder in respect of this work or any other work, undertaken for the department.

After the termination of the contract under this clause, the department shall be at liberty to (i) get the balance work executed through some other contractual agency or through departmental means or to (ii) abandon the balance work altogether or to (iii) modify the design and scope of the work in any manner. The contractor/bidder shall have no claim against the department for treating the work in any manner deemed fit.

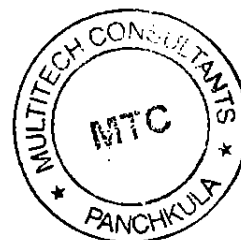
41. Liability of contractor/Bidder and Powers to Take Over and Dispose off Plant

In any case, in which any of the powers conferred upon the Engineer-in-charge by clause 3 hereof shall have become exercisable and shall not be 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 or default on the part of the contractor/bidder, for which by any clause or clauses, hereof, he is declared liable to pay compensation and the liability of the contractor/bidder for past and future compensation shall remain unaffected.

In the event of the Engineer-in-charge putting in force all or any of the powers vested in him under the proceeding clauses, he may if he so desires after giving a notice in writing to the contractor/bidder take possession of any or all tools, plant, materials and stores in or upon the works or the site thereof belonging to the contractor/bidder and his sub-contractors or produced by him and intended to be used for execution of the work on any part hereof paying or allowing for the same in account at the contract rates or in case of these not being applicable at current market rates to be certified by the Engineer-in-charge whose certificate hereof shall be final. Other wise the Engineer-in-charge may, by giving a notice in writing to the contractor/bidder or his agent at the site of work, require him to remove such tools, plants, materials of stores from the premises within the time specified in notice. In the event of the contractor/bidder failing to comply with any such requisition, the Engineer-in-charge may get them removed at the contractor/bidder's expense or sell them by auction or private sale on account of the contractor/bidder and at his risk in all respects. The certificate of the Engineer-in-charge as to the expense of any such removal and the amount of proceeds and expense of any such sale shall be final & conclusive against the contractor/bidder.

42. Extension of Time

If the contractor/bidder shall desire an extension of the time for completion of the work on the ground of his having been unavoidably hindered in its execution or any other ground he shall apply in writing to the Engineer-in-charge (with corresponding time extension in Performance Bank Guarantee) within thirty days of the date of hindrance (but before the expiry of time limit) on account of which he desires such extension as aforesaid and the Superintending Engineer shall, if in



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his opinion (which shall be on reasonable grounds) be shown therefore authorize such extension of time, as may in his opinion be necessary or proper. No application for extension of time received late or addressed to the sub-divisional Engineer or any officer other than the Engineer-in-charge shall be considered valid. If the contractor/bidder fails to apply for extension as aforesaid and the work is not completed within the time limit the contract shall be determined absolutely after action under clause 2 and 3 above.

43 Completion (as defined in Annexure C) Certificate

Within ten days of the completion of work, the contractor/bidder shall give notice of such completion to the Engineer-in-charge & within 30 days of the receipt of such notice, the Engineer-in-charge shall inspect the work and if there is no defect in the work, shall furnish the contractor/bidder with a certificate of completion, otherwise a provisional certificate of completion indicating the defects (a) to be rectified by the contractor/bidder and/or (b) for which payment will be made at reduced rates shall be issued. However no certificate provisional or otherwise shall be issued, nor shall the work be considered to be complete until the contractor/bidder shall have removed from the premises on which the work has been executed, all scaffolding, surplus material, rubbish and all huts & sanitary arrangements set-up for his labour on the site (except that required for operation and maintenance of STP) and cleaned of the dirt from all wood-work, doors and windows walls, floor or other parts of the building in upon or about which the work is to be executed or of which he may have had possession for the purpose of execution thereof and not until the works shall have been measured by the Engineer-in-charge including providing proper signage If the contractor/bidder shall fail to comply with the requirements of this clause as to the removal of scaffolding, surplus material and rubbish, all huts and sanitary arrangements and cleaning off as aforesaid before the date fixed for the completion of work, the Engineer-in-charge may, at the expense of the contractor/bidder get cleared off such dirt as aforesaid and the contractor/bidder shall forth will pay the amount of all expenses so incurred and shall have no claim in respect of any such scaffolding or surplus materials so aforesaid except for any sum actually realized by the sale proceed thereof.

43 (A): Winding-up of the Contract

On completion of work including maintenance period, the contractor/bidder shall hand over the same to the Engineer –in-charge or his authorized representative free from all defects, shortcomings or imperfections. He shall clear the site of all-temporary works, pits, Godowns, offices, sanitary, scaffolding, debris, waste materials and installations. He shall also furnish the following documents duly signed by him or his authorized representatives after completion of the work.

- (i) Five Completion drawings showing the work as finally constructed.
- (ii) Variation statement showing the altered items, if any, against those provided in the original approved drawings.
- (iii) Original site instructions book
- (iv) Original registers for various quality control tests as specified.
- (v) Cement/Steel consumption registers.
- (vi) Consolidated O&M monitoring reports.

44. Payment on Intermediate Certificates Regarded as Advances

No payment shall be made for a work estimated to cost less than rupees twenty thousands till after the whole of the work shall have been completed and a certificate of completion given. But in the case of works estimated to cost more than rupees twenty thousands the contractor/bidder shall on submitting a bill there-of be entitled to receive a monthly payment proportionate to the part thereof



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the time limit than executed to the satisfaction of the Engineer-in-charge, whose certificate of the sum payable shall be final and conclusive against the contractor/bidder. But all such intermediate payments shall be regarded as payments by way of advance against the final payment only and not as payments for work actually done and completed and shall not preclude the requiring of bad, unsound imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or be considered as an admission of the performance of the contract or any part thereof in any respect of the occurring of any claim nor shall it conclude, determine or effect in any way the powers of the Engineer-in-charge under these conditions or any of them as to the final settlements and adjustment of the accounts or otherwise or in any other way, vary or affect the contract. The final bills shall be submitted by the contractor/bidder within one month of the date fixed for completion of the work, otherwise the certificate of the Engineer-in-charge as regards measurements and the total amount payable for the work shall be final and binding.

45. Bills to be Submitted Monthly

A bill shall be submitted by the contractor/bidder each month on or before the tenth day or any other date fixed by the Engineer-in-charge accompanied by the following documents:

- (i) Measurements and quantities of items of work done since last bill.
- (ii) Upto date statement of materials received, from the stores showing the recoveries made upto last bill in question, both in terms of quantity and value.
- (iii) Copies of quality control tests in specified format covering the work done since last bill.
- (iv) Copies of instructions recorded in the site instruction book containing the instructions and compliance made thereof, covering the work done since last bill.

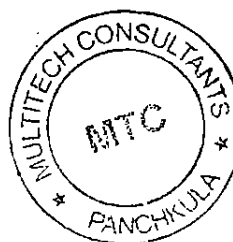
A bill, which is not accompanied with the above documents, shall not be entertained.

The Engineer-in-charge shall get the bill verified, if possible, within 30 days from its Presentation and the contractor/bidder shall be required to sign the corrections made, if any, in token of its acceptance, before releasing or adjusting the payable amount.

If the contractor/bidder does not submit the bill within time limit or delays its submission or acceptance of correction after verification, the entire responsibility for non-payment or delay in payment shall rest with him. The contractor can submit more than one bill during a month provided that the work done for such intermediate Bills is more than Rs. 20.00 lac.

46. Work to be executed in accordance with Specifications, Drawings and Order etc.

The contractor shall execute the whole and every part of the work in the most substantial and workman like manner both as regards, materials and labour and otherwise in every respect in strict accordance with the CPWD specifications latest Editions. 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 lodged in his office and to which the contractor shall be entitled to have access during the office hours or on the site of work. The contractor shall be furnished free of charge one copy of all such drawings and such specifications as are not included in the printed CPWD specifications. He shall, if he so requires, be entitle at his own expenses to make or cause to be made copies of the drawings, designs, specifications and instructions as aforesaid.



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46. (A): Removal of Employees/Workmen

The Engineer-in-charge shall have full powers at all times to object to the employment of any workmen, foremen or other employees on the work by contractor/bidder, and if the contractor/bidder shall receive notice in writing from the Engineer-in-charge requiring the removal of any such person from the work, the contractor/bidder shall comply with the order forth with. No such workmen/foremen or other employees, after his removal from the works by order of the Engineer-in- Charge shall be re-employed or re-instated on the work by the contractor/bidder at any time except with the previous approval in writing of the Engineer-in-charge. The contractor/bidder shall not be entitled to demand the reason from the Engineer-in-charge for requiring the removal of any such workman/foreman or any other employee.

47: Alterations in Specification & Designs

The Engineer-in-charge shall have power to make any alterations, omissions from, additions to or substitutions for the original specifications, drawings, designs and instructions that may appear to be necessary or advisable during the progress of work, and the contractor/bidder shall be bound to carry out the work in accordance with any instructions which may be given to him in writing, signed by the Engineer-in-charge. Such alterations/additions or substitutions shall not invalidate the contract and any altered additional or substituted work shall be carried out by the contractor/bidder 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 tender for the main work. The time of completion of the work shall be extended in the proportion that the altered, additional or substituted works bears to the original contract work and the certificate of the Engineer-in- Charge shall be conclusive as to such proportion. The rates for such additional, altered or substituted work shall be determined in accordance with the following provision in their respective order:

- i. If the rates for the additional, altered or substituted work are specified in the contract for the work, the contractor/bidder is bound to carry out the additional, altered or substituted work at the same rates as are specified in the contract for the work.
- ii. If the rates for the additional, altered or substituted work are not specifically provided in the contract for the work, the rates will be derived from the rates for a similar class of work as are specified in the contract for the work.
- iii. If the rates cannot be determined as provided in the (i) and (ii) above, then such work shall be paid at the rates entered in the Delhi Schedule of Rates minus/plus the percentage rate at which the bids has been accepted.
- iv. If the rates for the altered, additional or substituted work cannot be determined in the manner specified in clauses (i), (ii) and (iii) above, then the contractor/bidder shall within 7 days of the date of his receipt of the order to carry out the work inform the Engineer-in-charge of the rate or rates which he intends to charge for such class of work supported by analysis of the rate in support of rates/claimed. The Engineer-in-charge shall determine the rates or rate on the basis of prevalent market rates and pay the contractor/bidder accordingly.

However the Engineer-in-charge, by notice in writing, will be at liberty to cancel the order given to the contractor/bidder to carry out such class of work and arrange to carry out in such manner as he may consider advisable, provided always that if the contractor/bidder shall have commenced work or incurred any expenditure in regard there to before the rates shall have been so determined, then in such case he shall 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 dispute, the decision of the



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Superintending Engineer, Municipal Corporation, Public Health Division No. 4, Sector - 9, Chandigarh shall be final.

48. No Compensation for Alteration in or Restriction in Works

If at any time, after the commencement of the work, the department shall for any reason whatsoever not require the whole or part thereof as specified in the contract to be carried out, the Engineer-in-charge shall give notice in writing of the fact to the contractor/bidder, who shall have no claim to any payment or compensation, whatsoever on account of any profit or advantage which he might have derived from the execution of the work in full, but which he did not derive in consequences of the full amount of the work not having been carried out, neither shall he have any claim for compensation by reason of any alternation having been made in the original specifications, drawings, designs and instructions, which shall involve any curtailment of the work originally contemplated.

49. Action and Compensation Payable in case of Bad Work

If it shall appear to the Engineer-in-charge, or his subordinate in-charge of that work, that any work has been executed with unsound, imperfect, unskillful workmanship or with materials of any inferior description or that any articles or materials provided by the contractor/bidder for the execution of the work are unsound or of a quality inferior to that contracted for or otherwise not in accordance, with the contract, the contractor/bidder, shall on demand in writing by the Engineer-in-charge specifying the work, materials or articles complained of, notwithstanding that the same have been inadvertently passed, certified and paid for, forthwith rectify or remove and reconstruct the work so specified in whole or in part, as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own proper charge and cost. In the event of his failing to do so, within a period to be specified by the Engineer-in-charge, in his demand aforesaid, the contractor/bidder shall be liable to pay compensation at the rate of 1% of the estimated amount of that bad work for every week not exceeding 10 weeks, while his failure to do so shall continue and in the case of such failure, the Engineer-in-charge may rectify or remove and re-execute the work or remove and replace with others, the materials or articles complained of as the case may be at risk and expense in all respects of the contractor/bidder.

50. Works to be Open to Inspection

All work 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 senior/sub-ordinates and the contractor/bidder 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 or his senior/subordinates to visit the works shall have been given to the contractor/bidder, either himself be present to receive orders and instructions or have a responsible agent, dully accredited in writing, present for that purpose. Orders given to the contractor/bidder's agents shall be considered to have the same force as if they had been given to the contractor/bidder himself.

51. Notice to be given before Work is Covered-up

The contractor/bidder shall give not less than ten 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 or measurement any work in order that the same may be measured and correct dimensions thereof any be taken before the same is so covered up or placed 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 contractor/bidder's expense or in default thereof no payment or allowance shall be made for such work or of the material with which the same was executed.

52. Labour Laws

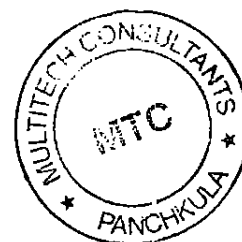
The contractor/bidder shall comply with all the provisions of Minimum Wages Act 1948, Workmen's Compensation Act 1923, Contract Labour (Regulation & Abolition) Act 1970 and the rules framed there under, the payment of Wages Act 1936, Employees Liability Act 1938, Maternity Benefits Act 1961, the Apprentices Act 1961 and rules framed there under and the Industrial Disputes 1947. He shall also make satisfactory arrangements for labour huts, protection of health and sanitary arrangements for the workmen employed on the work.

For Women labourers the contractor shall arrange for the medical as well as crèche facility for their children & provide separate toilet lavatory arrangement for the women. Also lodging facilities for women & their children should be separate if these are arranged for the labourers.

In every case in which by virtue of provisions of the Contract Labour (Regulation and Abolition) Act 1970 and of the contract labour rules, the department is obliged to pay any amount of wages to a workmen employed by the contractor/bidder in execution of the work or to incur any expenditure in providing welfare and health amenities required to be provided under the above said Act and the rules under the PWD, Contractors labour regulations or under the rules framed by the CPWD from time to time for the protection of health and sanitary arrangements for worker employed by the contractor/bidder. The department will recover from the contractor/bidder, the amount of wages so paid or the expenditure so incurred under without prejudice to the rights of the department. , under section 20 subsection (2) and section 21 subsection (4) of the contract labour (Regulations and Abolition) Act 1970. department shall be at liberty to recover such amount or any part thereof by deducting it from the security deposited or from any sum due to the department to the contractor/bidder whether under this contract or otherwise. The department shall not be bound to contest any claim made against it under section 20 subsection (1) and section 21 subsection (4) of the said Act except on the written request of the contractor/bidder and upon his giving to the department full security for all costs for which the department might become liable in contesting such claim.

53. Contractor/Bidder Liable for Payment of Compensation to Injured Workman or in Case of Death

In every case in which by virtue of the provision of the section 12, sub section (1) of the workman's compensation Act 1922, the department is obliged to pay compensation to a workman employed by the contractor/bidder in execution of work, department will recover from the contractor/bidder the amount of compensation so paid and without prejudice to the rights of the department under section 12, sub section (ii) of the said Act, the department shall be at liberty to recover such amount of any part thereof by deducting it from the security deposit or from any sums due by the department to the contractor/bidder whether under this contractor/bidder or otherwise the department shall not be bound to contest any claim made against it under section 12, sub section (1) of the said Act except on the written request of the contractor/bidder and upon his giving to department full security for all costs for which the department might become liable in consequence of contesting such claim.



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55. Deduction of Dues on Any Account whatsoever Permissible

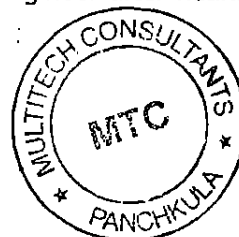
Any excess payment made to the contractor/bidder inadvertently or otherwise under this contract or on any account whatsoever and any other sum found to be due to the department by the contractor/bidder in respect of this contract or any other contract or work order or on any account whatsoever may be deducted from any sum payable by the the department to the contractor/bidder either in respect of this contract or any work order or contractor/bidder or any other account by any other Department.

56. Directions of the Superintending Engineer

All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the Superintending Engineer of the circle 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 out.

57. Disputes & Arbitration

- (i) If any dispute or difference of any kind whatsoever shall arise between the the department, its authorised representative and the contractor/bidder in connection with or arising out of this contract or the execution of work there under.
- (ii) Whether before its commencement or during the progress of work or after the termination, abandonment or breach of the contract, it shall in the first instance be referred for settlement to the Engineer-in-charge of the work and he shall, within a period of sixty days after being requested in writing by the contractor/bidder to do so, convey his decision to the contractor/bidder. Such decision in respect of every matter so referred shall, subject to arbitration as herein after provided, be final and binding upon the contractor/bidder. In case the work is already in progress, the contractor/bidder shall proceed with the execution of the work on receipt of the decision of the Engineer-in-charge as aforesaid with all due diligence, whether any of the parties require arbitration as hereinafter provided or not.
- (iii) If the Engineer-in-charge has conveyed his decision to the contractor/bidder and no claim for arbitration has been filed by the contractor/bidder within a period of sixty days from the receipt of the letter communicating the decision, the said decision shall be final and binding upon the contractor/bidder and will not be a subject matter of arbitration at all.
- (iv) If the Engineer-in-charge fails to convey his decision within a period of sixty days after being requested as aforesaid, the contractor/bidder may within further 60 days of the expiry of the first sixty days from the date on which the said request was made by the contractor/bidder refer the dispute for arbitration as herein after provided.
- (v) All disputes or differences in respect of which the decision is not final and conclusive shall, at the request of either party made in a communication sent through registered - AD Post, be referred to the sole arbitration of the Superintending Engineer of the circle concerned in the department, acting as such at the time of reference unless debarred from acting as an Arbitrator by an order of the department, in which event, the Chief Engineer shall appoint any other technical officer not below the rank of Superintending Engineer to act as an Arbitrator on receipt of a request from either party.
- (vi) The Chief Engineer shall have the authority to change the arbitrator on an application by either the contractor/bidder or Engineer-in-charge requesting change of the arbitrator giving reasons thereof, either before the start of the arbitration proceedings or during the course of such proceedings. The arbitration proceedings would stand suspended as soon as an application for change of an Arbitrator is filed before the Chief Engineer and a notice thereof is given by the applicant to the Arbitrator. The Chief Engineer after hearing both the parties

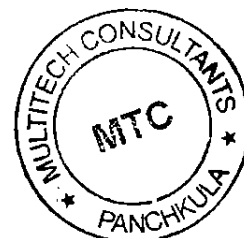


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may pass a speaking order rejecting the application or accepting to change the Arbitrator simultaneously, appointing a technical officer not below the rank of a Superintending Engineer as Arbitrator under the contract. The new Arbitrator so appointed may enter upon the reference a fresh or he may continue the hearings from the point these were suspended before the previous Arbitrator.

- (vii) The reference to the Arbitrator shall be made by the claimant party within 120 days from the date of dispute of claim arises during the execution of work. If the claim pertains to rates or recoveries introduced in the final bill the reference to the Arbitrator shall be made within six calendar months from the date of payment of the final bill to the contractor/bidder or from the date a registered notice is sent to the contractor/bidder to the effect that his final bill is ready by the Engineer In charge (whose decision in this respect shall be final and binding) which ever is earlier.
- (viii) It shall be an essential term of this contract that in order to avoid frivolous claims the party invoking arbitration shall specify the dispute based on facts and calculations stating the amount claimed under each claim and shall furnish a "deposit-at-call" for ten percent of the amount claimed, on a schedule bank in the name of the Arbitrator, by his official designation who shall keep the amount in deposit till the announcement of the award. In the event of an award in favour of the claimant, the deposit shall be refunded to him in proportion to the amount awarded w.r.t the amount claimed and the balance, if any, shall be forfeited and paid to the other party.
- (ix) The provisions of the Indian Arbitration Act 1996 or any other statutory enactment there under or modifications thereof and for the time being in force shall apply to the arbitration proceedings under this clause.
- (x) The Arbitrator shall award separately giving his award against each claim and dispute and counter claim raised by either party giving reasons for his award, any Lumpsum award shall not be legally enforceable.
- (xi) The independent claims of the party other than the one seeking arbitration, as also the counter claims of any party shall be entertained by the Arbitrator.
- (xii) The venue of Arbitration shall be such place or places as may be fixed by the Arbitrator in his sole discretion. The work under the contract shall continue during the arbitration proceedings.
- (xiii) The stamp fee due on the award shall be payable by the party as desired by the Arbitrator and in event of such party's default, the stamp fee shall be recoverable from any other sum due to such party under this or any other contract.
- (xiv) Neither party shall be entitled to bring a claim for arbitration, if it is not filed as per the time period already specified or within six months of the following:
 - (a) Of the date of completion of the work as certified by the Engineer In charge or
 - (b) Of the date of abandonment of the work or breach of contract under any of its clauses or
 - (c) Of its non-commencement or no resumption of work within 10 days of written notice for commencement or resumption as applicable, or
 - (d) Of the cancellation termination or withdrawal of the work from the contractor/bidder in whole or in part and/or revision or foreclosure of the contract, or
 - (e) Of receiving an intimation from the Engineer-in-charge that the final payment, due or recovery from the contractor/bidder had been determined, for the purpose of payment/adjustment whichever is the latest.

If the matter is not referred to Arbitrator within the period prescribed above, all the



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rights and claims of either party under the contract shall be deemed to have been forfeited and absolutely barred by time for arbitration and even for civil litigation.

- (xv) No question relating to this contract shall be brought before any civil court without first invoking and completing the arbitration proceedings, if the issue is covered by the scope of arbitration under this contract. The pending arbitration proceedings shall not disentitle the Engineer-in-charge to terminate the contract and to make alternate arrangements for completion of the works.
- (xvi) The Arbitrator shall be deemed to have entered on the reference on the day, he issued notices to the parties fixing the first date of the hearing. The Arbitrator may, from time to time with the consent of the parties enlarge the initial time for making and publishing the award.
- (xvii) The expiry of the contractual time limit, whether originally fixed or extended, shall not invalidate the provisions of this clause.

58. Extra-ordinary Claims

No claim for payment of an extraordinary nature, such as claims for bonus, for extra labour employed in completing the work before the expiry of the contractual period at the request of Engineer-in-charge or claims for compensation where work has been temporarily brought to a stand still though no fault of the contractor/bidder, shall be allowed unless and to the extent that the same shall have been expressly sanctioned by the Chief Engineer under his own signatures.

59. Lump sum in Estimate

When the estimate on which a bid is made includes lump sums in respect of parts of the work the contractor/bidder shall be entitled to payment in respect of the items of work involved at the same rates as are payable under this contract for such items. If the part of the 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 Engineer In charge shall be final and conclusive against the contractor/bidder with regard to any sum or sums payable to him under provision of this clause.

60.

(a) Statutory Levies

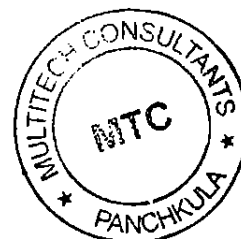
The rates as offered and accepted in this contract are inclusive of all taxes and statutory levies such as stamp duty on the contract agreement, Income tax, Octroi terminal tax, Sales; tax/turn over tax, royalty, contribution under employee's State Insurance and local taxes payable under the respective statutes (ESI contribution etc.). Any change in Taxation will have to be borne by the Bidder.

(b) Income Tax

Income tax shall be deducted at source as per provisions of the Income tax Act and a certificate of such deduction made in each financial year shall be furnished to the contractor/bidder by the disbursing officer.

(c) VAT & Other Taxes

VAT, turnover tax or any other tax (GST as & when applicable) shall also be deducted from the bills of the contractor/bidder if so directed by the authorities concerned. Water charged @1.5% will be deducted on the entire payment made to the agency.



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(d) Local Laws & Levies

The contractor/bidder shall comply with the proper bylaws and legal orders of the local bodies or public authority under the jurisdiction of which the work is executed and pay all fees and charges for which he may be liable. Nothing extra shall be payable on this account.

(e) Daily Payment in Emergency

In case of emergency, the contractor/bidder shall be required to pay his labour every day and in case of default, the requisite payment shall be made by the department and the amount shall be recovered from the contractor/bidder.

61. Site Clearance

No extra money will be payable to the contractor/bidder for removal of shrubs, debris, rubbish, heaps of earth or any such unevenness in the ground levels before commencement of the work. Similarly as per the CPWD specifications he will remove from site above said materials and surplus materials as directed by the Engineer-in-charge and backfill the excavated trenches, pits, foundations etc. in successive horizontal layers not more than 15 cm. thick and leave the site in a condition i.e. acceptable to the Engineer-in-charge as far as the cleanliness of work site is concerned without any additional payment.

62. In case if the treated effluent quality whatsoever may be the reason does not satisfy the standards given in this tender, the contractor will be penalized on double the prorated basis in the form of deduction of payment admissible to him on the per day basis desired from the quoted rates mentioned in Volume 3 Item No. 1.4 (iii) for that particular year at O&M.

Any recovery made by the UT Electricity on account of misuse & nonfunctioning of any equipment of electricity will be deducted from the contractors bill.

For testing the quality of sewage in the Departmental lab / Government approved lab, the contractor or his authorized representative has to make himself available at the time of collection of sample. If contractor or his representative fails to present himself the sample will be collected in his absence. The same thus collected shall be tested in the departmental lab and it would be binding on the contractor to abide by the test results. In case of any query / clarification over test results, the contractor may however get the samples tested at Pollution Control Board, Chandigarh at his own expenses after due permission from the Executive Engineer, M.C. Public Health, Division No. 4, Chandigarh.



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**PERFORMA FOR MOU BETWEEN CONTRACTOR & TECHNOLOGY PROVIDER(to be
(submitted by the contractor in his bid except when he himself is Technology Provider)**

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding (MOU) is entered into on _____ by and
between M/s _____ (Name of Bidder) (hereinafter referred as
'XXXX'), with a Registered Office at _____

_____. (Address of Bidder).

AND

_____, (Name of Tech Provider) (hereinafter
referred as 'YYYY'), with a Registered Office at _____
_____. (Address of Tech Provider).

WITNESSETH

Whereas M/s ('XXXX') is in business of turnkey execution of Water and Sewage / Waste Water
Treatment Plants.

Whereas M/s ('YYYY') is in business of Design, Engineering and Supply of Components for SBR
Technology for Sewage Treatment Plants.

Whereas _____ (Name of
Customer) (hereinafter referred as 'ZZZZ') has invited bids on prescribed Performa from reputed
and experienced agencies for turnkey contract for " _____

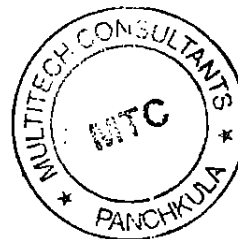
(Name of Work)".

This MOU is executed specifically for the above mentioned work and cannot be used for any other
works/Project

AND

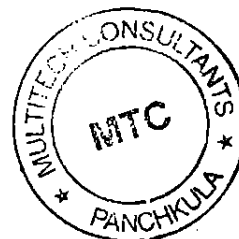
M/s (XXXX) is submitting its bid as lead partner and M/s (XXXX) has decided to enter into an
exclusive MOU with M/s (YYYY) to engage them exclusively as Technology Provider for the
Biological Treatment section using SBR Technology as part of the above mentioned work for which
tenders are invited by (ZZZZ).

Now, therefore both the parties hereto agree as follow:



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1. M/s (XXXX) is submitting its bid only and exclusively with M/s (YYYY) as technology Provider.
2. M/s (YYYY) will be the Technology Provider to M/s (XXXX) for the SBR Technology to be used for in the Biological Treatment section of the STP.
3. M/s (YYYY) shall provide following services and Equipments to M/s (XXXX):
 - a) Basic Engineering for SBR Technology.
 - b) Supply of all Equipments and Instruments as part of the SBR Technology along with back up guarantee for performance as per the tender requirement. Back – up guarantee for performance shall be applicable and valid only in case all design and documents for the complete STP is in accordance with M/s (YYYY) design guidelines and all documents and drawings are reviewed, stamped and signed by M/s (YYYY).
 - c) Shall provide supervision assistance during erection, commissioning, performance testing and trial runs of the STP on SBR Technology.
 - d) Shall provide supervision assistance during O&M period of the STP for the SBR Technology units of the STP if required on a chargeable basis, for which he is accountable to M/s (ZZZZ).
4. M/s (XXXX) will be the main contractor and the authority to sign the agreement with (ZZZZ). M/s (XXXX) and M/s (YYYY) shall jointly accept responsibility and obligation for the works and shall be jointly and severally responsible to the client viz. (ZZZZ) for the performance of the entire project as per the tender document. M/s (XXXX) and M/s (YYYY) shall jointly furnish bank guarantees for due security, performance and O&M and all other such obligations under the project.
5. M/s (YYYY) shall provide and commit such resources as are necessary to perform their scope of work for the successful completion of the project. M/s (YYYY) shall also attend all review meeting over the project as and when called for by (ZZZZ) till the completion of the project.
6. M/s (XXXX) shall make all payments due to M/s (YYYY) or to their accredited representative as per their offer to be decided between themselves.
7. Each party hereto in relation with the other is solely responsible and liable for their respective scope of work, to be mutually agreed between the parties and incorporated a detailed Agreement/ Purchase Order to be entered into between the parties before start of work for the above mentioned work. Such detailed Agreement/ Purchase Order shall be deal with technical and financial aspects of the project.
8. Each party agrees to and undertakes to indemnify and hold harmless the other party against any liability, loss, cost damages or expenses sustained as a result of negligent or improper performance or disturbance caused by itself or by any of its sub – contractors, suppliers or associates in connection with its share of works as per the contract. If any third party enforces any claim, which is attributable to the scope of work of a certain party, that party shall settle such claims. The parties agree to indemnify each other against all claims made by any third party in respect of any infringements of any rights protected by patents, designs or copyrights or trademarks employed in the project by any party.
9. In the course of working as associates, M/s (XXXX)/M/s (YYYY) will be sharing information with each other which may be proprietary / confidential information/ knowledge acquired by each other. It is hereby agreed that both the parties will maintain complete secrecy regarding such information/ knowledge and will not divulge to any party for any other purpose except for the success of the joint execution of the contract.



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10. Further it is to be explicitly understood by the bidder that SBR is intellectual property and bidder shall not copy/ or develop a similar technology or disclose any of the technology information including drawing and design to any third party or use them for any other project other than covered under this MOU.
11. M/s (XXXX) shall only quote on SBR Technology & will not offer any alternate SBR or any other Technology in the above tender of (ZZZZZ).
12. Disputes if any arising in connection with this agreement shall, at the first place, be referred and settled mutually and amicably between the parties herein through their respective senior executive without making reference to the arbitration. In the extreme unlikely case, where no reconciliation is reached within sixty (60) days from reference for the dispute to the other party by the dispute raising party, such dispute shall be settled by arbitration in accordance with the provisions of the arbitration & conciliation Act, 1996 and/ or any statutory amendments thereto. The number of arbitrators shall be three. Each party shall nominate their respective arbitrators and both the nominated arbitrators shall appoint the third arbitrator who shall act as the Presiding arbitrator. The venue of arbitration shall be Chandigarh and the language used shall be English. The arbitral award shall be final and binding upon the parties. Neither party shall be released from its obligations to comply with any of the provisions of this agreement, the contract and the detailed agreement as a result of reference of disputes to arbitration or during the course of arbitral proceeding.
13. The MOU shall be effective from the date s mentioned in the first page of the MOU and shall remain valid till the project completion and shall terminate on the happening of any of the following:
 - a) The bid submitted by M/s (XXXX) is rejected or M/s (XXXX) is unsuccessful in the bid.
 - b) The contract for the works has been awarded to the other third parties.
 - c) The client notifies the parties that they will not proceed with the project.
 - d) Any of the parties to the Agreement is declared insolvent by a court of competent jurisdiction.
14. This MOU shall be subject to the laws in India and shall be subject to the jurisdiction of the court at Chandigarh.
15. For the sake of correspondence, following Addresses and the Persons concerned are to be contacted:

(Name of Bidder)	(Name of Tech Provider)
(Address of Bidder)	(Address of Tech Provider)
Tel No. : +91	Tel No. : +91
Fax No. : +91	Fax No. : +91
Contact Person:	Contact Person:
Designation :	Designation :

For (Name of Bidder)

For (Name of Tech Provider)

(Authorized Signatory)

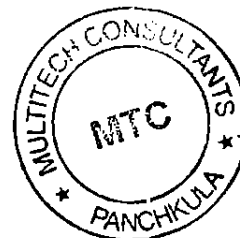
(Authorized Signatory)

Name :

Name :

Designation :

Designation



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List of essential Equipments and Machinery to be arranged by the Contractor/Bidder Free of Cost

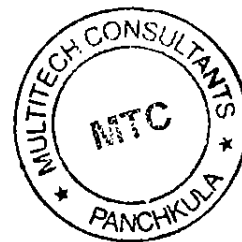
(a) FOR CONSTRUCTION:

Following equipment and machinery shall be arranged by the contractor/bidder (free of cost) in sufficient no./quantity, commensurate with the time schedule for completion of work.

1. Steel Shuttering :
2. Concrete Mixer with Hoppers :
3. Concrete Vibrators :
4. Pump Sets (for dewatering of Sub soil Water) :
5. GI Pipe Line with Specials :
6. Flexible Pipe Line :
7. Theodolite :
8. Dumpy Level with Leveling Staff :
9. Plane Table Set :

(b) FOR FIELD LABORATORY:

1. Compression Testing Machine
2. Concrete Cube Moulds (150 mm x 150 mm x 150mm)
3. Slump Cones
4. Graduated Glass Cylinder
5. Set of Sieves for Coarse Aggregate (40, 20, 25 & 4.75 mm)
6. Set of Sieves for fine aggregate (4.75, 2.36, 1.18 mm & 600, 300, 150 micron)
7. Weighing Scale (Pan Type) with Weights.
8. Core Cutters for soil with accessories.





DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH.

VOLUME - I : PART - 2

SCOPE OF WORK

(A) CAPITAL WORKS

**EXECUTIVE ENGINEER,
MUNICIPAL CORPORATION PUBLIC HEALTH
DIVISION NO. 1, CHANDIGARH**



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(A) CAPITAL WORKS**1.0 INTRODUCTION**

1.1 Chandigarh is the only planned city in India with a population of 9 lakh in the year 2001. It is one of the fastest growing cities with population growth rate of 40.3% per decade. The city Chandigarh is offering world class services to its investors. However the city is still developing its infrastructure. Due to rapid urbanization growth and industrial development, the up gradation of infrastructure is further required. It is proposed to construct a 22.7 MLD STP (5MGD) based on SBR Technology at Maloya.

The tender documents consist of:

Volume – I

Part – 1: Notice Inviting Tender, Instructions to Bidders, Forms of Agreement & Clauses of Contract

Part – 2: Scope of Work

Part – 3: Submission / Evaluation of Bid

Volume II

Part – 1: Technical Specifications for Civil Works

Part – 2: Technical Specifications for Electro-mechanical Works

Volume III: Price Schedule

Preliminary Drawings

1.2 Site Information

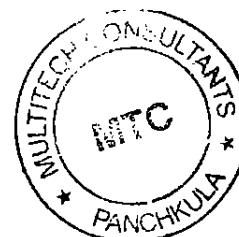
The map indicating the area available, ground levels etc is enclosed. The depth of sewer at last point is approx 2.70 metres

Ground Level of the site	=	Varying from 320.00 to 321.00 m
Present spring level	=	10 m below ground level
Worst Spring Level	=	to be ascertained by the agency as mentioned in Volume 1 Page 106 of tender document
Net safe bearing capacity of soil	=	Detailed soil bearing report attached
HFL of receiving drain (Choe)	=	To be ascertained by the bidder
FGI to be provided at site	=	As per the approved drawings
Plinth Level of Building	=	As per the approved drawings
HFL of STP site	=	As per the approved drawings

1.3 Raw Sewage Characteristics

The Plant shall be designed for Average Flow of 22.73 MLD and Peak Flow of 51.14 MLD considering a Peak Factor of 2.25. The Plant shall be designed for following characteristics of raw sewage:

Sr. No.	Parameter	Value	Unit
1	pH	7.0-8.0	---
2	Biochemical Oxygen Demand (BOD ₅)	325	mg/l
3	Chemical Oxygen Demand (COD)	500	mg/l
4	Total Suspended Solids (TSS)	330	mg/l
5	Fecal Coliform Count	1 x 10 ⁷	MPN/100 ml
6	Total Kjeldahl Nitrogen (TKN as N)	45	Mg/l



7	Amonia Nitrogen	10	Mg/l
8	Total Phosphorous	5	Mg/l
9	TDS	1000-1500	Mg/l

1.4 Treated Sewage Quality

The treated sewage quality to be guaranteed by the contractor is as below:

Sr. No.	Parameter	Value	Unit
1	Biochemical Oxygen Demand (BOD ₅)	≤ 5	mg/l
2	Total Suspended Solids (TSS)	≤ 5	mg/l
3	Chemical Oxygen Demand (COD)	≤ 50	mg/l
4	pH	6.5-8.0	
5	Ammonical Nitrogen (NH ₃ -N as N)	≤ 2	Mg/l
6	Nitrate Nitrogen (NO ₃ -N as N)	≤ 10	Mg/l
7	Total Phosphorous (TP)	≤ 2	Mg/l
8	Fecal Coliform Count	≤ 230	MPN/100 ml

Note : If there is any presence of any heavy metal in the incoming sewage, the contractor is not expected to provide any treatment for that metal. However, treatment for all the parameters as defined in the DNIT has to be provided at all times.

1.5 Scope of Work

The scope of work shall include but not limited to the following:

- Planning, designing and construction of civil engineering works for all the Units and all the Ancillary Structures.
- Planning, designing, supplying, erection, testing & commissioning of all the Mechanical Equipments.
- Planning, designing, supplying, erection, testing & commissioning of all the Electrical & Instrumentation Items.
- Planning, designing, supplying, erection, testing & commissioning of all the Piping, Gates, Valves and Specials etc.
- Hydraulic testing of all the Water Retaining Structures
- Operation & Maintenance of the Plant for Start-up / Stabilization for a period of 180 days or complete stabilization of the Process whichever is longer.
- Operation & Maintenance of the Plant for a period of One Hundred and Twenty (120) months after Stabilization of Process.
- During Stabilization and Operation & Maintenance Period, Electricity Charges, Diesel Charges (if any) will be borne by the Department. All other consumable Materials and required Staff will be provided by Bidder.
- Defect liability for a period of twelve (12) months after the completion of Works.
- Supply of as-built Drawings after completion.
- Supply of Equipment Drawings, Technical Specifications and Catalogues.
- Manufacturer's Manual for Operation & Maintenance of the Equipment supplied.

1.6 Drawings

1.6.1 Digital site survey plan is attached in this tender document for reference of the bidders. However the bidders are advised to visit the site to get acquainted with it before bidding. **All bidders are required to submit Layout Plan, Hydraulic Flow Diagram, P&I Diagram along with Process Calculations, Pipe Sizing calculations and any other necessary details in**



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their technical bid. Any bid submitted without these above mentioned drawings and designs shall be summarily rejected. During technical equalization, the department shall give its observations on these drawings and any changes suggested by the department shall be binding upon the bidders.

1.6.2 Detailed working drawings and design shall be submitted by the successful bidder to the department for approval before execution of work. The design/drawings submitted by the Contractor to the department will be approved by the department. If changes in the submitted design/drawings are required, the Engineer-in-charge may either himself do so prior to approval or may request the contractor to resubmit the design/drawings after making the required amendments. Any changes / modifications suggested by the department in the drawings will be binding upon the bidders before this approval.

1.6.3 Time Schedule for Submission of drawings from Letter of Acceptance:

- i. Submission of process design for approval : Within 3 weeks of allotment of work.
- ii. Submission of structural design based on approved process design: Within 4 weeks of approval of process design.
- iii. Mechanical / Electrical design and drawing shall be submitted by the agency within 45 days after approval of structural drawings complete in all respects.

1.6.4 Approval of design / drawings:

All the drawings / design shall be got vetted from Punjab Engineering College (PEC), Sector 12, Chandigarh or any NIT / IIT before the approval by the department. The process, structural, electrical, mechanical design shall be designed strictly according to tender document, Contractor's bid and Manual of Sewerage and Sewage Treatment (Latest Edition) quoting reference number as well as structural, electrical and mechanical design strictly according to latest relevant IS codes.

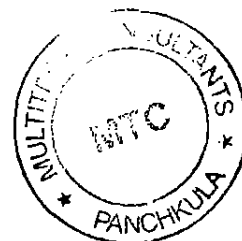
2.0 SCOPE OF WORK FOR MAIN PUMPING STATION (MPS)

2.1 CIVIL WORKS

- Sewer Connection
- Inlet Chamber
- Screening Chamber
- Main Collection Sump
- Valve Chamber
- Piping and Specials
- Bypass Arrangement

2.1.1 Sewer Connection

Raw sewage will be conveyed to the STP site through existing sewer line, located outside the boundary wall of the STP site. The depth of this line is approximately 2.70 metres below road level. The contractor shall lay 36" dia RCC NP-3 sewer line from existing last manhole of sewer line upto proposed Main Pumping Station including connection with existing sewer and provision of intermediate manholes. Length of sewer line shall depend upon the layout plan proposed by the bidder and as per approval by the department.



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2.1.2 Inlet Chamber

The inlet chamber is proposed to act as a receiving structure for the sewage flow from the gravity sewer of the MPS. The sewage from the inlet chamber overflows into screen chamber where it undergoes screening.

No. of unit	=	1
Average flow (MLD)	=	22.7
Peak factor	=	2.25
Peak flow (MLD)	=	51.075
Free Board (m)	=	0.50
Hydraulic Retention time at peak flow	=	30 seconds (minimum)

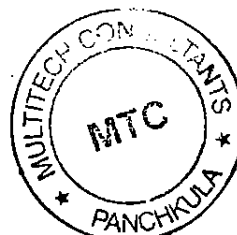
2.1.3 Screen Chamber

Two number screen channels with 2 Number mechanical bar screens (working) each designed on 100% peak flow shall be provided. C.I. sluice gates shall be proposed on upstream and downstream of all the three channels to regulate the flow. RCC Platforms shall be provided at suitable level to enable operation and maintenance of the unit.

Number of Units	=	2 Nos. Mechanical (1working + 1 Standbye)
Approach Velocity at Average Flow (m/sec.)	=	0.3
Velocity through Screen at Average Flow (m/sec.)	=	0.6 maximum
Velocity through Screen at Peak Flow (m/sec.)	=	1.2 maximum
Free Board u/s of screen (m)	=	0.5
Average flow for each screen (MLD)	=	22.70
Peak flow for each screen (MLD)	=	51.08

2.1.4 Main Collection Sump

Main Collection sump is rectangular RCC Structure with two compartments for receiving and collection of sewage from screening chamber. Hydraulic retention time shall be minimum 5.0 minutes at peak flow. **The working depth of sump shall be considered below bed level of screening chamber / weir level at the downstream end of screening chamber.** Additional depth of sump to take care of minimum submergence of pumps shall be provided. Main collection sump shall be divided into two compartments with a full height partition wall separating the two compartments. Each compartment shall have walkway all along the sump. Civil structure for pump lifting with Mono rail mounted Electric Manual Hoist shall be provided. A CI sluice gate (1000 x 1000mm) shall be provided in the partition wall of the sump. The gate shall be operatable from the top of sump, with the help of operating stock. The sluice gate shall be capable of withstanding unbalance head. 6 numbers submersible raw sewage pumps, non clog type, shall be provided in the main collection sump (3 in each compartment). Complete piping, valves, cabling, earthing etc shall be included in the scope of work of the contractor. Based on incoming flow conditions, adequate no. of pumps shall start / stop automatically to cater the pumping requirements. Automation shall be controlled through the PLC provided for operation of the plant. Suitable arrangement shall be made for emptying either of the two sump portions for maintenance.



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2.1.5 Valve Chamber

Raw Sewage Sump to drain off the water from the Valve Chamber into the Raw Sewage Sump. Valve Chamber shall be a rectangular enclosure, 3 m wide, 2 to 2.5 m deep and length equal to the length of Raw Sewage Sump. It will house all the specials of delivery line i.e. Check Valves, Sluice Valves, Tees, Bends, Dismantling Joints etc. and common delivery header (rising main).

Two numbers of 80 mm dia. puddle pipes with Sluice Valves shall be provided in the wall common with the Raw Sewage Sump to drain off the water from the Valve Chamber into the Raw Sewage Sump to drain off the water from the Valves Chamber into the Raw Sewage Sump. In addition, a Pit of 1.00 x 1.00 x 0.50 m shall be provided in one corner of the Chamber for collection of water which can be pumped out by a moveable pumping set.

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.

2.1.6 Delivery Piping and Specials

This shall include providing, laying, cutting, jointing, testing etc complete of following pipes along with specials:

- Pipe from last manhole of existing sewer line upto inlet chamber of MPS : RCC NP-3
- Delivery line for individual pump upto common header : DI K-9
- Non return valve, sluice valve, dismantling joint , Pressure gauge on each pump delivery line
- Common header upto inlet of STP : DI K-9
 - All other required specials such as bends, tees etc.
 - The common header pipe shall be minimum 1000 mm dia DI K-9 pipe.

2.1.7 Bypass Arrangement

A bypass RCC channel / RCC NP-3 pipe shall be provided in the Receiving Chamber of MPS to enable the incoming raw sewage to be bypassed whenever required. When the pumps are non operational or calamity flow has reached the MPS, the sewage level will rise in the MPS. When the level reaches the invert level of the bypass channel / pipe, the sewage will start flowing to this bypass channel / pipe. The flow through the bypass channel / pipe is to be controlled by DI Sluice Gates / DI Sluice Valves. The bypass channel / pipe shall terminate into the treated effluent disposal pipe / channel to be constructed to dispose of the treated effluent into the receiving choe located at certain distance outside the STP boundary. (as shown on Survey Plan).

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.



2.2 ELECTRICAL & MECHANICAL WORKS of MPS

1. Mechanical Coarse Screens
2. Raw Sewage Transfer Pumps
3. Electrical Panels
4. Cabling & Earthing
5. Instrumentation
6. Control Gates
7. Electrical Hoist Mechanism
8. PLC / SCADA

2.2.1 Mechanical Coarse Screens

This includes supply, erection, testing and commissioning of two (2) numbers of Mechanically Operated Coarse Screens (1 working + 1 stanbye). These shall be provided in the screen chamber after the flow is received in the inlet chamber. The screens should be of sturdy design to take care of all sorts of materials envisaged in the gravity sewer.

Design Criteria

Avg flow through each screen	:	22.70 MLD
Peak flow through each screen	:	51.08 MLD
Mechanical Bar Screen (Each designed on Peak load)	:	2 Nos. (1 W +1S)
Approach velocity at Average Flow (m/sec.)	:	0.3
Velocity through Screen at Average Flow (m/sec.)	:	0.6 maximum
Velocity through Screen at Peak Flow (m/sec.)	:	1.2 maximum

The clear opening for mechanical screen shall be 20 mm. The mechanical bar screens shall be of 10 mm thick Stainless Steel (SS-304) flats. Conveyor Belt and chute arrangement shall be provided to take the screenings. A conveyor system for mechanical screens of suitable width shall be provided which shall into a wheel barrow for its disposal.

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.



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2.2.2 Submersible Sewage Pumps

It is proposed to install 6 submersible sewage pumps of equal capacity alongwith motors in the main collection sump (3 in each of compartment). The capacity of pumps shall be such that any 4 pumps running in parallel can pump out peak flow. Remaining 2 pumps shall act as stand bye.

The automated working of the main pumping station shall be governed by the level of sewage in the Main Collection Chamber. It will have following features.

- There shall be provision of the pumps turning ON depending upon the level of sewage in the collection chamber. The ultrasonic level indication mechanism shall be fitted on the top of the Collection Sump which shall transmit signal for starting or stopping of specific number of pumps as per level of sewage in the collection sump.
- Sequence change of the pumps should be ensured so that the standby pumps are also brought to use regularly.
- The pumps operating at lowest level shall be changed on daily basis.
- Raw Sewage Pumps Operation shall be in auto. Capacitance type level transmitter shall be provider for "High", "Medium", "Low" and "Low – Low" levels for auto start / stop for pumps. The arrangement shall be such that under no condition, dry run of pump occurs. Also adequate number of pumps shall start / stop based on levels in the sump. The pumps shall be PLC controlled.

Type	:	Non Clog, Submersible
Quantity	:	4W + 2 SB
Solid size handling	:	minimum 80 mm
Minimum efficiency	:	65%

2.2.3 Electrical Panels

The following panels would be provided in the Panel Room in Operations Building for feeding and controlling the electrical loads.

Main Electrical Panel for incoming Power Supply (HT + LT Panel)

1.1 General Specifications

The panel will be manufactured out of 2 mm thick CRCA sheet for load bearing members and hinged doors and 1.5 mm thick sheet for partitions & bolted covers. Suitable reinforcement will be provided, wherever required. The panel will be powder coated with Siemens Grey shade or as approved by Engineer-in-Charge after seven tank process of pretreatment. LT Panels should be totally type tested as per IEC 61439 and shall be of form 4B Segregation. The Panels shall also be tested for internal arc containment test as per IEC 61641.

Motors upto 7.5 HP Air Break Direct on line starter would be provided. For motor above 7.5 HP upto 25 HP Star Delta starter shall be provided. For motors above 25 HP. Soft starters shall be provided. All incomer breaker for Transformer and generator should be connected to Arc Guard device for protection against Arc Accidents.



1.2 Moulded Case Circuit Breaker (MCCB)

Molded case circuit – breakers with Rated service voltage 690 V AC with minimum rated impulse voltage for currents equal or over 160 A: 8 kV with Rated insulation voltage for currents equal or over 160 A: 800 V AC. The protection threshold against overload must be continuously adjustable starting from 0.7 times the rated current of the trip unit and upto its rated value. The protection threshold against short-circuit can be either the fixed or adjustable type with continuity from 5 and up to 10 times the rated current of the trip unit. For circuit-breakers with rated uninterrupted current upto 400 A, a thermo magnetic trip unit must be available for generator protection with adjustable thermal threshold, starting from $0.7 \times I_n$, and fixed magnetic threshold at $3 \times I_n$ or adjustable magnetic threshold from 2.5 to $5 \times I_n$.

1.3 ACB (Air Circuit Breaker)

The circuit-breakers must have a rated service voltage of 690 V AC and a rated insulation voltage of 1000 V with rated impulse withstand voltage of 12 kV. It must be possible to inspect easily the arcing chambers and to check main contact wear with the circuit-breaker racked-out, by removing the arcing chambers. All the circuit-breakers in the range should have the same height and depth with the aim of standardizing the supporting structures of the switchgear. The whole range of air circuit-breakers must be fitted with electronic protection releases. It must be allowed the interchangeability of protection releases from skilled personnel. Bluetooth communication capable required for easy SCADA Communication in future. The circuit-breakers in the withdraw able version must be fitted with anti-racking in locks to prevent racking a moving part into a fixed part with a different rated current. Thermal memory for functions L and S, Protection against over temperature. It must be possible to signal the presence of anomalous temperatures on the release by means of two LEDs (Warning and Alarm) and, if decided during the unit configuration phase, when the temperature is over 85°C .

1.4 Soft Starter

The soft starter shall be constructed and tested in accordance with UL 508. The soft starter shall have documented Type – 2 coordination with circuit breakers and fuses for short-circuit protection. Three phase control with operation voltage: 208- 600V AC wide rated control supply voltage: 100-250VAC 50/60 Hz Built in bypass to reduce energy consumption at full speed and increase the life time of soft starter. Possibility for both in line and inside-delta connection of the motor. The soft starter shall have built in Modbus RTU for communication. Support for other protocols shall be an option. The softstarter shall be equipped with one analog output. The softstarter shall have a minimum 3 signal Relays output for Run, Bypass (Top of Ramp) and Event signal. The soft starter shall have a start and stop buttons, information button for access to a built in manual and an USB-port for connection to a PC. The softstarter shall have the following start ramps available. voltage start ramp Torque start ramp & Full voltage start.

The softstarter shall integrate motor and load protections, which shall under no circumstances be disabled when the integrated bypass is used. The softstarter shall also be able to present a warning before tripping for each protection.

The Softstarter shall have the following motor protections available.

- Electronic Overload Protection, Class 10A, 10, 20, 30
- Locked Rotor Protection



- Motor Underload Protection
- Current Imbalance Protection
- Voltage Imbalance Protection
- Overvoltage and Under Voltage Protection
- Phase Reversal Protection
- Earth Fault Protection

1.5 Contractors

The contractors would be capable of frequent switching and should operate without de rating at 55 degree C for AC3 applications. Above 185 Amp Coil Access should be available from front. The rated operational voltage of the contractor should be 690 V and rated insulation voltage will be 690-1000V. The rated impulse voltage of the contractor would be 8KV.

All 3 Pole & 4 Pole Contractor should withstand voltage fluctuations with wide banc voltage limits where Drop out Voltage should be less than or Equal to 100V & Pick up will be less than & equal to 130 V. The thermal over load relay if used will be direct / separate mounting over the contractor without any specific connections.

For Capacitor use, the contractor would be suitable for Capacitor with damping Resistance having unlimited in rush current handling capacity.

2.0 ARC GUARD

All switchgears should be equipped with an efficient and reliable arc detection system designed according to IEC 61508 with a safety level exceeding SIL 2. The system shall consist of one or more arc monitoring units and light detectors. Arc detection system will not be activated by interfering influences such as portable lamps, electro-magnetic fields, vibration or touching in case of an arc occurring in the switchgear it shall be possible to identify where and when the arc has occurred. This information should be accessible without opening the switchgear door and stored even if power is lost to the system. The HMI should have LCD Display & shall not affect the IP degree of the cabinet. HMI can see last 7 instances trip history with time & date with real time clock is an inbuilt feature. Apart from this, it can reset and clear the fault from HMI itself very easily. It should also have self-diagnostic feature 24/7 on its own. Breaker trip selectively to be set from HMI along with dip switches, so it ensures avoiding miss handling by human being in the application. Arc detection unit should have point detector instead of sling detector & can be possible to extend up to max of 30 detector.

3. MPS Main Electrical Panel For Distribution of Supply to MPS Load

The Panel will act as main distribution panel through which supply shall be fed to the Mechanical Coarse Bar Screen, Flat Belt Conveyer, Raw Sewage Transfer Pumps and Electric Hoist etc. The incoming supply to this Panel will be obtained from the Main Electric Panel.

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.



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4. Individual Starter Panels for Mechanical Screens (2 No.)

Individual starter panel shall be provided for each mechanical coarse screen. Necessary control wiring should be made so that the screens start / stops on auto.

5. Individual Starter Panels for Submersible Sewage Pumps (6 Nos.)

Individual starter panel shall be provided for each Submersible Sewage Pumps. The pumps should be controlled by the automatic liquid level controller while the pumps run in auto mode. Necessary control wiring should be made so that the pump start / stops on auto.

6. APFC Capacitor Panel

This Panel is provided in order to improve the power factor of the Main Pumping Station.

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.

2.2.5 Cabling & Earthing

Cabling:

This includes supply, erection, testing & commissioning of power & control cables required for interconnecting Metering Unit, HT Panel, Transformers, Electrical Panels, Drives and various electrical loads and their controls such as water level control, dry run control, moisture seal control, ON/OFF control to their respective sources and loads. The cables with cable termination kits, cable trenches / trays and junction boxes, wherever required, should be provided in all respect. Civil works like construction of cable trenches with bricks, with angles, chequered plates etc. are also included in the scope. For cables outside the building trenches will be constructed.

Power & Control Cables	:	LOT
Junction Boxes	:	LOT
Cable Trays	:	LOT

Note: Power will be made available inside the STP premises by the department. All other works including HT, LT cabling, panels, substation etc will be done by the contractor.

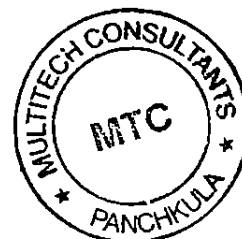
All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.

Earthing:

This includes the earthing arrangement of all ground-exposed, non-current carrying metal components of electrical equipments, cable grounding conductors, armour or shielding and enclosures. Continuity of system and equipment grounds throughout the electrical installation shall be maintained. Grounds, bushings and jumpers shall be provided where normal metallic ground paths are interrupted. The work should be done accordingly as mentioned in the specifications.

Earthing works	:	LOT
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All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.



2.2.6 Instrumentation

This includes supply, erection, testing and commissioning of various instruments used. The details of the instruments are as follows:

Sr. No.	Instrument	Location	Quantity
1	Pressure Gauge: Sealed Diaphragm Type	On delivery line of Raw Sewage Transfer Pumps	6
2	Level Transmitter: Ultrasonic Type	Raw Sewage Sump	2
3	Differential Level Transmitter: Ultrasonic Type	Mechanical Coarse Screen Channels	2
4	Ultrasonic flow transmitter	Common discharge header of raw sewage transfer pumps	1
5	Manual valves & gates	Valves / Gates	As per requirement

2.2.7 Control Gates

CI Sluice Gates shall be provided at following locations for flow control:

- Upstream of Mechanical Coarse Screen Channel
- Dividing Wall of Raw Sewage Sump (Main Collection Sump)
- Bypass Channel/Pipe

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.

2.2.8 Electrical Hoist Mechanism

This includes supply, erection, testing and commissioning of manually operated Hoist with electrically operated Travelling Trolley with all the accessories, suitable for lifting Raw Sewage Transfer Pumps. Minimum capacity of the hoist shall be 3 tonnes.

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.

2.2.9 PLC / SCADA

PLC based automation system along with SCADA to control all pumps, valves, gates etc shall be provided.

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.



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3.0 SCOPE OF WORK FOR SEWAGE TREATMENT PLANT (STP)

3.1 CIVIL WORKS

1. Inlet Chamber
2. Fine Screen Channels
3. Mechanical Grit Chambers
4. Distribution Box/ Splitter Box
5. SBR Units
6. Sludge Sump
7. Polyelectrolyte Dosing Tanks
8. Sludge Pump House
9. Centrifuge Shed
10. Deep Bed Rapid Sand Filter
11. Sludge Storage Platform
12. Chlorine Contact Tank
13. Interconnecting Piping (Process Piping & Drain Piping)
14. Transformer Shed
15. Trenches for Cables
16. Horticulture & Landscaping

3.1.1 Inlet Chamber

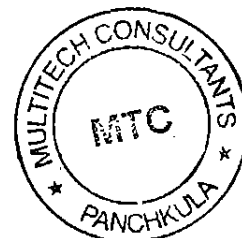
Inlet Chamber will receive raw sewage from Main Pumping Station. RCC Platform/Walkway, minimum 1.00 m wide with Hand Railing as per specifications shall be provided. RCC Staircase, minimum 1.00 m wide with Hand Railing as per specifications shall be provided for access from Finished Ground Level to the top of the Unit & to the Operating Platform / Walkway.

Average Flow	: 22.70 MLD
Peak Factor	: 2.25
Peak Flow	: 51.08 MLD
Number of Units	: 1 No.
Hydraulic Retention Time	: 30 Sec min. at Peak Flow
Free Board	: 0.50 m min.

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.

3.1.2 Fine Screen Channels

Two Mechanical (1W+1S), Fine Screen Channels, each designed for 100% of Peak Flow shall be provided. Sluice Gates shall be provided at upstream and downstream of both the Channels to regulate the flow. Each Screen Channel shall have a CI/DI DF down take pipe with a Sluice Valve/Knife Gate Valve to drain out sewage into a Pit from where the spillage and drain water will



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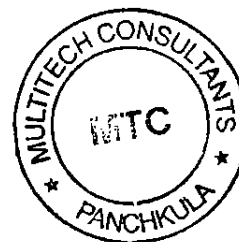
be discharged into the Receiving Chamber of MPS through external sewerage system of SW/RCC Pipes. RCC Platform/Walkway, minimum 1.00 m wide with Hand Railing as per specifications shall be provided. RCC Staircase, minimum 1.00 m wide with Hand Railing as per specifications shall be provided for access from Finished Ground Level to the top of the Unit & to the Operating Platform/Walkway.

The angle of inclination of the manual bar screen with the horizontal shall be approximately 60 degrees. The manual bar screen shall be fabricated from 50 mm x 80 mm thick SS flats with 10 mm clear opening. The assembly (bars and frames by using SS, 75 mm x 40 mm x 6 mm) shall be installed in such a way that in can be installed and removed as and when required.

Average Flow	: 22.70 MLD
Peak Factor	: 2.25
Peak Flow	: 51.08 MLD
Number of Units	: 2 Mechanical (1W+1S) each for 100% of Peak Flow capacity.
Approach Velocity at Average Flow	: 0.30 m/s
Velocity through Screen at Average Flow	: 0.60 m/s max.
Velocity through Screen at Peak Flow	: 1.20 m/s max.
Free Board	: 0.30 m min. on upstream side of the Screen at maximum water level
Wheel Barrow	: 1 No. min.
Minimum Length	: 6 m

The mechanical and manual screen channels are controlled by Aluminium sluice gates at the upstream and downstream end to regulate the flow. Each screen channel shall have a down take CI / DI DF pipe with a sluice valve to drain out sewage into collecting chamber from where the spillage and drain water will be discharged into the collection sump of MPS through external sewerage system of SW / RCC pipes.

The opening of mechanical bar screen shall be 6 mm. Detailed specifications of mechanical bar screen are given in Mechanical Section.



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3.1.3 Mechanical Grit Chambers

Two working mechanical grit chambers are proposed after fine screen units. The mechanical grit chambers shall be Square Mechanical detritus Tanks.

Each Grit Chamber shall have the following:

- One tapered inlet channel running along one side with deflectors for entry of sewage into the Grit Chamber.
- One tapered outlet channel for collecting the degritted sewage, which will overflow over a weir into the outlet channel.
- One sloping grit classifying channel into which the collected grit will be classified.
- The grit from classifier will be collected in a wheel barrow of approx. 0.5 m³ capacity.
- A Grit Scraping Mechanism.
- Adjustable Influent Deflectors.
- Reciprocating Rake Mechanism / Screw Mechanism to remove the grit.
- Organic Return Pumps.

To enable easy operation, RCC platforms with railing shall be provided. Also access is provided from this level to the mechanism support beam of the grit chamber.

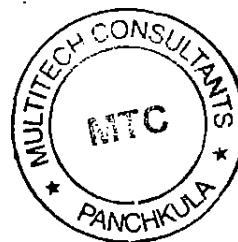
Design Criteria

Average Flow	:	22.70 MLD
Peak Factor	:	2.25
Peak Flow	:	51.08 MLD
No. of Units	:	2 Mechanical (1W+1S) for 100% of Peak Flow capacity each
Design peak flow for each grit chamber	:	51.08 MLD
Type	:	Mechanical
Free Board	:	0.50 m min.
Side Water Depth	:	0.70 m min.

Bypass arrangement with sluice gates shall be provided to bypass either of the two grit chambers or both the chambers simultaneously for maintenance. The ground surface below this unit will be finished with Rubber moulded interlocking paver blocks of cement concrete M-20, 60 mm thick laid over 75 mm sand will be part of Bidder's scope.

M-30

All other accessories, whether specified or not, but required for completion of Contract shall form the part of Bidder's Scope.



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3.1.4 Distribution Box / Splitter Box

A Distribution Box / Splitter Box shall be provided downstream of Grit Chambers prior to SBR Reactors for uniform flow distribution to SBR Reactors. The Distribution Box shall be equipped with suitable motorized Sluice Gates and outlet Weirs.

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.

3.1.5 Sequential Batch Reactor (SBR) Units with diffusers

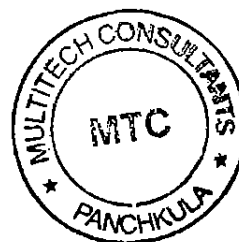
Minimum (2) two SBR reactors along with platforms, railings and Staircase are to be provided. 1 m wide plinth protection consisting of Paver Blocks 60 mm thick laid over 75 mm thick CC 1:3:6 along with toe wall shall be provided around the reactors.

Design Criteria:

Average Flow	:	5 MGD (22.7 MLD)
Peak Flow	:	51.08 MLD
No. of Reactors	:	Minimum 2 Nos.
Minimum HRT	:	12 hrs of Average Flow
MLSS	:	3000-5000 mg/litre
F/M	:	0.10-0.25
DO level during Aeration Phase	:	Min 2 ppm
Free Board	:	Min 0.5 m
SWD	:	Max 5.5 m
Decanting depth	:	3.0 m (max)
SVI	:	<120
Anoxic Zone	:	Minimum 30 minutes
Recirculation Ratio	:	20-30% of feed flow

The reactor shall have provision for installation of Recirculation and Surplus Sludge Pumps and also pits for the same. The walls of the reactor should be designed for installation of decanting mechanism. One Decanter for each Reactor / Basin shall be provided. Provision shall be made for transfer of waste water from one reactor to another for the purpose of maintenance of reactors.

Note : Since the design parameters and arrangements differ for each technology provider, the technology provider is allowed to propose modifications in the SBR internals as per his design. These modifications shall be subject to approval by the department. Also, the guarantee of performance of the plant jointly are severely lies on the Contractor as well as the Technology Provider.



b

3.1.6 Sludge Sump

Sludge sump shall be provided to collect the excess sludge from SBR Reactors. There shall be one common Sludge Sump for all reactors. The Sump shall be equipped with coarse Bubble Air Grid made from stainless steel pipes to facilitate mixing of contents of sludge sump on continuous basis.

Number of Units	:	1 No.
Free Board	:	0.5 m
Capacity	:	4 hr holding of average daily sludge production.

3.1.7 DWPE Dosing Tanks

Two Nos DWPE dosing tanks with provision of mixers shall be provided.

Polymer dosing	:	0-15 kg / MT of dry sludge
Solution Strength	:	0.1%
Capacity of each tank	:	Sufficient for 8 hours dosing

Tanks should have provision for slow speed mixer

3.1.8 Sludge Pump House

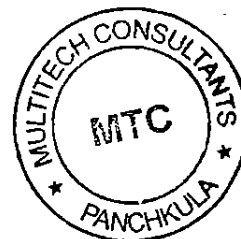
Sludge Pump House of area 40 sqm shall be near sludge sump. This shall be RCC frame and brick masonry structure. Minimum height of the pump house shall be 4 m from the plinth level. It shall be provided with rolling shutter and doors and windows. A chain pulley block of adequate capacity along with girder and pillar arrangement shall be provided.

The pump house shall be painted from inside and outside with approved colour and make as directed by Engineer in Charge. The Pump house shall house –

- Screw pumps for centrifuge feed
- Air blowers for Sludge Sump
- DWPE dosing pumps

3.1.9 Centrifuge Shed

Centrifuge Shed shall accommodate three Centrifuge Units shall be constructed with sufficient floor height above Ground Level to park sludge collection vehicle directly under the sludge discharge line of centrifuge. The room shall have a RCC roof at a height suitable for installing an electrically operated gantry system. Minimum area of the Shed shall be 40 m² . It should be framed RCC structure with the top roof also in RCC. A RCC staircase, minimum 1.0 metres wide, shall be provided. The staircase should be finished with C.C Chequered tiles. White glazed tiles upto one mtr from floor level should be fixed on walls of centrifuge building and the floor at ground and first floor should be Ironite.



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3.1.10 Chlorination Room & Chlorine Contact Tank

The chlorination System having components such as Tonner Shed (Equipped with 3 ton capacity EOT Crane), Chlorination Room , Chlorine Mixing Tank / chlorine contact tank along with suitable size inlet and outlet channels / pipe shall be constructed. The sizes of various components shall be designed in such a way to meet the desired effluent parameters as specified in the tender document.

Decanted treated water from SBR Process shall be taken to chlorine mixing tank by RCC channel / pipe. Chlorine solution (chlorine and water) of required concentration shall be added in the chlorine mixing tank. From here waste water shall pass on to chlorine contact tank. Baffles shall be provided to achieve proper mixing and disinfection. The tank shall be constructed in M30 grade concrete and as per IS 3370. RCC platform, 1 m wide, as per specifications shall be provided.

The inlet and outlet pipe shall be designed for peak flow or decant flow, whichever is more.

Design Flow	:	maximum decant flow
No. of Units	:	1 No.
Detention Time	:	Minimum 20 minutes
Freeboard	:	0.5 m

The No. of tonners provided shall be sufficient to hold 30 days chlorine dose required for achieving the desired results. The tonners shed shall be of sufficient size to accommodate all the tonners. Minimum area of tonner shed shall be 50 sqm. The chlorinators room which shall house the chlorinators & booster pumps shall be of sufficient size of minimum area 12 sqm.

3.1.11 Sludge Storage Platform

A Sludge Storage Platform of minimum 400 m² area shall be provided at a suitable location for storage of sludge from Centrifuge Units. Flooring of the Sludge Storage Platform shall be of 75 mm thick PCC (1:2:4) laid over 100 mm thick stone ballast. Level of the Platform shall be at least 20 cm above the level of the approach road. A brick channel of 30 cm x 30 cm cross section should be constructed all around the platform and to be connected with nearest manhole for sewer line for carrying the flow to MPS.

3.1.12 Process Piping & Drain Piping

This shall include the interconnecting pipeline between different units of STP as given below:

SL NO	FROM	TO	MOC
1.	Grit Chambers	Distribution Box / SBR Reactors	RCC Channel / RCC NP-3 Pipe
2.	SBR Air Blowers: Discharge	Common Discharge Header	MS
3.	SBR Air Blowers: Common Discharge Header	SBR Reactors	MS
4.	SBR Basins: Down comers (Vertical)		SS 304



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5.	Selectors: Air Header		MS
6.	Selectors: Down comers (Vertical)		SS 304
7.	RAS Pumps: Discharge	Selectors	DI K-9
8.	SAS Pumps: Discharge	Sludge Sump	DI K-9
9.	Sludge Sump Air Blowers: Discharge	Sludge Sump	MS
10.	Sludge Sump : Downcomer and laterals		SS 304
11.	Sludge Sump	Centrifuge Feed Pumps: Suction	DI K-9
12.	Centrifuge Feed Pumps: Discharge	Centrifuges	DI K-9
13.	DWPE Dosing Tanks	Drain/Overflow	SS 304
14.	DWPE Dosing Tanks	DWPE Dosing Pumps: Suction Header	SS 304
15.	DWPE Dosing Pumps: Discharge Header	Centrifuge Inlet	SS 304
16.	SBR Reactors	Chlorine Mixing Tank	RCC Channel / RCC NP-3 / DI K-9 Pipe
17.	Concentrate from centrifuge	Nearest Chamber	DI K-9
18.	Drain Pipes for various units	Nearest Chamber	DI K-9
19.	External Sewerage System		SW / RCC NP-3 Pipe
20.	Bypass Pipe / Channel for bypass of MPS & STP	Effluent Disposal Channel / Pipe	RCC Channel / RCC NP-3 Pipe
21.	Any other		

3.1.13 Notes:

The entire network shall be designed for peak flow.

a) Combination of Pipes and Channels can be used for conveyance of wastewater as per site conditions.

b) The sizes of Pipes shall be calculated to meet following criteria

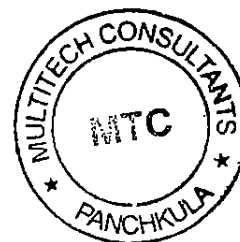
Velocity for Air Pipe : 12 – 25 m/sec.

Velocity for Water/Wastewater Pipes : 0.6 – 2.00 m/sec

c) Piping shall include specials like Elbows, Wyes, Sluice Valves, Knife Gate Valves and Non return valves etc wherever required.

3.1.14 TRANSFORMER SHED

The transformer shed as per the approved drawing and specifications to the entire satisfaction of the Engineer in Charge.



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3.1.15 TRENCHES FOR CABLES

The cables will be laid in the brick work trenches in the open area duly covered with RCC slabs. The cables which would be required to be laid in the buildings / constructed areas will be laid in trenches covered with 5 mm thick MS Chequered plates supported on MS angle frames fixed in floors with suitable hold fasts complete including lifting arrangement and painting etc. The cables in these trenches shall be fixed on the walls of the trenches with suitable clips / clamps. Each cable should be tagged at every 1 mtr distance.

3.1.16 HORTICULTURE & LANDSCAPING

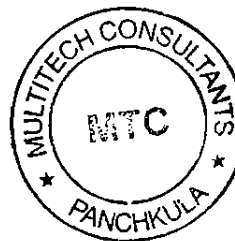
The agency will carry out the work of plantation of grass / plants / trees in the 50% of the plot within boundary walls and also maintain the same complete to the entire satisfaction the Engineer in Charge throughout throughout the contract period including O & M Period of 120 months.

3.2 ELECTRICAL & MECHANICAL WORKS

1. Mechanically Operated Fine Bar Screens
2. Mechanical Detritor
3. Air Blowers (SBR)
4. Fine Bubble diffusers
5. Decanters
6. Return Activated Sludge Pumps
7. Surplus Activated Sludge Pumps
8. Air Blowers (Sludge Sump)
9. Centrifuge Feed Pumps
10. Centrifuge Units
11. Polyelectrolyte Agitator
12. Polyelectrolyte Dosing Pumps
13. Electric Hoists for centrifuge unit, SBR, Air blowers & Tonner shed
14. Chain Pulley Block for Sludge Pump House
15. Flash Mixers
16. Control Gates (Sluice Gates)
17. STP – Main Electrical Panels
18. Capacitor Bank / APFCR Capacitor Panel
19. Cabling & Earthing
20. Automation & Control
21. Instrumentation
22. Chlorination System
23. Laboratory Equipment

3.2.1 Mechanically Operated Fine Bar Screens

This includes supply, erection, testing and commissioning of 2 Nos. Mechanical Fine bar screens. This shall be provided in the screen chamber after the flow is received in the inlet chamber.



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The clear opening for mechanical screen shall be 6mm. The mechanical bar screens shall be of 2 mm thick Stainless Steel (SS-304) flats. Conveyor Belt and chute arrangement shall be provided to take the screenings.

Mechanical Bar Screen - 2 Nos. working

3.2.2 Mechanical Detritus

This includes supply, erection, testing and commissioning of Mechanical Detritions, Classifier and organic return pump with all the accessories of suitable size and capacity.

Mechanical Detritus - 2 Nos. Working

3.2.3 Air Blowers (SBR)

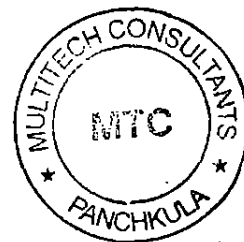
The air blower arrangement shall be capable of handling Total Water Level and Bottom Water Level operation conditions, controlled by process sensors such as DO, temperature and level.

In one set of blowers, one blower shall be operated through Variable Frequency Drive (VFD) and other blowers including standby shall be provided with soft starters.

- The blowers shall be positive displacement (roots) type, and head for blowers shall be decided on the basis of Standard Oxygenation Rate of diffusers and maximum liquid depth in tank duly considering the losses governing point of delivery (diffusers) and the blowers. Blowers shall be complete with motor and accessories like base frame, anti vibratory pad, silencer, non return valve, air filter etc. as per requirements. Vibration due to operation of blowers should not damage the structures. Further, blowers shall have acoustic enclosure to ensure that the noise level at 3 m from blowers is below 80db. The blower platform shall have sufficient working space.
- The blower shall be operated through PLC on variable frequency drives and capable to operate at different speeds as per requirement of the system.
- The header / rising main shall be adequately supported at suitable intervals. The sub header shall have auto valves to facilitate switch on aeration cycle from one reactor to other by PLC operation. The header shall supply air to basin at various locations through air supply pipes. Air supply pipe above water level shall be in MS and below water level it shall be in SS-304 for vertical down comers and UPVC for horizontal lateral.

Blower Details

MOC : CI
Type : Twin lobe roots type Duty As per design
Discharge Head : suitable
No. of units : Minimum 4 Nos. (3 W + 1 SB)
Duty : As per Design



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3.2.5 Fine Bubble Diffusers

Only fine bubble membrane diffusers shall be acceptable with adequate number of diffusers required as per detailed design of oxygen requirement. Diffusers shall be fixed type, submerged fine bubble / fine pore, high transfer efficiency, low maintenance, non-buoyant type. Diffusers shall be tubular (membrane) type made up of EPDM / PU membranes.

Material of construction for (entire under water system including accessories) shall be non corrosive. Any support for under water system shall be of adjustable type and made of SS 304. In Selector Zone of SBR Basin, Coarse Bubble Aeration shall be provided.

3.2.6 Decanters

The decanting mechanism shall of Stainless Steel (SS-304) and all the other accessories such as gear box etc. shall be provided on the operating platform. The hydraulic discharge capacity of the decanting mechanism shall be proportional to the selected basin area :-

- Each Decanter mechanism shall be inclusive of local control boxes with manual operation selection and function buttons, communication to main PLC.

3.2.7 Return Activated Sludge (RAS) Pumps

Capacity and Head	:	As per requirements
Type	:	Submersible / Horizontal Centrifugal
Liquid	:	Biological Sludge of 1% – 2% solids consistency
Specific Gravity	:	1.05
Solid Size handling	:	40 mm (Maximum)
Installation	:	Removable from the top of Tank Platform
Efficiency	:	more than 50%
Quantity	:	1 No. per Basin + 2 Nos. in Store as Standby

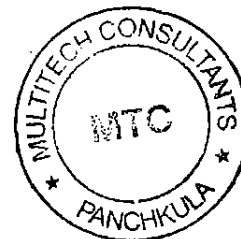
Suitable lifting arrangement shall be provided to install / uninstall SAS pumps.

3.2.8 Surplus Activated Pumps

Capacity and Head	:	As per requirements
Type	:	Submersible / Horizontal Centrifugal
Liquid	:	Biological Sludge of 1% – 2% solids consistency
Specific Gravity	:	1.05
Solid Size	:	40 mm (Maximum)
Efficiency	:	more than 50%
Quantity	:	1 No. per Basin + 2 Nos. in Store as Standby

Suitable lifting arrangement shall be provided to install / uninstall SAS pumps.

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.



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3.2.9 Air Blowers (Sludge Sump)

The Air Blowers shall be positive displacement (Roots) type and head for Air Blowers shall be decided on the basis of S.O.R. of Diffusers and maximum Liquid Depth in Sludge Sump duly considering the losses governing point of delivery (Diffusers) and the Air Blowers. Air Blowers shall be complete with Motor and accessories like Base Frame, Anti Vibratory Pad, Reactive Silencer, Non Return Valve, Air Filter etc. as per requirements. Further, Air Blowers shall have acoustic enclosure to ensure that the noise level at 2.00 m from Air Blowers is below 85 db.

No. of Units : 2 Nos. (1W+1S)
Type : Twin Lobe / Tri Lobe
Installation : Fixed

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.

3.2.10 Centrifuge Feed Pumps

The Centrifuge Feed Pumps shall be provided to feed biological sludge to Sludge Dewatering Device. The pump shall be of screw type suitable for handling biological sludge of 1 – 2% solids consistency.

Pumps capacity and Head shall not be less than : Sufficient for handling total daily sludge in 20 hours.
Number of Units : 3 Nos. (2W + 1S)
Capacity : As per requirement
Type : Positive Displacement Type / Progressive Cavity Type Screw Pump
Liquid : Bio-Sludge of 1-2% solids consistency
Specific gravity : 1.05
Solid Size : 40 mm (Maximum)
Efficiency : More than 30%

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.

3.2.11 Centrifuge Units

The Centrifuges shall be Solid Bowl Centrifuge of co-current/counter-current design as decided by the Bidder. The Centrifuge shall have sufficient clarifying length so that separation of solids is effective. The Centrifuge and its accessories shall be mounted on a common base frame so that entire assembly can be installed on an elevated structure.

Suitable drive with V-belt arrangement and turbo-coupling shall be provided along with overload protection device. Centrifuge shall be with SS304 wetted parts.

Differential speed and bowl speed should be adjusted by changing the pulleys; differential speed may be adjustable by use of epicyclical-gear. The bowl shall be protected with flexible connections so that vibrations are not transmitted to other equipment. The base frame shall be in epoxy painted steel construction and provided with anti-vibration pads. All steps necessary to prevent transmission of structure borne noise shall be taken. Adequate sound proofing shall be carried out.



A Hoist shall be provided above Centrifuge for maintenance purpose. The hoist shall be such that it shall be possible to erect or de-erect the centrifuge while one centrifuge is in operation.

Number of Centrifuges : 3 Nos. (2W+1S) of suitable capacity with minimum 50% standby.
Capacity : As per requirement
Type : Solid Bowl Type
Operating Hours : 20 hrs per day maximum

Mixing arrangement of Polyelectrolyte and sludge : online mixing.

Dewatering polyelectrolyte Dosing system is to be provided to dose Poly Electrolyte solution to the incoming sludge at entrance to the centrifuge.

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.

3.2.12 Agitator of Polyelectrolyte

This shall include drive motor, direct coupling, impeller assembly and such other fittings, devices or appurtenances necessary for a complete operating installation. The drive motor shall not exceed 1,500 RPM and directly coupled with the gearbox. It shall be totally enclosed, fan cooled, rated for severe chemical duty with a minimum service factor of 1:1.5. The rotary speed of the impeller shall not exceed 100 RPM. Number = 1W+1SB.

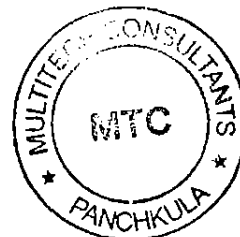
All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.

3.2.13 Polyelectrolyte Dosing Pumps

Dosing Pumps shall be of mechanically actuated Diaphragm Type Metering Pumps. These shall be able to handle a flow variation of +25 % of the required flow. The construction shall be totally enclosed and corrosion proof.

Number of Units : 3 Nos. (2W+1S)
Capacity : As per requirement
Type : Mechanically/Hydraulically actuated Plunger / Diaphragm Type Metering Pumps
Medium : Polyelectrolyte Solution of 0.1% Strength
Material of Construction of wetted Parts : SS 304 / PP

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.



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3.2.14 Electric Hoist

This includes supply, erection, testing and commissioning of electrically operated Hoist with electrically operated Travelling Trolley with all the accessories, suitable for lifting Chlorine Tonners and Centrifuges. The three way movement shall be as : (i) Vertical, (ii) Longitudinal and (iii) Transverse

Electric Hoist of suitable capacity : 2 Nos. (1 for centrifuge shed and 1 for chlorination toner shed).

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.

3.2.15 Chain Pulley Block (for Pump House)

This includes supply, erection, testing and commissioning of adequate capacity Chain Pulley Block with all the accessories. It should be compatible with the lifting chain of the pump.

Chain Pulley Block of adequate Capacity : 1 Nos.

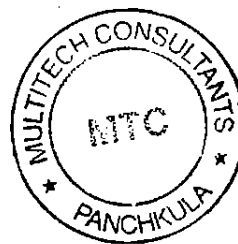
3.2.16 Control Gates

Control gates shall be provided at following locations for flow control.

- 1) Upstream & downstream of screen channels – Aluminum
- 2) Upstream of grit bypass channel – Aluminum
- 3) Inlet to Mechanical Detritor – Aluminum
- 4) Inlet to the SBR Reactor (motorized) – CI
- 5) Any other location, as per process requirement

The gates shall be single faced, rising spindle, flush bottom closing, and wall mounted flange back frame. Aluminum sluice gates suitable for seating water head and mounting on the flat face of a wall, water sealing at two vertical sides, top and bottom side of gate frame by means of neoprene rubber seal fitted in gate aperture and having forced contact with gate slide, to be provided with Aluminum frame and shutter, SS 304 spindle to suit distances as specified in the bill of quantities. All fasteners shall be in SS 304 and anchor bolts, EPDM rubber seals, SS 304 rubber seal retainer bars, CI stem guide bracket, SS 304 coupling, CI manually operated head stock.

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.



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TERTIARY TREATMENT

3.2.17 Secondary treated sewage sump and pumps :

The Secondary Treated sewage sump shall be constructed in M-30. It shall be covered tank. The sump shall have capacity of 1500 cum. In the sump four number non clog sewage pumpset (3W+IS) for delivering secondary treated sewage to tertiary units are to be provided. Each pumpset capable of delivering 500m³/hr at suitable head shall be complete with delivery line sluice valve, Non return valve, D.I pipe and required electrical installation and common header and D.I specials etc is in the scope of work.

3.2.18 Flash Mixer:

This Flash mixing chambers with 60 seconds HRT & baffle walls constructed in RCC M30 shall be provided with a turbine type high-speed mixer. The driving motor of suitable capacity and other accessories shall be totally enclosed but easily accessible for maintenance. The shaft with the impeller shall be freely suspended from the driving gear mounted on a platform on top of the reservoir. No thrust or guide bearing shall be located below the liquid level. The shaft of the mixer and the impeller shall be of stainless steel- 304. This Chamber shall be connected to the drainage system by means of a CI/ DI pipe DF & a manually operated sluice valve of DN 100.

There shall be suitably sized sluice gates manually operated for tertiary treatment or by pass of flash mixer tertiary treated be provided.

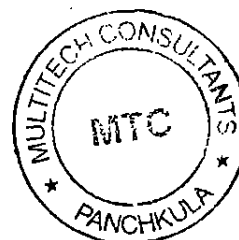
3.2.19 Deep Bed Rapid Sand Filters :-

Minimum 3 (Three) working deep bed rapid gravity Dual Media Filter Beds constructed in RCC M-30 open to sky shall be provided for a total capacity of 22.7 MLD & all to be located in a single row & fed from a single channel. The filter beds shall be supplied Secondary treated clarified effluent from clarified water sump. The proposed filters shall be constant flow, rising liquid level (Influent split stream) type. All filters shall be identical in internal dimensions.

A rectangular sharp edged weir with gate shall control the flow to the filter units. The weirs shall be adjusted in a manner that all filters in operation received the same flow taking into account the hydraulic conditions of the common feeder channel and fully opened gates. The tolerance shall not exceed +/- 5%. The gate shall be used for the isolation of a filter in case of backwash or maintenance.

The water level on the filter bed during filtration shall not be controlled. It will serve as the indicator for the head loss. The maximum water level (admissible filter head loss) must be such to allow free fall from the feeding channel/ rectangular weir. Filters shall be cleaned when the water has reached that upper level. There shall be proper arrangements to avoid that the freely falling water may not destroy the media surface in case of a low water level in the filters just after cleaning.

Filtration shall be by gravity, downwards through a bed of filtering media supported on a layer of suitably graded filter gravel. The filtering media shall consist of anthracite/ Charcoal/ Crushed coconut shells over hard durable grains of silica. The filter gravel shall consist of hard, preferably rounded stones with an average specific gravity not less than 2.5, shall be free from clay, sand, loam



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and organic impurities of any kind and shall be such as to ensure adequate and uniform distribution of wash water and air after leaving the orifices with the minimum risk of mixing sand with the gravel of the supporting media.

A 1.2M wide RCC walkway with railing as per specification given in Technical specification for civil items & the minimum 2.1 M wide operating platform over piping duct for the pipe gallery shall be provided.

It shall be deemed that the Contractor has investigated all potential sources and verified that sufficient quantities of satisfactory filter media can be obtained, and stored on site.

The under drain system shall be a pipe grid type consisting a central pipe/ channel with lateral system of PVC Class 6 Kg/cm² pipes having nozzles. Slabs with plastic will be under drainage system shall confirm to IS: 8419 (Part 2). The under drain system shall be designed to provide uniform draw-off of filtered water and uniform distribution of wash water and air over the whole area of the filter. Particular provisions have to be made for the handling of the high air velocities at the inlet zone of the manifold.

The Contractor shall take all necessary measures to ensure that false floor if used containing nozzles and the water conveying system of pipes of channels connected to the floor are free from any debris, concrete, sand or other material which could other wise block or partially, block nozzles.

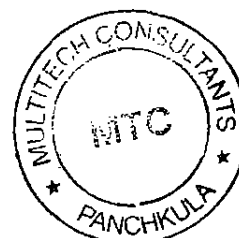
Such requirements shall also apply in the case of piped laterals with nozzles or orifices. It shall be the responsibility of the Contractor to remove any such debris before the commissioning, laying filter floors or lateral and shall continue to remain his responsibility for excluding unwanted materials, which could block the filters.

Each filter shall have a gullet and lateral wash water trough, which shall be connected with adequate slope to the wash water outlet to prevent deposits of silt. They shall allow an equal withdrawal of the wash water during backwashing the filter.

A float switch with alarm shall be provided at the maximum admissible levels of each filter to indicate the need for backwashing.

Parameters:

Filters:	
Filtration rate	10 m ³ / m ² / h
Water column	Min 2.0 m above weir crest at filtered water chamber.
Free board	0.5 m
Airflow for air scouring.	750 LPM/ M ²
Backwash water flow for backwashing	500 LPM/ M ²



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Filtration Duration	23 hours/day
Filter media:	Crushed Coconut shell / Anthracite confirming to UK & European Standards EN12909-2005 and American Standards of AWWA-B100-1 NSF61 . with Specific gravity 1.50 to 1.60; Depth as 0.4 m (minimum);Effective size-0.8 to 2.0 mm; Uniformity coefficient-1.3 to 1.6
Depth of sand bed	500 mm
Effective size of sand particles	0.4– 0.8 mm
Specific gravity	: 2.65
Uniformity coefficient of sand	1.2 – 1.6
Depth of gravel layer	500 mm
Maximum Permissible velocities, MPS.	
Filter Inlet.	: 0.6
Filter Out Let.	: 1.5
Backwash Inlet.	: 3.5
Backwash Out let	: 2.4
Air	: 25

a) Filter Operation Gallery and Pipe Gallery:

The filters shall be operated and backwashed according to the instruction of the Engineer. Each filter shall be provided with necessary manually controlled valves/ gates for the filtering process. The following valves / gates shall be provided.

- a) Filtered water outlet.
- b) Backwash water inlet.
- c) Air inlet.
- d) Drain water outlet.
- e) Inlet gate.
- f) Backwash water outlet gate/ valve.

The valves shall be connected to pipe branches coming out of the filter box. These outlet and inlet pipes shall be provided with proper wall ducts without any leakage.



Before backwashing, the Filter Water Level has to be lowered to its minimum in order to avoid wastage.

The pipe gallery shall have the following piping arrangement:

- g) The width of the pipe gallery shall be kept, as 3.5 M from the outer face of the filter wall to the inner face of the outer wall & ceiling height shall not be less than 3.5 M above working platform.
- h) Backwash water pipe with connection to each filter.
- i) Air pipe with connection to each filter.
- j) Filtered water outlet from each filter to filtered water collection pit.

Drain valve of each filter connected to Backwash Drain water CI Pipe of each filter unit.

The filtered water pipe of each filter shall be connected to a small chamber with an adjustable rectangular weir to the common filtered water channel. This weir controls the minimum water level in the filter. The weir crest shall be 10 cm above media top level in the filter. The weir length shall be designed to have less than 20 cm head. The completely covered channel leads to disposal point. In each Filtered Water Chambers, transparent glass fixed in the removable cover shall be provided.

The back wash water & drain water from each filter unit shall be taken outside the filter plant through pipe & discharged in to man hole located outside & further conveyed to raw sewage sump

In the pipe gallery easy access to all valves and cables etc. has to be ensured. If required, walkways and ladders shall be provided.

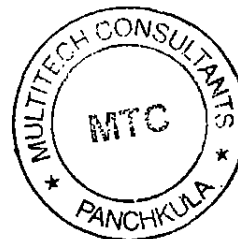
b) Backwashing Equipment of the Filters:

The filters shall be backwashed with water and air according to a cycle prescribed by the Contractor. The water shall be delivered from a backwash reservoir filled or by centrifugal pumps / directly taking water from the sump in the filter water channel.

c) Backwash Reservoir:

The backwash reservoir as per requirement shall be of RCC M-30 constructed on top of the filter gallery. The capacity of the reservoir shall be sufficient to provide for quantity of water required for backwashing of one filter unit +10% extra for other utilities over the dead storage. It shall have a free board of 300 mm above overflow pipe. The elevation of the reservoir shall be fixed according to the requirement of the backwash. It shall also provide for the following:

- a) Filling pipe.
- b) Backwash pipe (outlet).
- c) Overflow pipe back to the filtered water channel / sump.
- d) Top-level float switch.



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All pipes passing the walls of the reservoir shall be provided with suitable pipe ducts so that there shall be no leakage.

The reservoir shall have an access to the roof with 600 mm manholes and cover, a galvanized steel ladder for the access to the reservoir floor & ventilation pipes DN 200 with cowls and wire mesh.

d) Backwash Reservoir Pumps:

The contractor shall provide Centrifugal / Non- Clog submersible type pump (1W+1SB) along with suitable induction motor suitable for operating on 415 V 50 Hertz c/s frequency supply. The system shall be complete with guide pipe in the bay of the sump. The delivery pipe with sluice valve along with non-return valve shall be provided. The pumps shall be designed to fill the full capacity of the tank in not more than 1hrs.

e) Air scour system:

The air delivery for scouring of each filter bed shall be provided. Scour unit will be provided with a, pressure relief valve and non-return valve.

The air pipe to the filter shall be laid with an apex above the max water level of the filters. Pressure gauges with stopcock at the pressure side shall also be provided.

The air piping to the filters shall be laid out on the ring main principle. There shall be a provision for the release of air from the system at the end of the scour before backwash commences.

Parameters:

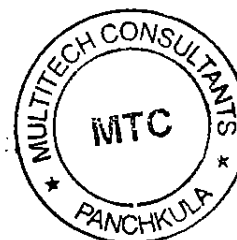
Vol. Of free air	: 750 to 900 liters. / Min. / sq M
Air pressure at under drain	: 0.35 Kg/ sq cm
Air velocity in pipe and valves	: < 25 meters / sec.

3.2.20 Electrical Panels

(a) Main Electrical Panel:

This includes supply, installation, testing and commissioning of Main Electrical Panel (MCC) containing individual Starter Panels for various loads/drives complete in all respects with suitable switchgears. It shall be provided with Metering, ACBs (MDO type) with S/C, O/L & CG31 Relay, Switch/Fuse Units, Lamps, Bus bars etc. The accessories used shall conform to the latest IS codes. It will serve the following equipments:

1. Mechanical screens
2. Mechanical Detritus
3. Classifier
4. Organic Return Pump
5. Air Blowers for SBR and Sludge Sumps
6. Submersible RAS pumps
7. Submersible SAS pumps



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8. Centrifuge units
9. Centrifuge Feed Pumps
10. Dosing Pumps
11. Agitators
12. Decanters
13. Electric Actuators for Air Piping and Sluice Gates
14. Electrical Hoist
15. Blower Room's Light and other requirements
16. Operations Building's Light and other requirements
17. Toilet Block for Workers' Light and other requirements
18. Street lighting.
19. Chlorination System
20. Any other

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.

(b) Capacitor Bank / APFCR Capacitor Panel:

This Panel is to be provided in order to improve the power factor of the STP. It shall be of suitable rating with Automatic Power Factor Correction Relays. It shall consist of SFU of suitable rating, Start/Stop Push Buttons, Fuses and Indicating Lamps for On/Off positions provided separately for each Capacitor Bank. Relays shall be of 6 stage, suitable for 3-Phase, 415 V, 115 A and 50 Hz supply. Power Factor Meter shall be provided with Selector Switch and LEDs along with the Relays. In addition, it will consist off Push Buttons for Auto/Manual and On/Off operations. Panel shall be floor mounted made out of 14 SWG CRCA steel sheets with IP-54 enclosure protection.

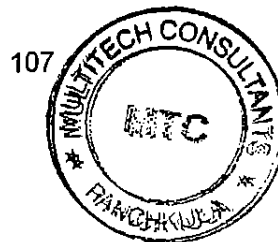
3.2.18 Cabling & Earthing

This includes supply, erection, testing and commissioning of L.T Power & Control cabling required for inter-connecting all the control panels / LDB to their respective sources and loads at STP. The cabling shall be complete in all respects. Civil works like construction of cable trenches with angles, chequered plates etc. are also included in the scope. Cable trays & junction boxes shall be installed to accommodate the cables wherever required.

Power & Control Cables	:	LOT
Junction Boxes	:	LOT
Cable Trays	:	LOT

Note : Cable from Transformer to Main Electrical Panel is also included in the Scope of work, However, Transformer and HT Panel are also in the bidder scope and release of the electricity connection from the electricity department is also in the scope of the bidder.

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.



3.2.19 Automation and Control (PLC, PC etc)

PLC based Automation System with application software based on Rockwell or equivalent to control SBR System including all Gates, Air Blowers, Pumps, Valves and Decanters as per Bidder's/Technology Provider's own design including I/Os with 20 % Spares and UPS.

1. Stand alone/ or integrated PLC panel having Suitable PLC, HMI and MODEM/ROUTER.
2. Non contact type ultrasonic level transmitter on sump/ collection tank.
3. Digital energy meter along with CT's and protective switchgears on each MCC which shall be connected on MODBUS communication with PLC to have all parameters like, Voltage, current, Power Factor, active and reactive power.
4. Interfacing of PLC panel with MCC
5. HMI Panel shall comprise latest 2 Nos. Personal Computer with 22" LCD Monitor, Multi Media Kit, Printer, Internet Connection, RS-View, RS-Links (Gateway Version), Process and Operator Software with dynamic Flow Charts, Pictures, Screens, Alarms, Historical Trends, Reports etc.

SACADA based Automation System to monitor the following parameters continuously in each SBR Basins:

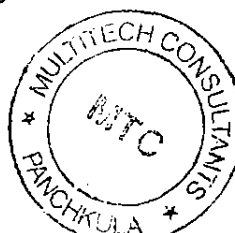
- Fill Volume
- Discharge Volume
- Temperature
- DO Level
- Oxygen Uptake Rate
- Air Blower Speed
- Decanter Speed

The components of Automation are as follows:

- | | | |
|---|---|--------|
| • PLC cum Control Panel | : | 1 No. |
| • Personal Computer with SCADA | : | 2 Nos. |
| • Online 2 KVA UPS with 1/2 Hours Battery Back-up | : | 2 Nos. |

PLC / SCADA system shall be provided for following components of the plant :

- a. Mechanical Course Screens shall be controlled through PLC based on differential level across the screen.
- b. Pumps for the Raw Sewage shall be controlled by PLC based on the inputs from level transmitter in sump.
- c. Mechanical Fine Screens shall be controlled through PLC based on differential level across the screen.
- d. Grit mechanism, grit classifier, grit wash pumps / organic return pumps shall be started / stopped from PLC.
- e. SBR including blowers – complete operation through PLC.



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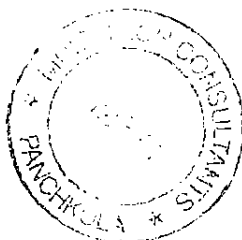
- f. Chlorination system – Feedback from chlorine analyser, booster pump operation shall be done from PLC.
- g. Feedbacks of Sludge pumps, centrifuges, blowers for sludge sump, level in sludge sump etc, shall be available in PLC, Operation will be done manually.
- h. Also, energy meters for each MCC shall be connected to PLC so that power consumption can be monitored for each unit.”

3.2.20 Instrumentation:

This includes supply, erection, testing and commissioning of various instruments used. The details of the instruments are as follows:

Sr. No.	Instrument	Location	Quantity
1	Pressure Gauge: Bourdon Tube Type	On delivery line of Air Blowers	8
2	Sludge flow meter	Inlet pipe of sludge sump for SAS pumps	1
3.	Pressure Guages	Discharge of all pumps and Air Blowers	As per requirement
4.	Pressure Gauge: Sealed Diaphragm Type	On delivery line of Pumps	13
5.	Level Switch: Float Type	Polyelectrolyte Dosing Tanks	2
6.	Level Switch	Sludge Sump	1
7.	Differential Level Transmitter: Ultrasonic Type	Mechanical Fine Screen Channels	2
8.	Level Transmitter: Hydrostatic Type	SBR Basins	2
9.	DO Meter: Submerged Type	SBR Basins	2
10.	Flow Meter: Ultrasonic Type	Common Delivery Header of Raw Sewage Transfer Pumps	1
11.	Variable Frequency Drive	Air Blowers (SBR)	As per Requirement
12.	Variable Frequency Drive	Decanters	2
13.	Actuators for valves & gates	Valves / Gates	As per requirement

Note : The above given quantities are the minimum quantities and may increase as per the



requirement for proper functioning of the plant.

All other accessories, whether specified or not, but required for completion of the work shall form the part of bidder's scope.

3.2.21 Chlorination System:

Flow	:	Maximum decant flow of concerned STP
Number of Units	:	2 (1W+ 1 S)
Type	:	Vacuum Type
Chlorine Dosing	:	As per requirement

Chlorination system covering chlorine tonners, chlorinator, piping, booster pumps, ejector, trunions, lifting device with weighing scale, leak detection and leak absorption system, safety equipments like canisters, gasmasks etc. and other ancillary shall be provided in the chlorine house. It shall have sufficient ventilation as per the latest norms for safety purpose with necessary lifting arrangement and EOT of minimum 3 T capacity, etc. complete.

Immersion tank of sufficient capacity shall be provided at ground level to emergency use.

3.2.22 Laboratory Equipments

The list of Laboratory Equipments is as follows:

3.2.22.1 EQUIPMENT: The list of lab equipments to be supplied is as follows

1 PH Meter Digital

pH Range	:	0 to 14 pH
Milli Volt Range	:	0 to \pm 1999 mV
Accuracy	:	0.01 pH \pm 1 digit.
Reproducibility	:	0.01 pH
Temperature compensation	:	0 to 100 ^o C
Power Supply	:	230 V \pm 10% 50 Hz
Accessories	:	2 Nos combined electrodes

2 Centrifuge

Maximum speed	:	3200 rpm
Maximum centrifuge force	:	1600 x G.
Maximum capacity	:	6 x 15 ml



3 Dissolved Oxygen Meter

The instrument should be capable of DO and temperature measurement in raw and treated sewage water :-

Range	: 0 to 20 mg/l.
Temperature	: 0 to 60 ^o C
Resolution	: DO – 0.1 ppm Temperature 0.1 ^o C.
Accuracy	: DO - \pm 0.3 ppm Temperature \pm 0.2 ^o
C Temperature compensation	: 0 to 50 ^o C
Censor	: DO – Amperometric (Gold/Silver) Power : 230 V \pm 10% 50 Hz

4.Chlorine Comparator

Comparator should have capacity to measure the residual chlorine from 0.1 to 2 PPM and pH from 6 to 8.4 (phenol red indicator disk) by moveable disk arrangement.

5. Accessories :

Orthotolidie solution test tube brush and cover separate movable disk

6. Counters

Colony counter with digital display electrically operated suitable for bacterial plate count complete with counting plates and lenses etc.

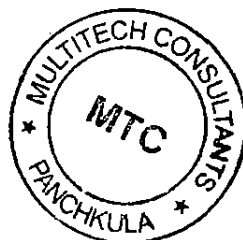
7Binocular Microscope

Binocular research microscope with built in illumination with variable transformer. Two pair eye pieces 5 x 10 and four objectives 5x, 10x, 45x, 100x, oil (springs).

8Distilled Water Plant

Electrically heated with boiling chamber lid and cooling jacket, made of stainless steel, provided with two automatic injection type heater, constant water level device, stout valve, hanging brackets complete in all respects.

Power	: 220 – 230V AC
Capacity	:Approx – 4L/Hr
Rating of Element	: 1.5 KW each



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9 Water Bath (Serological)

Rectangular water bath should be completely made of copper, heavily tinned inside and outside finished in enamel.

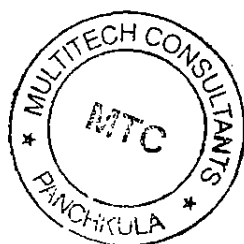
The cover should be chrome plated and should have 12 holes of 7.5 cm O concentric rings (3 sizes of each hole) with lid. The water bath should have built in constant level arrangement and fitted with swan type ejection electric heaters.

Dimensions : 40 cm x 30 cm x 9 cm
Rating : 1.5 KW
Power : 230 Volt AC
Accessories : 2 M long cord with 3 Pin and adopter for power.

10 Electric Oven

Should be double walled with inner chamber of aluminum sheets and outer body made of MS sheets. The gap should be filled with good quality glass wool for proper insulation, space for inserting thermometer control system of the accuracy of $\pm 1^{\circ}$ C.

Temperature Range : Room temperature to 250° C $\pm 1^{\circ}$ C.
Power : 220-250 Volt AC
Chamber size : 45 x 45 x 45 cm.



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11 Autoclave

Autoclave should be vertical type, sturdy double walled construction with boiler made of stainless steel 18 SWG, sheet and easy to operate. Outer shell should be made of mild steel finished with enamel point. The boiler and outer shell should have air insulation. Lid should be made of stainless steel plate and tightened all round by wing nuts. Moulded, jointless, gaskets should be made of neoprene rubber. It should be fitted with water level arrangements to indicate water position inside the boiler, pressure gauge, air/steam release cock, spring loaded safety valve which can be set any selected point from 10 PSI to 25 PSI +/- 3 psi and drain. ISI marked immersion type heating element heats the water stream to desired temperature and pressure, supplied complete with SS basket, cord and plug to work in 220 volts 50 cycles AC supply.

Chamber size (O x depth) : 300 x 500mm
Load : 2 KW

12 Incubator (1 No) for bacteriological tests

Incubator made of aluminum sheet , inner door of glass with 3 adjustable shelves with temperature control system and accuracy of +/- 0/5°C. Double wall should have proper glass wool insulation system, thermostatically controlled.

Size (w x d x h) : 61 x 45 x 45 cm
Operating temperature : 5°C above ambient to 60°C.
Power : 220 – 250 Volts AC.

13 BOD Incubator

Suitable to work at 230 V with automatic control heating or cooling circuits according to environmental temperature, made of mild steel all with enamel paint, inside chamber should be anodized, adjustable shelves made of aluminum and full inner view glass doors. Chamber capacity should be 286 L. Temperature control device German thermostat.

Chamber size : 87 x 57 x 55 cm

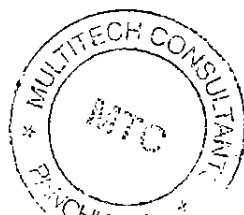
Temperature Range : 5 - 50°C.

Operating sensitivity : +/- 0.5°C.

Forced air circulation to maintain uniform temperature with dial thermometer.

14 Magnetic Stirrer with HOT Plate

Magnetic stirrer with hot plate of 2 L capacity with separate stirring and temperature controlled regulator for setting stirring rate and temperature complete with plug, 2M long cord. Adapter and Teflon paddle 1" long (Rotor 3 Nos) capacity 2 liters, maximum speed 1200 rpm.



B

15 Analytical Balance

Analytical balance complete with case, weight box and beam of gun metal. Flat beam sprayed with colorless cellulose lacquer edges are of best selected agates ground to optical precision case finally polished with two side doors and counter poised front slide. Case made of teak wood having sun mica base.

Capacity : 20 gm
Sensitivity : 1/10 mg
Diameter of pan : 3 inches slightly nickel chromium plate
Length of beam : 5 inches
Watch glasses : 2 Nos, light weight to be provided on each of the pan
Graduation : Graduated in to 100 divisions with 0 in centre.

16 Electronic Balance

Readability : 1 mg/10 mg
Weighing capacity : 60 mg/310 mg
Repeatability : 0.2 mg/0.5 mg
Linearity : +/- 2 mg / +/- 10 mg
Stabilization : 5 seconds
Power Supply : 230 V AC +/- 10%, 50 Hz
Facility of piece counting, 0% weighing, display various weighing units, provision for attachment of printer.

17 Vacuum pump single (with suction flask/Liter capacity)

Electrically operated should be compact and smooth in operation with effective cooling, high power water vapor tolerance and guaranteed ultimate vacuum.

Air Displacement : 150 L/Minute
Ultimate vacuum : 10 microns Mcleod
HP of motor : 0.5 or 1/3
Pump speed : 375 rpm approx
Power supply : 220/230 V AC

18 Refrigerator

Minimum 300 liters capacity of reputed make.

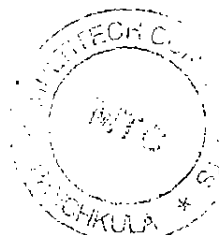
19 Muffle Furnace

Quick heating type light weight, fibre wool insulation to keep heat loss too low. Heating chamber made of Ceramic Fibre Muffle, surrounding with canthal wire, max. Temp. 1000^oC, continuous working temp. 930^oC Outer casing made of mild steel duly painted with heat resistant paint, with plug & cord. Size of inner chamber 6"x6"x12".

20 Laboratory Thermometer

Mercury in glass yellow back, range:

10 to 500^oC - 2 Nos
10 to 1100^oC - 2 Nos



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21 Stop Watch

Digital Display electronic hand held stop watch with extra facility for day date and time reading 1/100 Sec.

22 Laboratory Retort Stand (3 Nos)

Rectangular heavy type with Rod, Base size 7" x 5" duly painted.

23 Pipette Stand (3 No)

Made of teak wood, polished.

24 Set of clamp & Boss Heads made of brass	-	2 Nos.
25 Burette clamp fischer type made of brass	-	1 No.
26 Stainless steel tongs	-	2 Nos.
27 Asbestos hand gloves size 14"	-	2 Nos.
28 Bottle cleaning brush nylon best quality	-	4 Nos.
29 Dissolved Oxygen Sampler	-	1 No.
30 Conductivity Meter	-	1 No.
31 C.O.D. Apparatus	-	1 No.
32 Filtration Assembly	-	1 No.
33 Kjehldahl Digester unit	-	1 No.

3.2.21.2 GLASSWARE :

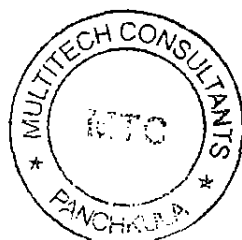
The list of glassware to be supplied is as follows

SNO	GLASSWARE	QTY	UNIT
1	Gooch crucibles disc dia 40mm porosity G-3, Borosil R.	2	m
2	Vacuum flask i.e. filtration flask cap. 500 ml. with side tabular	2	No.
3	Evaporating dishes.	50	No.
4	Desiccator large with cover size 250mm Borosil R.	1	No.
5	Buchner Funnel cap. 80 ml. disc dia 40 mm porosity G-3.	2	No.
6	Measuring cylinder graduated Borosil R.		
	10000 ml capacity	2	No.
	500 ml capacity	4	No.
	100 ml capacity	6	No.
7	Burette with straight bore stop cock Borosil R.		
	100 ml capacity	2	No.
8	50 ml capacity Conical flask Borosil R.	2	No.
	1000 ml capacity	2	Nos.
	500 ml capacity	10	Nos.
	100 ml capacity	15	Nos.



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9	50 ml capacity Volumetric flask	8	Nos.
	1000 ml capacity	4	Nos.
	500 ml capacity	8	Nos.
	100 ml capacity	8	Nos.
	50 ml capacity	4	Nos.
10	Reflux flask i.e. COD flask cap. 250 ml with B-24 joint Borosil - R.	12	No.
11	Volumetric pipettes i.e. Bulb pipette borosil R.		
	50 ml capacity	2	Nos.
	20 ml capacity	2	Nos.
	10 ml capacity	2	Nos.
	5 ml capacity	2	Nos.
	2 ml capacity	2	Nos.
12	Serological pipettes i.e. graduated pipette Borosil R.		
	20 ml capacity	2	Nos.
	10 ml capacity	4	Nos.
	5 ml capacity	4	Nos.
	2 ml capacity	2	Nos.
13	Orsat gas analysis Apparatus 4 test comprising of leveling bottle, gas burette with outer jacket, four absorption pipettes, 4 test manifold, calcium chloride tube and rubber below. In wooden case with sliding doors made from Borosil R.	1	No.
14	Breaker Borosil R		
	1000 ml. Capacity	2	Nos.
	500 ml capacity	8	Nos.
	250 ml capacity	8	Nos.
	100 ml capacity	6	Nos.
	50 ml capacity	2	Nos.
15	Allhin Condenser length 400 mm with B-24 cone & socket Borosil R.	12	No.
16	Imhoff cones Borosil R	2	No.
17	Separating Funnel pear shape Borosil R capacity 250 ml.	2	No.
18	Filter Funnel dia 4" Borosil R.	8	No.
19	Plastic filter funnel dia 4".	1	Nos.



10

20	Labolene solution	3	Nos.
21	Wash bottle polythene fitted with stopper & dlivery tube capacity	4	Nos.
22	Glass rod 8mm dia length 12".	4	Nos.
23	Glass beads	1	No.
24	Connecting tube 'T' shape	2	Nos.
25	Sample bottle with screw capacity Borosil R.		
	Capacity 30 ml.	10	Nos.
26	BOD bottles capacity 300 ml. Borosil R.	50	Nos.

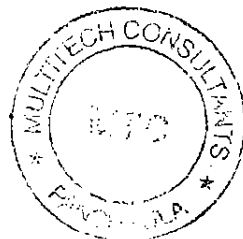
Notes

1.0 All aforesaid instruments should be supplied along with operation and circuit diagram manual, dust cover, 2 M long cord and plug and related accessories required for the satisfactory working of the instruments.

2.0 All necessary chemicals in sufficient quantity of reputed made shall be supplied and maintained.

4.0 SCOPE OF WORK FOR OTHER WORKS COMMON TO MPS & STP

- i. Transformer & its Accessories (Substation)
- ii. Transformer Shed
- iii. Blower Platform
- iv. Operations Building
- v. Toilet Block for Workers
- vi. Platforms and Stairs
- vii. Railings along all the Platforms & Stairs
- viii. Painting, White Washing and allied works.
- ix. External Sewerage Systems
- x. Lowering of ground water table during construction, if any.
- xi. External water supply system in the plant
- xii. Roads & Pavements
- xiii. Plant Lighting
- xiv. Storm water drainage including construction of proper tail end complete
- xv. Effluent Disposal Channel / Pipe including end protections
- xvi. Diesel Generating Set
- xvii. Energy Meter / Electricity Connection
- xviii. Gases
- xix. Horticulture & Landscaping of 50% area



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- xx. Cable trenches
- xxi. Tail end for bye-pass channels & effluent channel
- xxii. Providing and fixing of signages

4.1 Transformer & its Accessories (Substation)

Supply, installation, testing & commissioning of 11 kV type secondary substation outdoor type designed for natural cooling (K-10 class), comprising of oil cooled distribution transformer and SF-6 insulated compact switchgear enclosed in robotically sealed stainless steel tank, low – voltage switchboard, interconnection between HT switchgear and transformer using cables and transformer to LT-switchgear using aluminum conductor cable / copper busbars, factory build ready for connection type, internal GI earthing provided complete as required conforming to IEC 62271-202 and relevant IS specifications, as regards to design, manufacturing, type-testing, routine-testing and mandatory operator safety precautions such as IAC AFLR 20 Ka/ 1-sec. The enclosure shall have modular construction using G.I sheet and shall be power- coated from exterior. The Transformer compartment will have IP-23 ingress protection, whereas the transformer used shall be mineral – oil cooled designed for losses as per ISI 180-Energy Efficiency Level – 01.

HT Switchgear shall comprise of 01 No. Fixed – Type VCB feeding to Xmer, all enclosed in common tank, made of robotically welded non-magnetic / non-ferritic Stainless Steel sheets, and filled with SF6 gas acting as an excellent insulating medium, tank design meeting IP-67 criteria with SF6 gas leakage rate less 0.1% per annum, whereas it shall be Arc-Proof design with Internal Arc criteria of 20kA/ 1-sec. The complete Compact Switchgear shall be a front-panel design with associated Capacitive Voltage LED Indicators for each arc-proof cable box, with associated Terminal Protector boots and front-facia semaphore mechanical indication for isolator / breaker On/ off/ earth. The breakers will be provided with integrated Self – Powered 30C+1EF relay with Low and High set for Over current and Earth Fault. Relay should have facility to display the maximum loaded phase current also. Relay shall record minimum 5 fault records with time stamping, and shall be operated via Resin cast Ring Core protection CTs of suitable ratio and burden.

The Compact Switchgear shall be accompanied with associated line-connected PT- metering module, containing set of 03 nos. single – phase PTs (11/r 3:110V/r3, 25VA, CI.1.0) to monitor the line-voltage using digital Voltmeter (Acc. CI.1.0), and Multifunction Meter (Acc. CI.1.0) to measure input Kva, kW, kVAh, pF, Hz etc.

Transformer shall comprise of 800 KVA 11 KV/ 433 V DYn11 Copper Wound ONAN Transformer with off load tap links of +5% to -5% @2.5% with OTI/ WTI scanner. Temperature Rise 40/50 (oil/winding), Losses as per IS-1180 (2014). Energy Efficiency Level -01 and suitable terminals for jumper connection to LT-panel and cable- connection to HT-panel. (Exact Rating will be calculated by contractor).



LV-Panel shall consist of – 600 Amp. Aluminium Bus Bar arrangement, Incomer-cum-Outgoing as 630A, 433V, 36kA, 4P Fixed, Manual MCCB with numerical overcurrent and earthfault releas, associated Breaker ON/ OFF/ TRIP LED Indications, R-Y-B Phase LED Indications and Multifunction Meter (Acc. CI. 1.0)

Outdoor Enclosure shall comprise of having construction of Galvanized sheet Steel of thickness 1.5/2 mm. The Enclosure shall have common canopy, providing IP54 degree of protection of HT & LT panels & IP23 degree of protection with natural ventilation for Transformer compartment. Each compartment will be provided with the door and pad locking arrangement. All equipment, including HT panel, transformer and LT panel shall be inside common metallic partitioned, Internal-Arc Proof enclosure, with safe design as validated via type-test reports for IAC AFLR AB 20 kA / 1- second, each compartment having independent illumination lamp, door access and switch. Suitable civil work / foundation preparation and earthing arrangement to be carried out at site as per specifications of Engineer in Charge.

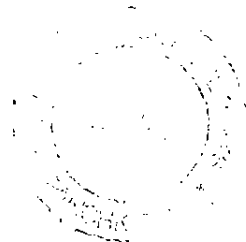
The number of transformers along with their rating and other technical details shall be supplied by the bidder in his technical bid.

4.2 Transformer Shed

A Transformer shed of sufficient size (min 40 sqm) shall be constructed for placement of transformers and accessories. This enclosure will be covered from top with polycarbonate sheet supported on M.S Trusses, purlins & struts etc and will have fencing all around upto minimum height of 1.20m. The fencing shall be with MS angle complete & 10 mm SWG galvanized iron wire chain link mes. Provision of gate shall be made. Transformer should be mounted on M-30 RCC Foundation bed whereas surrounded should be finished with gravels as per Electricity Department, UT, Chandigarh norms.

4.3 Blower Platform

A platform of suitable size shall be provided for the blower. It shall have sufficient strength (M-25) and concrete thickness of 200 mm with suitable reinforcement.



4.4 Operations Building

The Operations building shall be RCC framed structure with minimum clear height of 4 metres, consisting of following:

- (i) Admin Room :Minimum area = 40 sqm
- (ii) MCC Room :Minimum Area = 80 sqm
- (iii) PLC Room :Minimum Area = 30 sqm
- (iv) Laboratory :Minimum Area = 30 sqm
- (v) Toilet Block for officers: Minimum Area = 10 sqm

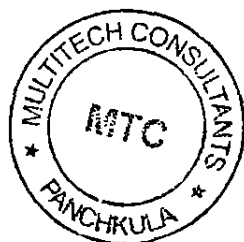
The MCC room shall have panels for all the electric units of MPS and STP (as defined in the respective scope of work of MPS and STP). The MCC and PLC rooms shall be so arranged so that the operator sitting in PLC room can have good view and easy access to the MCC.

The toilet block for officers shall be provided with suitable plumbing fixtures. A HDPE / RCC storage tank of minimum 500 litres capacity shall be provided on roof for conveying water to toilet and laboratory. A RCC staircase, minimum 1.0 metres wide, shall be provided for access to roof.

All internal lighting, internal water supply, sanitation and joinery shall be provided by the contractor. The waste water from toilet block shall be connected to external sewerage system so that waste water is conveyed to the Main Pumping Station. PLC room shall be provided with sufficient Air Conditioners (Split type) of minimum 4 ton capacity.

4.5 Toilet Block for Workers

A separate toilet block shall be provided for workers / field staff with provision of lighting, ventilation, water supply, sanitation and joinery. It shall consist of minimum 2 number urinals, 1 WC (European type), 1 bath room and 1 wash basin. It shall be RCC framed structure. The waste water from toilet block shall be connected to external sewerage system so that waste water is conveyed to the Main Pumping Station. A RCC staircase, minimum 1.0 metres wide, shall be provided for access to roof. The toilet block shall receive water from the storage tank of 500 litres provided on the roof of Operations Building.



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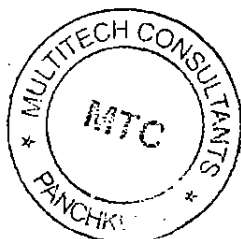
Specifications of Blower Room, Operations Building and Toilet Blocks

Sno	Description of Items	Specifications
1.	Flooring	
i	MCC Room	Kota Stone
ii	Entrance Lobby, Stairs and Toilet Block	Marble Flooring / Granite (19mm to 25mm)
iii	Admin Room, PLC Room / MCC Room and Laboratory	Vitrified Tiles Double changed (Minimum size 600 mm to 600 mm)
2.	Roof Water Proofing	Brick Bat Coba
3.	Plaster	
i	Walls both inside & outside	Cement mortar 1:4 12/ 15 mm thick
ii	Roof including cantilever	Cement mortar 1:3 10 mm thick
4.	Painting	
i	External	Premium Acrylic exterior paint with silicon additives
ii	Internal	Premium Acrylic interior paint.
5.	Dado /Skirting	Same Material as on Flooring 2.10 high in toilet block & 0.10 m high in all other rooms/spaces
6.	Doors & Windows	Powder coated aluminium of thickness 10 SWF
7.	Plinth Protections	Rubber moulded interlocking block of C.C M-30, 60 mm thick laid over 75 mm thick C.C 1:4:8 with suitable Brick Toe wall / Kerb Stone as per decision of the Engineer – in Charge.

4.6 Platforms and Stairs

RCC platforms (minimum 1.0 m wide, unless specified otherwise) shall be provided with chequered tiles at sufficient locations for movement across all the units and for operation & maintenance of all units.

RCC / MS staircase (minimum 1.0 m wide, unless specified otherwise) shall be provided with chequered tiles to access all the platforms provided/required for all the units above ground level. The tread shall not be less than 250 mm and rise shall not be more than 160 mm.



4.7 Railings

Railing shall be provided along all the platforms/ walkways above the Ground level and staircases. The railings shall consist of two Horizontal rows of 40mm i/d GI B Class Pipe supported on MS Angle 75 x 75 x 6 mm pedestal 1m high fixed at an internal of 1.5 M C/C for internal staircases and 2 Horizontal rows of 40 mm dia, G.I pipe class 'B' supported on C.I Pedestals 1 mtr high fixed at 1.00 mtr c/c for all external railings.

4.8 Painting, Whitewashing and Allied Works

All the internal and external surfaces of the walls, ceiling of the Blower, MCC / PLC Rooms boundary wall etc shall be painted with Premium Acrylic exterior paint with silicon additives. All the external and internal surfaces will be prepared with white cement based putty & approved primer before painting.

Water Retaining Structures

The inner concrete surfaces of all the water retaining structures including channel shall be painted (two coats) with approved make of epoxy paint.

Pipes and specials

All the MS/DI/CI pipes & specials and other equipment shall be painted with two coats of approved make anti corrosive paints.

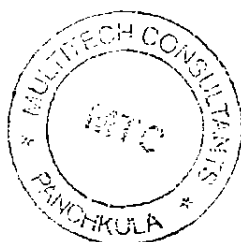
4.9 External Sewerage System

The wastewater collected through down take pipes of grit chamber/screen channel / inlet chamber, centrifuge sludge platform & sludge pump house shall be carried through GSW/RCC NP3 pipe upto inlet chamber of existing MPS.

In addition to this the wastewater of Toilet/MCC/PLC room shall be carried to this pipe with GSW pipe. Provision shall also be made for collection of sludge filtrate from sludge platform and its connection to external sewerage system. The required no. of manholes shall be constructed as per drawing submitted by the bidder and approved by Engineer-in-charge before execution of the work. The bedding and haunches of the GSW / RCC NP-3 pipes shall be as per the specifications approved by the Engineer-in-charge.

4.10 Lowering of Ground water table during construction

The Ground water table, if encountered during construction shall be lowered sufficiently so as to enable construction in dry conditions without any extra cost to the Department.



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4.11 External water supply system in the plant

External water supply system shall be provided within the plant area to make available the water for maintenance, cleaning, flushing and day to day use near various units such as toilet, Laboratory, screening chambers, Grit Chambers, Dosing Pumps, Centrifuge unit, etc. The system shall comprise:

1. **An underground storage tank** of minimum 5000 litres capacity shall be provided at suitable location to convey water to various units of the plant such as toilets, laboratory, DWPE dosing tank, rinsing of sludge pumps, centrifuge etc. The Underground Tank shall consist of CI pipe vents, manholes, ladder, water level indicator and other required specifications as followed in the department.
2. **GI connection** of 2" dia, 6 kg/m² rating shall be taken from existing estate water line on main road outside STP area. This GI pipeline shall feed the Underground Storage Tank.
3. Two numbers (1W + 1SB) centrifugal / submersible pumps (called **Service Water Pumps**) along with necessary piping, specials and valves shall be provided on Underground Storage Tank. Suitable size GI / DI distribution network shall be provided from delivery line of pumps upto various units of the plant. The overhead storage tank on top of operations building shall also be fed from these pumps.

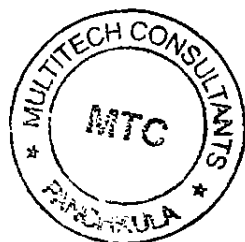
4.12 Concrete Roads & Pathways with proper drainage (For plant area / premises only).

Concrete Roads shall be constructed so that all major units of MPS and STP are approachable to facilitate carrying materials/ sludge/screenings/grit by truck. Similarly pavements shall be made around all units for easy movement during operation and maintenance of the plant. The reduced level of internal roads should be kept in accordance with the approach road to STP area. The Roads shall be minimum 4.2 m wide and pavements shall be minimum 2.6 m wide.

4.13 Plant Lighting (For plant area / premises only).

The plant lighting including lighting poles, fixtures etc complete, is included in the scope of work of the contractor. The contractor shall submit lighting plan to the EIC for approval and the lighting work shall be as per the satisfaction of EIC. The plant area shall be fitted with following minimum streets lights poles & fixtures :

1. 20 Nos 250w flood lights high pressure sodium vapour lamps with snap starter on 9.50 m high tubular poles.
2. 20 Nos florescent street lights luminour of 40 watts each fixed on 7.5m high steel tubular poles.



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3. 6 Nos. flood lights high pressure sodium vapour lamps with snap starters on blower room, MCC & Control room with suitable fixing arrangement.

4.14 Storm Water Drainage (For plant area / premises only).

The storm water drainage system shall be provided by laying RCC pipes (NP-2) type of suitable sizes as indicated on the layout plan. RCC road gulleys capable of withstanding 15 Ton load shall be provided at every 30 m distance. The storm water of the plant shall be disposed off into any of the following two options, as found suitable depending upon the Layout Plan :

(a) into the bypass channel / pipe of MPS & STP (which shall further convey water into the final Effluent Disposal Channel for conveying it into receiving choe) or

(b) into the nearby choe by constructing proper tail end.

4.15 Effluent Disposal Channel / Pipe including end protections

A RCC Channel or RCC NP-3, rubber jointed Pipe of sufficient size from Chlorine Contact Tank outlet to receiving Choe is to be provided. The nallah is located outside the site at some distance. End protection by providing RCC outlet chute & wired stone crates on both banks of nallah is also included in the scope of work. The RCC pipe NP-3 shall be incased with 150mm thick PCC 1:2:4 all round at the point of road crossing in the entire road width.

4.16 Diesel Generating Set

This includes supply, erection, testing and commissioning of sufficient number and capacity Diesel generating sets. The DG set system shall be sufficient to cater the complete plant operation at peak load. The complete operations of the same shall be controlled through PLC / SCADA which includes :

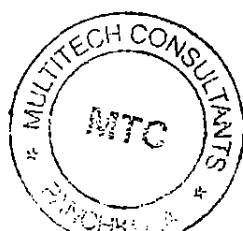
(i) Automatic switch over to DG set in case of power failure or shutdown and vice versa along with indication and alarm of the same on SCADA screen.

(ii) Indication of Fuel Level in Diesel Storage Tank of DG set along with Low Level alarm on SCADA screen

(iii) Data logging of running hours of DG set and history data generation in PC.

The DG sets should be provided with Acoustic Hood, Earthing arrangement, Cabling, etc complete. Suitable RCC foundation shall be provided for the DG sets which shall be minimum 230 mm above Formation Level of the site.

The multiple DG sets should be supplied with Auto Synchronising and auto load sharing panel. The bidder shall get the clearances from Electricity Department of



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U.T , Chandigarh / Pollution Control Board for the DG sets to be supplied. **The number of DG sets along with their rating and other technical details shall be supplied by the bidder in his technical bid.**

4.17 Energy Meter

An energy meter shall be provided for metering of the entire MPS and STP. The energy meter shall be connected to PLC / SCADA for display / recording / data logging of energy consumption of the complete plant and history data generation in PC.

4.18 General Points

The scope of work for electrical items shall also include following :

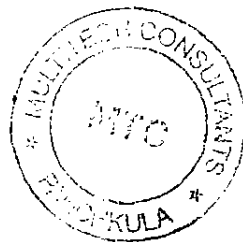
(a) Providing 11 KV SF6 Gas filled 3 panel ring main unit with one VCB & two isolator (motor operated) in order to ultimately keep in SCADA system, 11 KV SF6 Gas filled 3 panel RMU with one isolator, two VCB, 11KV x 433 V indoor transformer of required capacity. Capacity of transformer will be calculated on the basis of prevailing norms of PSPCL /any other authority, 11 KV cabling between RMU & RMU to VCB and VCB to transformer all within substation building.

(b) Wiring of substation and provision of standard safety equipments in the same as approved by the ELECTRICITY DEPARTMENT OF U.T, CHANDIGARH.

(c) The tenderer has to obtain from ELECTRICITY DEPARTMENT OF U.T, CHANDIGARH / any other approving authority, all necessary approvals right from the approval of scheme sanction of load to the releasing of power supply and bringing completion report from ELECTRICITY DEPARTMENT OF U.T, CHANDIGARH. The department shall help the contractor in documentation to obtain such approvals, however the responsibility to achieve the same lies with the contractor. The contractor will be fully responsible to obtain regularized and functional power connection from ELECTRICITY DEPARTMENT OF U.T, CHANDIGARH for proposed MPS and STP within time frame stipulated in the tender. No time extension will be granted on this ground.

(d) Provision of 1100 V grade LT XLPE insulated extruded inner and outer PVC sheathed aluminum conductor, armored cable adequate sized from the transformer up to PCC in the substation and up to MCC Panel up to the load point etc. complete along with the end termination with gland and crimping type of lugs.

(e) The main MCC panel shall comprise one incoming feeder and outgoing MCCB feeders for various loads in the STP. These may include loads such as main pumps, valve actuators, degritter panel, Electric hoist, EOT crane, instrumentation /



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control panels, plant lighting, area lighting etc. Necessary metering, protections and indications shall be provided on the LV switchboard.

(f) Provision of a complete indoor and outdoor cabling system. 1100 V grade, PVC insulated, extruded inner and outer PVC sheathed, aluminum conductor, armored cables shall be provided for distribution of power to various DBs/ panels and individual loads in the STP, while 1100 V grade, PVC insulated, extruded inner and outer PVC sheathed, stranded copper conductor, armored cables shall be provided for control and instrumentation. These cables shall be laid in trenches, trays, pipes/conduits, buried in ground, as required, depending on the plant layout. The entire cabling system shall be as per the approved drawings.

(g) Complete plant indoor and outdoor lighting system shall be provided, which shall be controlled from lighting panels/switches installed in respective plant areas. The entire lighting system shall be as per the approved drawings with required Lux level as per relevant IS codes. Lux level calculation should be submitted.

(h) Complete plant indoor and outdoor Earthing and lighting protection system comprising electrode pits and conductors shall be provided inside and outside the plant to ensure proper system neutral Earthing and safety Earthing. The entire Earthing and lightning protection system shall be as per the approved drawings and IS codes / Indian Electricity Rules / Act.

(i) LV capacitor bank, with control panel consisting of automatic power factor correction (APFC) relay, shall be provided to improve the overall plant 'PF' up to a maximum of unity.

(j) Local Start/Stop push button stations shall be provided near those motors, which are not controlled from a local console/panel.

(k) All the motors shall conform to the requirements of latest editions of application Indian Standards. The motors shall be squirrel cage, TEFC type and shall be rated for continuous duty. The winding insulation shall be of Class 'F' while the temperature rise shall be limited to that for Class 'B'. The degree of protection of enclosure shall be IP 54 for indoor motors and IP 55 for outdoor motors and IP 56 for outdoor motors located near water bodies.

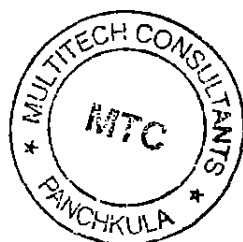
(l) Complete electrical works within the terminal points comprising of the following:

i. 3 panel Ring Main Unit 11 KV SF6 gas filled with two isolator.

ii. 3 panel RMU with one isolator.

iii. Two (2) nos Transformer of suitable rating.

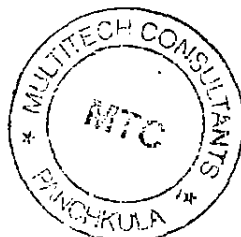
iv. LT Panel for the motors list/ sub panel as per requirement.



- v. Local Panels & Start Stop Push Button Stations.
- vi. Internal Illumination Lux levels indicated in the electrical specifications.
- vii. External Illumination to the Lux levels indicated in the electrical specification.
- viii. Power & Control Cables.
- ix. Earthing with earthing pits.

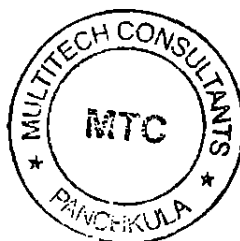
5.0 GENERAL INFORMATION /CONDITIONS

1. **Bearing Capacity** : Bearing capacity test of the STP area have been got done by the department. (Copy attached) The result of the same can be seen from the office of Executive Engineer, MCPH, Division No 1, Chandigarh. The bidder may himself get the bearing capacity of the STP area checked before submitting the bid. The successful bidder/contractor shall get the bearing capacity of the plant area tested (in the presence of Engineer-in-charge or his authorized representatives) and the design shall be based on the tested bearing capacity. The maximum safe net bearing capacity for which the structures are to be designed shall not be more than 8.6 ton per sq.m. In case the results of bearing capacity test done by the contractor and done by the department are in variance, the design value of bearing capacity shall be decided by the Engineer-in-charge, keeping in view the test results of bearing capacity reports got done by the contractor and the department. Any financial claim on account of difference in bearing capacity shall not be entertained afterwards. It is again reiterated that the contractor shall be responsible for soundness, safety and stability of the structures. The worst spring level shall be ascertained by the agency before bidding.
2. All the structures are to be designed / built considering worst spring level. No pressure release valves are allowed for release of uplift pressure.
3. Unless otherwise specified, the entire RCC structures are to be constructed in design mix M-30 grade of concrete as per IS 456-2000, IS-10262-1982, SP-23 1982 with upto date correction slips and revisions.
4. RCC access platform, Staircase and Railings shall be provided as a necessary item to all the units.
5. The minimum areas given for various buildings / sheds are the minimum requirement. However, if for proper functioning and workability, greater area is required, then the contractor has to provide the greater area within the same scope of work.



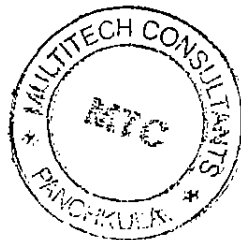
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6. All the sluice valves with diameter equal to or more than 400mm shall be geared and motorized.
7. Wherever sluice valves, or any other valve is to be installed below formation level of the area, the associated haudi / valve chamber shall also be constructed by the contractor within the scope of this contract.
8. The detailed technical specifications for all the items are covered in this part of the tender documents. In case any item is not covered or missing, CPWD specifications and relevant IS codes shall have to be followed upon approval of Engineer-in-Charge.
9. In case of any discrepancy between specifications laid down in this document and CPWD specifications / relevant IS codes, the decision of the Engineer-in- Charge will be final & applicable.
10. Wherever reference is made to Indian Standard Specifications, the latest specifications are applied.
11. The contractor shall use one of the approved makes as per availability in the market listed in Vol-II Part 3 of the DNIT.
12. The scope of the work under the contract is deemed to include the following works. The rates quoted by the contractor for the items in the BOQ shall include scope of work mentioned above and also the following works. Nothing extra shall be paid on these accounts.
 - a. Physical inspection of the inlet sewer terminating at the last manhole of sewer line and confirmation of invert level of the sewer at the site in consultation with Engineer in Charge.
 - b. Carrying out & confirming the detailed topographical survey of the treatment plant site, including the invert level of inlet sewer and establishing bench marks at least three locations within the STP site.
 - c. The contractor will also provide luminous painted warning / caution notice boards with flickering light arrangements at least 10 meters before the approach to the area of working place on either side, where the work is in progress.
 - d. The sub-soil water can be met excavation at the STP site location. The Contractor is advised to carry out its own investigations and gather information on the water table/subsoil conditions. The suitable and approved dewatering system should be adopted for execution of work. Nothing extra shall be paid on this account.



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- e. The sub-soil water pumped will be drained off to the proper disposal points. Contractor will have to make arrangements to dispose off the pumped sub-soil water to satisfaction of Engineer in Charge and nothing extra for dewatering of sub-soil water drain etc. will be paid. The contractor will have to carry sub-soil water at sufficient distance from the site of work at his own cost. The sullage / storm water side drains will be kept cleaned regularly to avoid unhygienic conditions in area. The instructions precautions / procedure of the health department will be binding and no claim on any ground will be entertained.
- f. The contractor will arrange sufficient number of diesel engine driven pumps for lowering down the water table below the required excavation level to keep the excavation dry for sufficient period of construction. Nothing extra shall be payable on this account.
- g. If as result of excavation of trenches, the underground services such as water, mains, electric-poles, cables, telephone cables and sewer lines etc., become exposed and un-supported it will be the responsibility of the contractor to make suitable & necessary arrangement for supporting and to keep them functional such arrangement will be done as per directions of the Engineer-in-Charge. No payment for supporting such utility services will be made. Any damage caused to the above mentioned underground services due to negligence of the contractor or otherwise shall be made good by the contractor at his own cost.
- h. The side slopes for excavation shall be decided by the contractor depending upon the sub-soil, strata and availability of land. In case wider excavations are not possible due to site conditions, close / open timbering shall be done by the contractor as per direction of the Engineer in charge to prevent caving-in of the trenches.
- i. The contractor shall have to make his own arrangements for labour camp site and its hutments. On completion of work, these shall be removed by the contractor, failing which the department will arrange to dismantle the same at the risk and cost of the contractor and the dismantled material will become the property of the department for which the contractor shall have no legal claim. The expenditure so incurred will be recovered from the dues of the contractor. The contractor shall also be responsible for keeping all hygienic conditions in his labour camp / hutments as desired by Local Health Authorities.
- j. The contractor shall take all precautions for the safety of existing nearby/adjoining main or lateral sewers and any damage to existing sewers or infrastructure shall be repaired free of cost by the contractor.

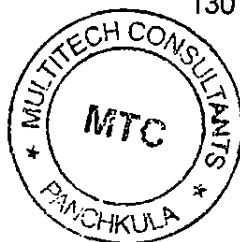


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- k. The contractor will provide a board indicating the name of work, name of contractor, name of division, cost of work, date of start, date of completion; telephone number etc., at site at his own cost and nothing will be paid by the department on this account.
- l. The contractor will be solely responsible for any mishaps, during the execution of the work. The contractor must get his labour insured before the start of work, for the entire period of completion of work.
- m. The contractor shall not disturb/damage or pull down any hedge, tree, building etc within the site or his area of operation without the written permission of the Engineer-in-Charge.
- n. The contractor shall at all the times during the progress of work take all requisite precautions and use his best endeavors for preventing any riotous or unlawful behavior by or among the workers and other employees at the work and shall preserve peace and protection of the inhabitants and the security of property in the neighborhood of the work.
- o. If the contractor or his workmen break, deface, injure or destroy any part of building in which they may be working, or any building, road, road curb, fence, enclosure, water pipe, cables, drains electric or telephone post or wires, trees, grass or grasslands, or cultivated ground contiguous to the premises on which the work or any part is being executed or if any damage shall happen to the work while in progress, from any cause whatsoever, the contractor shall make the same good at his own expense or in default the Engineer-in-Charge may ask the same to be made good by other workman and deduct the expense from any sums that may be due or at any time thereafter may become due to the contractor, or from his security deposit thereof.
- p. On completion of the work the contractor shall remove hutments failing which the department will dismantle and clear the site at contractor's risk and cost.
- q. Excess earth during construction of STP & MPS shall be utilized for leveling, grading and landscaping of the STP site within the boundary which is in the scope of work of the contractor. Full STP site area within the existing boundary wall is to be graded, maintained and landscaped by the contractor within his scope of work during entire Operation & Maintenance Period.

6.0 AS-BUILT DRAWINGS

After construction, testing and commissioning of all civil works mentioned above, the contractor shall submit the five sets (including 2 numbers of CDs) of As-built Drawings to



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the department. The As-built Drawings are the Detailed Engineering Drawings showing the actual details on which the construction / fabrication / erection has been carried out. The contractor shall have to obtain approval of the As-built Drawings from the department.

7.0 ACTIVITY BAR CHART

The successful bidder shall submit Activity Bar Chart, giving Time Schedule for each activity. The construction activities shall be based on this Bar Chart, after it has been approved by the department. Whenever there is a deviation from the approved Bar chart, a revised Bar Chart shall be submitted by the contractor. During the construction period, the updated Bar Chart shall be submitted to the Engineer-in-charge every month.

8.0 CONTRACT LIMITS

1. Sewer connection

The battery limit starts from existing sewer line located outside the boundary wall of the site. The contractor has to lay new RCC pipeline upto inlet chamber of MPS along with provision of intermediate manholes.

2. Treated waste water outlet upto receiving choe, located at some distance outside the boundary wall of site by constructing Effluent Disposal Channel / Pipe including end protection.

3. Handling of Sludge is in this scope of work. Sludge sale / disposal is the responsibility of the bidder. The safe disposal of sludge right from its generation as per Pollution Control Board norms will be done by the agency in all costs involved in this including transportation will be borne by the agency.

4. Electricity

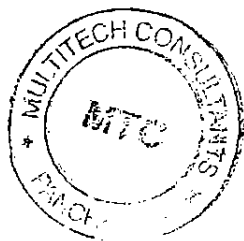
Contractor shall arrange electricity connection at his own expense during execution of the project. During the operation and maintenance for stabilization and maintenance period electricity charges will be paid to the electricity department directly by Municipal Corporation, Chandigarh. However, energy charges on account of excess energy consumption beyond average guaranteed power consumption (if any) and charges on account of power factor (if any) shall be deducted by the department out of running bills of the agency.

5. Existing Water Supply pipe line is located outside the boundary wall of the site. The contractor has to connect with this existing pipe line and lay new pipe line upto various units of the plant.

6. Collection & transportation of screening, Grit is the responsibility of the bidder.

7. Disposal of scour flow from various units & waste water from toilet upto Main Pumping Station.

8. Power will be made available at the STP gate by the department. All other works including HT, LT cabling, panels, substation, energy meter with CT / PT units, Electrical Panels, distribution thereof will be done by the contractor.





DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH.

VOLUME - I : PART - 2

SCOPE OF WORK

(B) OPERATION & MAINTENANCE

**EXECUTIVE ENGINEER,
MUNICIPAL CORPORATION PUBLIC HEALTH
DIVISION NO. 1, CHANDIGARH**



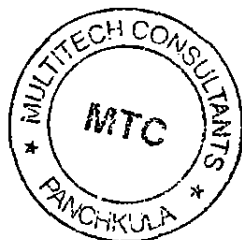
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(B) SPECIFICATIONS FOR OPERATION & MAINTENANCE

1.1 Scope of Work

The contractor is to operate, maintain and monitor the performance of 5 MGD (22.7 MLD) Sewage Treatment Plant (STP) at Chandigarh based on SBR Technology including operation and maintenance for 120 months. The scope of work is given below but not limited to the following. This may include other incidental items of work connected with the regular operation of plant as decided by EIC from time to time. Operation and maintenance period includes stabilization period (180 days or more as the case may be) and operation & maintenance of 120 months.

- 1.1.1 The contractor shall ensure proper running of the plant to give the desired effluent standards i.e. BOD less than 5 mg/l, TSS less than 5 mg/l and faecal coliform $\leq 230/100$ mg/l. The contractor shall also be responsible for overall maintenance of the plant i.e. civil, electrical, roads, landscaping, street lights and mechanical. The contractor shall also be responsible for all repairs of equipment/machinery.
- 1.1.2 The contractor shall monitor the quality of influent and effluent. The contractor shall take adequate action to ensure smooth and satisfactory performance/running of the plant.
- 1.1.3 The contractor shall prepare and implement an effective plant maintenance programme 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 hereunder.
- 1.1.4 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, fuel and other consumables etc. and various analysis performed. The contractor shall record and maintain the operation and maintenance data to be decided by Engineer-in-charge, in consultation with the contractor on the following Heads.
- I. Daily status record of STP
 - II. Daily flow record
 - III. Daily sampling record
 - IV. Operation record of mechanical screens
 - V. Operation record of RAS & SAS pumps
 - VI. Operation record of Decanters
 - VII. Operation record of Blowers
 - VIII. Performance/evaluation sheet of the STP
 - IX. Sludge profile data
 - X. Record of sludge discharge

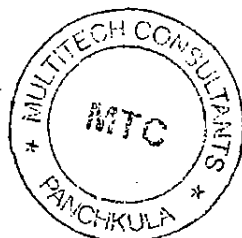


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- XI. Operation record of Centrifuge
 - XII. Any other allied works required by EIC during O&M.
 - XIII. Since the most of above parameters shall be available on the PLC, no separate register is required to maintain. Only in cases the online data is not stored, log books are required to be maintained. However, hard copy print of data available on PLC shall be taken every month.
- 1.1.5 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. The contractor shall hand over the machinery & site to the department after expiry of the contract period in good running condition.
 - 1.1.6 He shall be responsible for proper maintenance of all the pumps, Bar Screens, Gates, Decanters, Sludge Pumps, Blowers, Centrifuge and all other allied items including electric works.
 - 1.1.7 Round the Clock watch and ward of the constructed plant area / premises area including plants/machinery etc. will also be the responsibility of the contractor.
 - 1.1.8 The constructed plant area / premises will be kept neat and clean. The contractor will be responsible for landscaping in 50% of the STP area and the remaining will be kept clean without any wild growth.
 - 1.1.9 The records maintained by the contractors shall be produced periodically to the Engineer-in-charge for proper monitoring as desired by him.
 - 1.1.10 All necessary transports shall be arranged and made by the Contractor at his own costs including transport vehicles required for safe disposal of screening material, grit, sludge as directed by the Engineer-in-charge. All responsibilities of obtaining clearance and disposal of Residue / Screenings / Grit / Sludge etc. are in the scope of contractor.
 - 1.1.11 During the operation and maintenance for stabilization and monitoring period Electricity charges will be borne by the department and Diesel charges (if any) will be reimbursed by the department to the contractor on submission of detailed documents showing the actual consumption. The reimbursement rate will be as per actual purchase bills. The electricity charges will be paid directly to the electricity department by MC Chandigarh on actual basis as per electricity bill raised by the electricity department. All other consumable material and required staff for Operation & Maintenance will be provided by contractor.
 - 1.1.12 The contractor shall bear the cost of all spares, repairs etc. during Defect Liability Period as well as O & M period. Not only this, in case any machinery is irreparable the contractor shall replace the same during Defect Liability Period as well O&M period at his own cost.

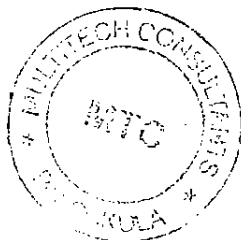
1.2 General Terms and Conditions

- 1.2.1 The chemicals and reagents will be arranged by the contractor from his own sources. The contractor will employ its own staff for testing purpose. However the department will be at liberty to get random sampling & testing done on its



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- own or from any other agency, to the entire satisfaction of Engineer-in-charge. In case of testing from other agency, charges will be borne by the department.
- 1.2.2 Plant and equipment covered under this contract shall be totally attended to by the contractor including any "Trouble Shooting" to ensure smooth and trouble free operation.
- 1.2.3 For effective maintenance of STP, the contractor shall employ sufficient staff with proper qualification. For his guidance, the pattern and number of minimum staff to be engaged is described in this chapter.
- 1.2.4 The maintenance period shall be 120 months from the date of complete stabilization of sewage treatment plant.
- 1.2.5 The contractor shall abide by all central/state govt./Semi govt./Local Bodies rules regulations, pertaining to this contract, without any extra cost.
- 1.2.6 In the event of any damage/loss of life/theft of property, due to negligence on the part of contractor, the contractor shall be solely responsible and liable for compensation and damages. Regarding negligence and compensation the decision of Engineer-in-charge shall be final.
- 1.2.7 The site will be open for inspection by the designated officers/official of the department at all times during the contract period.
- 1.2.8 The staff employed will be provided with all the required safety equipments. It shall be ensured that full safety measures are taken by the staff on duty. Staff employed shall be experienced and trained to handle the respective job/equipment.
- 1.2.9 The specification of material used for repair shall be the one used in original work. If not used during execution specifications of material shall be got approved by the department prior to commencement of O&M period and must be incorporated in the O & M Manual.
- 1.2.10 All spare parts used for the equipment in the maintenance of the system must be from the manufacturer of the equipment or if the equipment itself has been made with parts of the other manufacture then the parts must be of the same make as used in the equipment supplied and installed. The Contractor shall maintain sufficient stock of spares depending upon the importance factor of particular spare in operation of the plant, and time required for purchasing / arranging the spare.
- 1.2.11 The O & M Manual must be updated periodically for incorporating procedure of maintenance of repairs and breakdowns not incorporated in the earlier O & M Manual.
- 1.2.12 Frequency of spares used in maintenance of electrical, mechanical equipments must be recorded for updating the contents of manual.
- 1.2.13 Record of troubleshooting points and details of events causing trouble must be maintained and used for updating the contents of manual.



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1.2.14 The preventive maintenance will be made according to the preventive maintenance schedule of the plant. Short-term specialists of the Contractor for special maintenance tasks may reinforce the regular staff. The operation maintenance and repairs shall be-made with the help of the equipment and tools available at the plant, backed up and completed with the facilities of the Contractor brought to the plant by him temporarily for a special maintenance.

1.3 FINANCIAL TERMS AND CONDITIONS

1.3.1 During the operation and maintenance for stabilization and monitoring period Electricity charges will be borne by the department and Diesel charges (if any) will be reimbursed by the department to the contractor on submission of detailed documents showing the actual consumption. The reimbursement rate will be as per actual purchase bills. The electricity charges will be paid directly to the electricity department by MC Chandigarh on actual basis as per electricity bill raised by the electricity department. All other consumable material and required staff for Operation & Maintenance will be provided by contractor.

Note:

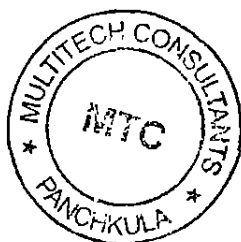
In case actual energy consumption exceeds the average guaranteed energy consumption, the charges for the excess energy consumption shall be borne by the contractor. These shall be deducted by the Department out of his running bills. Cycle for calculating excess energy consumption shall be bill to bill basis issued by the Electricity Department.

1.3.2 The operation & Maintenance cost approved by the Department shall be payable on monthly basis on completion of every month on submission of bill by the contractor. The contractor shall maintain the attendance record of the staff employed by him, which can be checked by the deptt. any time. The contractor will also submit copy of all the data sheets every month for evaluation.

1.3.3 The Sludge available from Sewage Treatment Plant shall be property of the contractor and suitable credit for the same shall be considered by the contractor while offering his price bid. It shall be the responsibility of the contractor to dispose off the sludge from the plant for the entire operation and maintenance period, including stabilisation period. Only three months of temporary storage facility at STP site shall be allowed by the department.

1.3.4 The treated waste water will not be sold by the Contractor. However, deptt. is at liberty to do so, and retain the proceedings, if any.

1.3.5 All sorts of Tool & Plant, required for proper operation & Maintenance of the plant, shall be arranged by the contractor at his own cost.



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1.4 Description of staffing

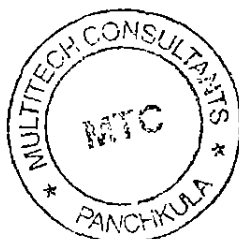
Details of minimum staff required to be employed for the operation and maintenance of the sewage treatment plant is given below. However, additional staff, if required for proper operation and maintenance of STP, will be provided by the contractor without any additional charges.

S. No.	Personnel	No.	Main Task of the Personnel
1	Plant Manager	1	Coordination of activities for satisfactory performance of the MPS & STP and reporting to the Engineer – in – Charge and responsible for the proper functioning & maintenance, data collection of MPS & STP.
2	Chemist	1	Daily analysis of samples of STP and fixing of chlorine doses
3	Operators (ITI Qualified)	4	Execution of specific tasks for operating the different installation of MPS & STP.
4	Electrician cum Fitter (ITI Qualified)	1/2	Responsible for maintenance of electrical and mechanical equipment.
5	Sweeper / Casual labour / Sewerman	6	Assistance to operator for cleaning of grit chamber / channels, removal of screenings, sludge handling, cleaning of pipes, manholes etc.
6	Watchman cum Gardener	9	To protection the plant from the trespassers, animals etc and to maintain the garden / landscaping of the plant.

In case the Contractor/ bidder fails to employ the above technical staff and fails to submit the names and attendance certificate of such staff, recovery shall be made from his bills at the rate of twice the average pay of the corresponding staff working with the department.

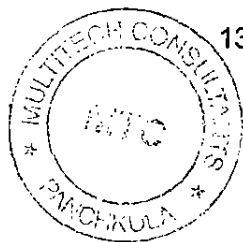
1.5 Sample Analysis Schedule

Sample collection is to be carried out under the supervision of qualified staff and as per instructions of the Engineer-in-Charge. The responsible employee of the contractor will indicate the details of sample locations and timings. During routine monitoring, samples of influent, effluent and sludge shall be analysed based on the Analysis Schedule given in the following Table for the given parameters.



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ANALYSIS SCHEDULE					
A. Waste water sample					
S. No.	Description of sample	Frequency	Location of sampling	Type of sample	Tests to be done
1	Influent waste water	Daily	Before fine screen	Grab	Temp, pH, BOD, COD, TSS, NH ₃ -N, TN, TP
2	Influent waste water	Twice a week	Before fine screen	Composite	Temp, pH, BOD, COD, TSS, NH ₃ -N, TN, TP, Fecal Coliforms
3	Effluent waste water	Daily	After Chlorine contact tank	Grab	Temp, pH, BOD, COD, TSS, NH ₃ -N, TN, TP
4	Effluent waste water	Twice a week	After Chlorine contact tank	Composite	Temp, pH, BOD, COD, TSS, NH ₃ -N, TN, TP, Fecal Coliforms
5	Effluent from SBR Reactor / Basin	Twice a week	Effluent Gutter	Grab	Temp, pH, BOD, COD, TSS, NH ₃ -N, TN, TP
B. Sludge Sample					
1.	From Sludge sump	Twice a week	Sludge sump	Grab	TSS, VSS
2.	Dried Sludge	Once a week	Centrifuge	Grab	Moisture content



- The composite sample, wherever specified, mean a sample prepared by taking sample every two hours for at least 12 hours a day and mixing them in proportion of the flow.
- Timings for grab samples are to be decided by Engineer-In-charge.
- Penalty will be imposed for non performance of the STP as per Clause 36 in 'Clauses of Contract', Volume 1 of this tender document.

2.0 Operation and maintenance activities:

1. The concrete Works/brick works/other civil works shall be checked regularly and repaired as and when required.
2. All metal works e.g. railing, staircase, chequered plates, valves, rungs etc shall be painted as and when required as directed by Engineer-In-Charge.
3. Overflowing of various units shall be checked regularly.
4. It shall be checked daily that all the units/ equipments are operational.
5. Disposal of screened waste, scum, grit removed and any other waste shall be done to the earmarked dumping site.
6. It shall be checked regularly that all Sluice valve and gates are functioning properly.
7. All pipes and bends shall be checked regularly for chokage and cleaned if required.
8. Lubrication of all the moving parts of equipments/gates/valves regularly as per instructions of manufacturer or earlier if required shall be done.
9. Greasing and glanding of equipment/ gates/valves regularly as per instructions of manufacture or earlier if required shall be done.
10. All equipments/unit shall be cleaned and repaired regularly.
11. Weir plates shall be cleaned regularly and their levels shall be kept proper.
12. Electric connections to all the machinery/equipment shall be checked/repaired regularly.
13. Level switches shall be checked/repaired regularly for their proper functioning.



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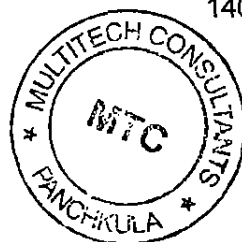
DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH.

VOLUME - I : PART - 3

SCOPE OF WORK

BID SUBMISSION

**EXECUTIVE ENGINEER,
MUNICIPAL CORPORATION PUBLIC HEALTH
DIVISION NO. 1, CHANDIGARH**

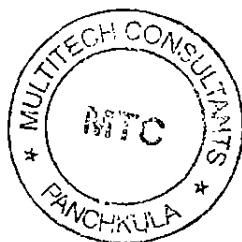


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1.0 MODE OF TENDERING

1.1 Folder B shall include

- Process calculations including pipe size calculation.
 - Layout plan.
 - Hydraulic diagram and P&I diagram
 - Memorandum of understanding or agreement with the technology provider.
 - The bidder's proposal must clearly specify the following information:
 - Proposed area for the Blower Room, MCC, PLC, Toilet, centrifuge shed, chlorination room, tonner shed, sludge storage platform, Transformer Shed etc.
 - Technical data such as no. of items, technical specifications, capacity of electrical & mechanical works, instrumentation ,pipes, valves and gates.
-
- The following schedules duly filled in are to be submitted.
 - Electrical drive list
 - Pipeline schedule
 - Field instrumentation
 - Transformer (substation) data sheet and details
 - DG set data sheets and details
2. The tender shall be valid for ~~120~~⁹⁰ days after end date of submission of e-tender.
 3. All disputes concerning in any way with this tender are subject to Chandigarh (India) jurisdiction only.
 4. The department reserves the right to reject any prospective application without assigning any reason. No contractor/bidder shall have any claim arising out of such action.
 5. Submission of false information/document by the prospective tenderer will invite disqualification from tendering process including forfeiture of EMD. Even prosecution proceeding can be launched against the tenderer.
 6. Meeting for scrutiny of technical bid and eligible criteria shall be held on _____ at _____ in the Committee Room of Municipal Corporation, Sector -11, Chandigarh.
 7. Instruction to bidders regarding e-tendering process :
 - a) Tenders without digital signatures will not be accepted by the Electronic Tendering System. No Price Bid will be accepted in physical form and in case it has been submitted in the physical form, it shall be rejected summarily.
 - b) Bids will be opened online as per Time Schedule mentioned above.
 - c) Before submission of online bids, the bidders must ensure that scanned copies of all the necessary documents have been uploaded with the bid.



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- d) The Executive Engineer, Municipal Corporation, Public Health Division No. 1, near Karuna Sadan, Sector – 11, Chandigarh will not be responsible for any delay in online submission of the bids due to any reason whatsoever.
8. For any technical issue related to Electronic Tendering Portal, the bidders may contract...IT Cell, CIT, 5th Floor, Additional Deluxe Building, Sector – 11, Chandigarh as e-mail at etender@chd.nic.in, Phone No. +91 172-2740641 / 2740003. The bidder may contact the Nodal Officer of Municipal Corporation Chandigarh for any help / assistance regarding e-tendering at +91 98-72-511311 and +91 172-5021625 during office hours.

9.0 BID EVALUATION

- 9.1 Earnest Money shall be opened first. The tenders without full amount of earnest money in the desired shape shall be rejected and no further evaluation shall be done for such cases.
- 9.2 The data provided by the bidder in support of his eligibility shall be scrutinised with respect to the eligibility criteria specified in the tender document. The bids which do not fulfil the eligibility criteria shall be rejected and **technical bid and Price Bid shall not be opened for such cases.**
- 9.3 Technical bid for the bidders who fulfill the eligibility criteria shall be opened later in the presence of the bidders or their representatives who choose to be present in the office of EIC at the date and time to be intimated by EIC.
- 9.4 The Technical Bid (envelope B) thus opened shall be evaluated by the department as per tender document. Tenderers shall furnish all Information / the Department may require & clarifications whatever during evaluation of Technical bid. Tenderers whose offers may be deviating from the tender document (DNIT) shall be asked to confirm their acceptance of tender specifications and terms. After the Technical bid evaluation is completed, the date for Price Bid opening shall be separately intimated to those tenderers whose 'technical bid' offer is found acceptable.
- 9.5 The Dept. will carry out a detailed evaluation of the Bids to be substantially responsive in order to determine whether the Technical aspects are in accordance with the requirements set forth in the bidding documents. In order to reach such a determination, the Department will examine and compare the technical aspects of the Bids on the basis of overall completeness and compliance with the Technical specifications. Deviation from Specifications, if acceptable to department, in so far as practicable, will be converted to Rupees Value and added to the Bid Price to compensate for the deviation from the specification.
- 9.6 **Price Bid of those tenderers will not be opened whose Technical Bids are not acceptable.**
- 9.7 Price Bid shall be opened on the date and time so intimated, in presence of intending tenderers or their authorized representative who may like to be present.



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- 9.8 The bids shall be evaluated on the basis of Life Cycle Cost worked out as under:
Life Cycle Cost = Price quoted by the bidder + Net Present Value (NPV) of Power Consumption

Calculated lifecycle cost of all the bidders shall be first compared to determine the lowest Bid. Then the Bid with the lowest lifecycle cost shall be evaluated for its reasonability / workability and as a result of this comparison / evaluation, the bid with lowest lifecycle cost will be selected for award of the Contract. The department reserves the right to accept or reject any bid or the lowest bid without assigning any reason.

9.8.1 Price Quoted by the bidder

Capital Cost of the STP is amount in Rupees quoted by the bidder in price schedule as per BOQ.

9.8.2 Net Present Value (NPV) of Power Consumption

Net Present Value (NPV) of the average daily guaranteed power consumption indicated in the Price Bid shall be worked out on the basis of following parameters:

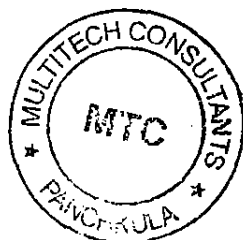
- Unit Rate of Energy = Rs 6.00 per kW.hr
- Period of Capitalization = 10 years
- Rate of Interest / Rate of Return = 10%

Example:

Average daily guaranteed power consumption	=	A kW.hr
Unit Rate of Energy	=	Rs 6.00 per kW.hr
Annual Energy Cost	=	A x 365 x 6.00
	=	Rs 2190 A
NPV Factor	=	6.144
NPV of Power Consumption	=	2190 A x 6.144
	=	Rs. 13455.36 A

Note:

- 1) Average Daily Guaranteed Power Consumption 'A' is not applicable for plant lighting, lab equipments, air conditioning and ventilation fans, Tertiary Treatment Plant.
- 2) In case actual energy consumption exceeds the average guaranteed energy consumption, the charges for the excess energy consumption shall be borne by the contractor. These shall be deducted by the Department out of his running bills. Cycle for calculating excess energy consumption shall be bill to bill basis issued by the Electricity Department.

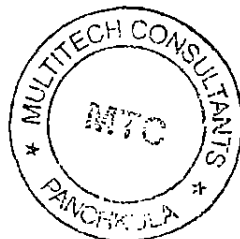


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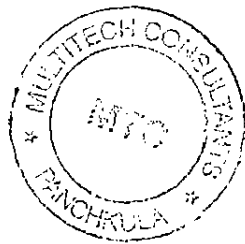
ELECTRIC DRIVE SCHEDULE

The bidder must fill in the following Electric Drive Schedule. Without the Electric Drive Schedule, the bid shall be considered as non-responsive. Please use additional sheets, if required.

Drive For	Nos. to be installed	Nos. Operating	Phase	Ratings in kW
(i) Raw Sewage Submersible				
(ii) Monorail mounted Electric Hoist for Raw Sewage Submersible Pumps				
(iii) Mechanical Bar Screen				
a) Main unit				
b) Conveyor belt				
(iv) Mechanical Detritor				
a) Main rake				
b) Classifier				
c) Organic return Pump				
(v) Return Activated Sludge				
(vi) Surplus Activated Sludge				
(vii) Air Blowers :				
(a) For SBR				
(b) For Sludge Sump				
(viii) Centrifuge Feed Pumps				



Drive For	Nos. to be installed	Nos. Operating	Phase	Ratings in kW
(ix) Centrifuge Units				
(x) Decanters				
(xi) Electric Hoists for STP				
(xii) Polyelectrolyte Agitator				
(xiii) Polyelectrolyte Dosing				
(xiv) Auto Valves / Sluice Gates				
(xv) Service Water Pumps				
(xvi) Plant Lighting				
(xvii) Any other				

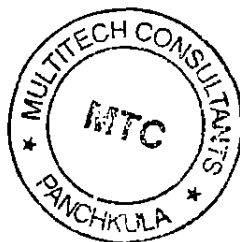


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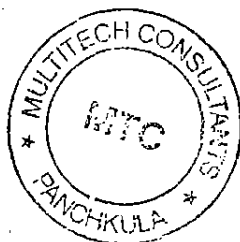
PIPE LINE SCHEDULE

The bidder must fill in the following Pipe Line Schedule. Without the Pipe Line Schedule, the bid shall be considered as non-responsive. Please use additional sheets, if required.

SNo	From	To	Flow	Pipe Dia	MOC	Remarks
1.	Last manhole of existing sewer line	Inlet Chamber of MPS			RCC NP-3 Pipe	
2.	Individual delivery pipe of raw sewage submersible pumps	Common header			DI K-9	
3.	Common header of raw sewage submersible	Inlet Chamber of STP			DI K-9	
4.	Grit Chambers	Distribution Box / SBR Reactors			RCC Channel / RCC NP-3 Pipe	
5.	SBR Air Blowers: Discharge	Common Discharge Header			MS	
6.	SBR Air Blowers: Common Discharge Header	SBR Reactors			MS	
7.	SBR Basins: Down comers (Vertical)				SS 304	
8.	Selectors: Air Header				MS	
9.	Selectors: Downcomers (Vertical)				SS 304	
10.	RAS Pumps: Discharge	Selectors			DI K-9	
11.	SAS Pumps WAS Pumps: Discharge	Sludge Sump			DI K-9	
12.	Sludge Sump Air Blowers: Discharge	Sludge Sump			MS	



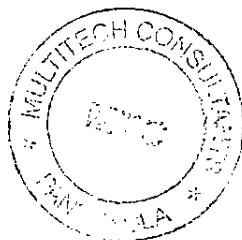
3.	Sludge Sump : Downcomer and laterals				SS 304	
14.	Sludge Sump	Centrifuge Feed Pumps: Suction			DI K-9	
15.	Centrifuge Feed Pumps: Discharge	Centrifuges			DI K-9	
16.	DWPE Dosing Tanks	Drain/Overflow			SS 304	
17.	DWPE Dosing Tanks	DWPE Dosing Pumps: Suction			SS 304	
18.	DWPE Dosing Pumps: Discharge Header	Centrifuge Inlet			SS 304	
19.	SBR Reactors	Chlorine Mixing Tank			RCC Channel / RCC NP-3 / DI K-9 Pipe	
20.	Concentrate from centrifuge	Nearest Chamber			DI K-9	
21.	Drain Pipes for various units	Nearest Chamber			DI K-9	
22.	External Sewerage System				SW / RCC NP-3 Pipe	
23.	Bypass Pipe / Channel for bypass of MPS & STP	Receiving nallah outside the boundary			RCC Channel / RCC NP-3 Pipe	
24.	Service Water Pumps	Various units of STP			GI / DI K-9	
25.	Any other					



⑤

FIELD INSTRUMENTATION SCHEDULE

Instrument	Location	Operation	To be filled by bidders		
			Type	Nos	Make
Differential Level Transmitter	On each Mechanical Coarse Screen Channel	Signals to PLC for Mechanical Coarse Screen operation	Ultrasonic		
Level transmitter	Collection Tank of MPS	Signals to PLC for sewage operation	Ultrasonic (non contact type)		
Flow Transmitter	Common discharge header of raw sewage transfer pumps	To measure sewage flow	Ultrasonic		
Level Transmitter	SBR Reactor	Signals to PLC for decanter operation	Hydrostatic		
Sludge flow meter	Delivery line from sludge sump	To record integrated flow	Electromagnetic		
Differential Level Transmitter	Fine Screens	For operation of screens	Ultrasonic		
Pressure Gauges	Discharge Of all Pumps & Air Blowers	Indication Of Pressure At Which Sludge Is Being Pumped & air is being Blown	Seal Diaphragm		
Level Switch	Sludge Sump	Auto Control Of Pumps – Start / Stop	Displacer / Float Operated Tilted Type		
Variable Frequency Drive	Blowers	To adjust RPM of blowers			
Variable Frequency Drive	Decanter	To adjust speed of decanter			
DO meter	SBR Reactor	To control aeration			
Actuators for valves & gates	Valves / Gates	Auto operation of valves / gates			
Any other					



CHEMICAL REQUIREMENT SCHEDULE**Chemicals**

The bidder should list the consumption of the chemicals at the project site to be used by them for the STP.

Sr. No.	Chemical	Dosage	Unit	Qty. Kg/day
1	Dewatering Polyelectrolyte			
2	Gas Chlorine or NaOCl			
3	Any other Chemical			

The technical schedule sheets are to be filled in by the tendered / bidder and returned with his bid. Bids without filled up technical schedule shall be summarily rejected.



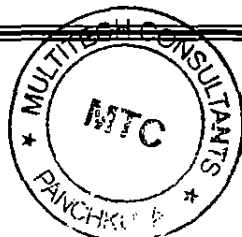


DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH.

VOLUME - I

GEOTECHNICAL INVESTIGATION REPORT

**EXECUTIVE ENGINEER,
MUNICIPAL CORPORATION PUBLIC HEALTH
DIVISION NO. 1, CHANDIGARH**



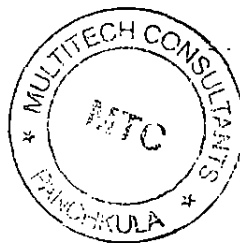
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C/o Soil investigation/ Bearing capacity & Water Table of
Soil for the Proposed S.T Plant at Maloya, Chandigarh.

S.H. - Soil Investigation.

CONTENTS

<i>S.No.</i>	<i>Description</i>
1.	<i>Introduction</i>
2.	<i>Notations</i>
3.	<i>Field Investigation</i>
4.	<i>Laboratory Investigation</i>
5.	<i>Sub- Soil Profile</i>
6.	<i>Foundation Parameter</i>
7.	<i>Computation of Allowable Bearing Capacity Values</i>
8.	<i>Recommendations</i>



P

GEOTECHNICAL INVESTIGATIONS.

C/o Soil investigation/ Bearing capacity & Water Table of Soil for the Proposed S.T Plant at Maloya, Chandigarh.

1.1. INTRODUCTION

1.1. General

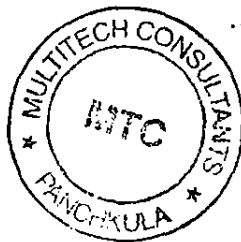
This soil investigation work was done at the instance of

Executive Engineer M.C.P.H Division No. 4 Chandigarh.

are to be carried out at the proposed site 5 bore holes, 15.0 meter deep each, were extended at the proposed site. Besides drilling, Standard Penetration Tests at specified intervals were performed as per B.I.S. specifications and in addition to the above Test, undisturbed as well as auger samples were collected from the bore-holes for classification of soil, shear strength tests and determination of mechanical properties of the soil in the laboratory.

1.2. Object :

The objective of the report is restricted to the factual information to be collected during the investigation period along with laboratory tests results and so as to obtain sequence & extent of soil so as to arrive at design parameters for the foundations of soils from the recommended safe bearing capacity of foundation soil.



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1.3 Test point Locations

1) Bore hole Locations

As desired 5.0 boreholes , were carried out upto a maximum depth of 15.0 mtr/ Refused Strata to carry out the desired investigations at the proposed site.

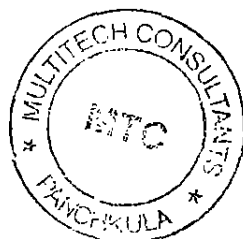
- 1) Proposed S.T Plant at Maloya, Chandigarh. = 5 Nos.

(Bore Hole - 1 - 5)

1.4 Planning And Soil Exploration :

On the basis of nature of work it was decided to carry out soil exploration in order to :

- a) Obtain soil samples, both representative and undisturbed wherever necessary for classification and other laboratory tests for determining engineering properties of soil strata.
- b) Obtain soundings of penetration resistance by standard penetration test in the bore holes.



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1.5 Design criteria For Footings :

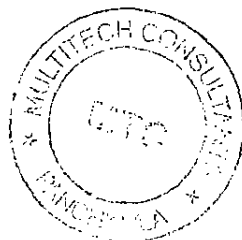
- i) Footing must be safe against shear failure of supporting soil.
- ii) Footing must not settle more than permissible limit.

Net safe bearing capacity 'qns' is obtained by using the physical characteristics of foundation & the relevant shear parameters of soil. Factor of safety of 2.5 is applied on ultimate bearing capacity as recommended by B.I.S. Net loading intensity 'qns' is obtained by using physical characteristics of foundation & relevant compressibility characteristics of the underlying soil. The settlement so obtained shall be within permissible limits as per BIS recommendations.

The lesser of these computed values i.e. 'qns' or q_n is adopted as the allowable bearing capacity for designing the foundations of structures.

LOCATION OF WATER TABLE :-

The Sub-Soil Water was located below the depth of 15.0 from N.S.L.



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2.0 NOTATIONS :-

AS PER SHOWN IN THE APPENDIX ATTACHED:

3.0 DETAILS OF FIELD WORK

3.1 Boring operation & Sampling :

150 mm dia hole was advanced at the location using shell and anger method. 150 mm nominal dia flush steel casing was advanced with the boring and the full length of the borehole was encased at each location.

3.2 Disturbed and undisturbed Sample :

Disturbed and undisturbed soil samples were obtained depending upon the nature of soil from different depths in the bore hole. The undisturbed samples were collected in sampling tubes. The ends of the tubes are sealed with molten wax to prevent evaporation. These samples were subsequently tested in the laboratory so as to determine the various index and engineering proportion of various sub soil strata met in the bore holes.



§

3.3 SPT Standard Penetration Test

Standard Penetration Test was performed in the borehole. The standard split spoon sampler, attached to a string of drill rods was lowered to the bottom of the hole and allowed to rest under self weight. The drill rods were connected to driving assembly which consisted of a hoisting equipments, a drive weight (Hammer) of 63.5 Kg, and a guide to ensure a 75 cm free fall of hammer on an anvil. The number of hammer blows that were required to penetrate the sampler through three runs of 150 mm each were recorded. Initial driving of 150 mm was disregarded and the number of blows required to drive the sampler through the remaining 300 mm is called BLOW COUNT or PENETRATION NUMBER, N. At the end of the test, the sampler was withdrawn and the soil extracted for subsequent testing in the laboratory. If the penetration was less than 30 cm for 50 blows, it is considered as refusal and the actual penetration was recorded.

Correction of 'N' value :

In case of Sandy soil & Non plastic silts, the observed SPT values, designated as 'N', are to be corrected to account for the following two effects.

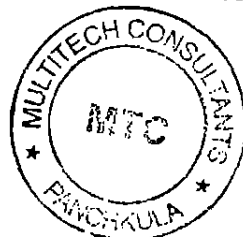
(i) Correct to account for the effect of overburden pressure.

$$N_n = C_n \times N$$

'C_n' is overburden pressure correction and is calculated from the figure No. 1 given on page No. 8 in IS : 2131-1981.

(ii) Correction due to submergence Correction.

$N_c = 15 + (N_n - 15) / 2$ provided N_n is > 15 where 'N_c' is the final corrected value where ever both the overburden and submergence corrections are necessary the overburden correction is applied first correction of N values of Bore Hole.



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4.0 LABORATORY TESTS :

4.1 Index Properties [As per SP 36 (Part-I)-1987] :

All the relevant classification on the samples obtained from the five bore holes were carried out in the laboratory. The index properties obtained from such classification tests at different depths in the bore holes are reported in the borehole log sheets, referred to Figs.

4.2 Engineering Properties [As per SP 36 (Part-I) 1987] :

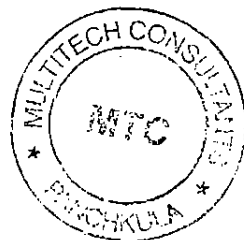
It comprised of conducting all the necessary tests on the disturbed and soil samples to evaluate different engineering properties of the sub-soil.

Direct shear tests were carried out on the sandy samples obtained from different depths from each bore-hole to determine the shear strength characteristics of the sandy strata.

The unconfined compression strength tests were performed on undisturbed samples obtained from the cohesive strata so as to obtain undrained shear strength of the cohesive soil.

Results of the above tests are indicated at Figs.

The consolidation tests were also performed on the remolded/undisturbed samples which were obtained from appropriate depths from each bore-hole. Results of these tests are shown at Figs.



5.0 Sub Soil Profile :

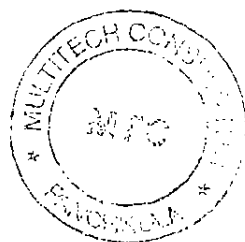
Nature of strata met at different depths in the bore hole is described as under :

Location - 1

Depth Range (m)		Nature of Strata.
NSL to 7.5	SM	Compact Sand
7.5 to 10.0	CL	Stiff Clay
10.0 to 12.0	ML	Silt of low Plasticity Strata.
12.0 to 13.5	SM	Compact Sand
13.5 to 15.0	SM-SP	Compact Sand

Location - 2

Depth Range (m)		Nature of Strata.
NSL to 7.0	SM	Compact Sand
7.0 to 9.0	CL	Stiff Clay
9.0 to 11.5	ML	Silt of low Plasticity Strata.
11.5 to 13.0	SM	Compact Sand
13.0 to 15.0	SM-SP	Compact Sand



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Sub Soil Profile :

Location - 3

Depth Range (m)		Nature of Strata.
NSL to 7.5	SM	Compact Sand
7.5 to 9.0	CL	Stiff Clay
9.0 to 11.5	ML	Silt of low Plasticity Strata.
11.5 to 13.5	SM	Compact Sand
13.5 to 15.0	SM-SP	Compact Sand

=====

Location - 4

Depth Range (m)		Nature of Strata.
NSL to 7.0	SM	Compact Sand
7.0 to 9.0	CL	Stiff Clay
9.0 to 12.0	ML	Silt of low Plasticity Strata.
12.0 to 13.5	SM	Compact Sand
13.5 to 15.0	SM-SP	Compact Sand

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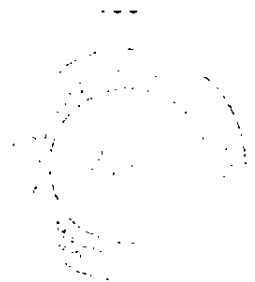


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Sub Soil Profile :

Location - 5

Depth Range (m)		Nature of Strata.
NSL to 7.5	SM	Compact Sand
7.5 to 10.0	CL	Stiff Clay
10.0 to 11.5	ML	Silt of low Plasticity Strata.
11.5 to 13.5	SM	Compact Sand
13.5 to 15.0	SM-SP	Compact Sand



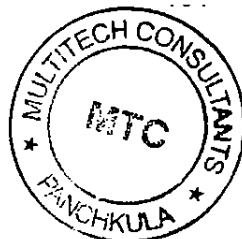
ALLOWABLE BEARING CAPACITY CRITERIA

A foundation can fail by two modes i.e.

- i) Shear failure.
- ii) Excessive settlement.

Shear failure being catastrophic, an adequate factor of safety is applied to ultimate bearing capacity that can initiate this type of failure. BIS recommends a value of FOS = 2.5 to obtain the net safe bearing capacity q_{ns} by using the physical characteristics of the foundation and relevant shear strength parameters of soil. Through Settlement analysis a net loading intensity q_n is obtained by using the physical characteristics of the foundation and the relevant compressibility characteristics of the underlying soil. The value so obtained ensures that the foundation shall not settle more than a that which is permissible as per BIS recommendations. The permissible settlement depends upon the type of superstructure and the nature of supporting strata.

The lesser of these computed values i.e. q_{ns} or q_n is adopted as the allowable bearing capacity for proportioning the foundation of superstructures.



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6.0 TENTATIVE DIMENSION OF THE PROPOSED FOUNDATIONS :

The proposed site is a . LINE , Hence the following dimensions of the proposed foundations shall be used in bearing capacity computations as per norms :

1.	FOR COLUMN FOOTING	
	Depth of Foundation Df :	1.2 ,1.5 , 2.0 ,3.0 Metre
	Size of footings (B x B) =	1.5 x 1.5 mtrs 2.0 x 2.0 mtrs



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BEARING CAPACITY BY MEANS OF
SHEAR FAILURE CONSIDERATION TEST :-

Depth = 1.5 metre.

Size = 1.5 x 1.5 mtrs

BEARING CAPACITY BY MEANS OF S.P.T. TEST :-

The Ultimate bearing capacity is calculated by the following formula :-

$$q_d = \frac{q (N' q - 1) s_q d_q + 1/2 B \gamma N' r s_y d_y W'}{(IS :- 6403-1981)}$$

Hence $\phi = 31.0$

$$\phi' = \tan^{-1} (0.67 \tan \phi)$$

$$= \tan^{-1} (0.67 \tan 31)$$

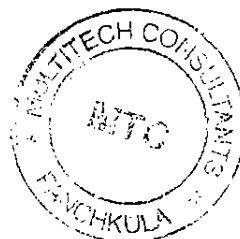
$$= \tan^{-1} (0.4025)$$

$$\phi' = 21.93$$

WHERE AS

SHAPE FACTOR (FOR COLUMN FOOTING)

$$S_c = 1.3 \quad S_q = 1.2 \quad S_y = 0.80$$



DEPTH FACTOR

$$D_q = D_y = 1.0$$

As the back filling may not be done with proper compaction.

$$\text{For } \phi' = 21.93$$

$$\begin{aligned} N'_q &= 6.40 + \frac{(10.66 - 6.40)}{5} \times 1.93 \\ &= 6.40 + \frac{(5.49)}{5} \times 1.93 \\ &= 6.40 + 0.852 \times 1.93 \\ &= 6.40 + 1.64 \\ &= 8.0 \end{aligned}$$

$$\begin{aligned} N_y &= 5.39 + \frac{(10.85 - 5.39)}{5} \times 1.93 \\ &= 5.39 + \frac{(5.49)}{5} \times 1.93 \\ &= 5.39 + 1.098 \times 1.93 \\ &= 5.39 + 2.119 \\ &= 7.5 \end{aligned}$$



15

Depth = 1.2 metre.

Size = 1.5 x 1.5 mtrs

FOR COLUMN FOOTING :-

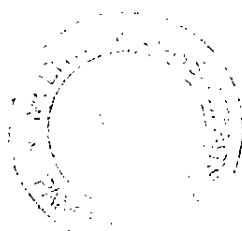
$$\begin{aligned}
 qd &= q (N' q -1) sqdqiq + 1/2 \text{ By } N' r \text{ sydyiy } W' \\
 &= 1.80 \times 1.2 (8.0 -1) \times 1.0 \times 1.2 + 0.5 \times 1.80 \times 7.5 \times \\
 &\quad 1.5 \times 0.8 \times 0.5 \\
 &= 18.14 + 4.0 \\
 &= \frac{22.14}{2.5} \\
 &= 8.8 \text{ T/M}^2
 \end{aligned}$$

Depth = 1.5 metre.

Size = 2.0 x 2.0 mtrs

FOR COLUMN FOOTING :-

$$\begin{aligned}
 qd &= q (N' q -1) sqdqiq + 1/2 \text{ By } N' r \text{ sydyiy } W' \\
 &= 1.80 \times 1.5 (8.0 -1) \times 1.0 \times 1.2 + 0.5 \times 1.80 \times 7.5 \times \\
 &\quad 2.0 \times 0.8 \times 0.5 \\
 &= 22.68 + 5.33 \\
 &= \frac{28.0}{2.5} \\
 &= 11.2 \text{ T/M}^2
 \end{aligned}$$



16

Depth = 2.0 metre.

Size = 2.0 x 2.0 mtrs

FOR COLUMN FOOTING :-

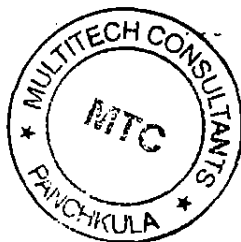
$$\begin{aligned} qd &= q (N' q -1) sqdq + 1/2 By N' r sydyiy W' \\ &= 1.80 \times 2.0 (8.0 -1) \times 1.0 \times 1.2 + 0.5 \times 1.80 \times 7.5 \times \\ &\quad 2.0 \times 0.8 \times 0.5 \\ &= 30.24 + 5.33 \\ &= \frac{35.57}{2.5} \\ &= 14.22 T/M^2 \end{aligned}$$

Depth = 2.0 metre.

Size = 2.5 x 2.5 mtrs

FOR COLUMN FOOTING :-

$$\begin{aligned} qd &= q (N' q -1) sqdq + 1/2 By N' r sydyiy W' \\ &= 1.80 \times 2.0 (8.0 -1) \times 1.0 \times 1.2 + 0.5 \times 1.80 \times 7.5 \times \\ &\quad 2.5 \times 0.8 \times 0.5 \\ &= 30.24 + 6.66 \\ &= \frac{36.90}{2.5} \\ &= 14.76 T/M^2 \end{aligned}$$



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17

Depth = 3.0 metre.

Size = 2.5 x 2.5 mtrs

FOR COLUMN FOOTING :-

$$\begin{aligned}
 qd &= q (N' q -1) sqdqiq + 1/2 By N' r sydyiy W' \\
 &= 1.80 \times 3.0 (8.0 -1) \times 1.0 \times 1.2 + 0.5 \times 1.80 \times 7.5 \times \\
 &\quad 2.5 \times 0.8 \times 0.5 \\
 &= 45.36 + 6.66 \\
 &= \frac{52.0}{2.5} \\
 &= 20.8 T/M^2
 \end{aligned}$$

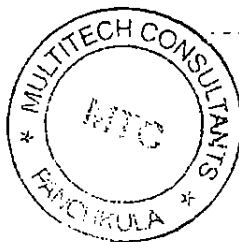
Wall Footing

Depth = 1.5 metre.

Size = 1.5 mtrs

FOR COLUMN FOOTING :-

$$\begin{aligned}
 qd &= q (N' q -1) sqdqiq + 1/2 By N' r sydyiy W' \\
 &= 1.80 \times 1.5 (8.0 -1) \times 1.0 \times 1.2 + 0.5 \times 1.80 \times 7.5 \times \\
 &\quad 1.5 \times 1.0 \times 0.5 \\
 &= 18.9 + 5.0 \\
 &= \frac{24.0}{2.5} \\
 &= 9.6 T/M^2
 \end{aligned}$$



SETTLEMENT CONSIDERATION : (Non-cohesive)

Depth = 1.5 Mtrs

Settlement / Unit pressure for Min corrected $N' = 13.5$

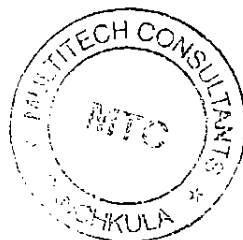
corresponding to foundation depth of 1.5 mtr & foundation width of 3.0 - 4.0 or more mtr calculated according to para 9.5 of I.S.8009-(Part-I)-1976 and read from fig :9 p.p. 17 of the I.S. Code comes to 22.0 mm. Settlement corrected for water table

$$= \frac{22}{0.5} = 44.0 \text{ mm.}$$

Allowable settlement being 50mm.,

$$\text{allowable bearing capacity} = \frac{50}{44} = 1.136 \text{ Kg/cm}^2$$

$$= 11.36 \text{ t/m}^2$$



SETTLEMENT CONSIDERATION : (Non-cohesive)

Depth = 3.0 Mtrs

Settlement / Unit pressure for Min corrected N' = 15.0

corresponding to foundation depth of 3.0 mtr & foundation width of

3.0 - 4.0 or more mtr calculated according to para 9.5 of I.S.8009-(Part-I)-1976

and read from fig :9 p.p. 17 of the I.S. Code comes to 16.5 mm. Settlement

corrected for water table

$$= \frac{16.5}{0.5} \quad 33.0 \text{ mm.}$$

Allowable settlement being 50mm.,

$$\text{allowable bearing capacity} = \frac{50}{33} = 1.515 \text{ Kg/cm}^2$$

$$= 15.15 \text{ t/m}^2$$



Recommendation

The following observation are made on the basis of field test
Data & Field Laboratory Test results and our experience
in soil testing jobs.

Column Footing.

Sr. No	Depth in Mtr.	Size in Mtr.	Net SBC in T/ M ²
1	1.2	1.5 x 1.5	8.8 t/m ²
1	1.5	2.0 x 2.0	11.0 t/m ²
1	2.0	2.0 x 2.0	14.0 t/m ²
1	3.0	3.0 x 3.0	15.0 t/m ²

From design point of view the following average value may be adopted .

$$(q_a) \text{ NET} = 11.0 \text{ T/M}^2$$

In case of multistory structures adjacent columns should preferably be interconnected by using the beams just below the PLINTH LEVEL. This imparts rigidity to the substructure and helps to even out the likely differential Settlements.



Technical Director

J. NATH
J. NATH
(Retd. Engineer)



S



BH-1

Soil Characteristics

Depth In Meter	IS Classification	N-Value	Gravel	Sand	Silt	Clay	Atterburg Limit IL PL	Water Content %	Bulk Density	C in TN/12	φ in Degree
0.75	SM	5	-	60	26	14	N P	10.0	1.78	NH	31.0°
1.5	SM	9	-	62	24	14	N P	10.2	1.80	NH	31.0°
3.0	SM	11	-	65	20	15	N P	10.5	1.82	NH	31.2°
4.5	SM	13	-	66	19	15	N P	10.7	1.84	NH	31.5°
6.0	SM	15	-	66	20	14	N P	11.0	1.85	NH	31.8°
8.0	CL	16	-	12	35	53	31.5 19.0	11.5	1.86	1.5	14.0°
9.0	CL	18	-	11	35	54	32.0 19.5	11.7	1.88	2.0	15.0°
10.5	ML	20	-	32	35	33	28.0 19.0	12.0	1.89	2.5	24.0°
12.0	ML	22	-	34	34	32	28.5 19.7	12.2	1.90	3.0	24.5°
13.5	SM	24	-	68	18	14	N P	12.5	1.92	NH	31.8°
15.0	SM-SP	25	-	92	4	4	N P	13.0	1.95	NH	32.0°

5



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BH-II

Soil Characteristics

Depth In Meter	IS Classification	N-Value	Gravel	Sand	Silt	Clay	Atterburg Limit LL PL P	Water Content	Bulk Density	Cin T/M ²	Ø in Degree
0.75	SM	6	-	61	24	15	N P	10.0	1.80	NH	31.2°
1.5	SM	10	-	62	23	15	N P	10.5	1.82	NH	31.2°
3.0	SM	12	-	63	23	14	N P	10.7	1.83	NH	31.5°
4.5	SM	14	-	64	21	15	N P	11.0	1.85	NH	31.5°
6.0	SM	15	-	66	20	14	N P	11.2	1.85	NH	31.8°
8.0	CL	17	-	11	37	52	32.0 19.2	11.5	1.87	1.0	15.0°
9.0	CL	19	-	12	35	53	32.5 19.5	11.8	1.88	1.5	15.5°
10.5	ML	20	-	33	32	35	28.2 19.7	12.0	1.89	2.0	23.0°
12.0	SM	22	-	67	19	14	N P	12.5	1.89	NH	32.0°
13.5	SM-SP	23	-	91	4	5	N P	12.7	1.90	NH	32.0°
15.0	SM-SP	24	-	93	3	4	N P	13.0	1.93	NH	32.5°

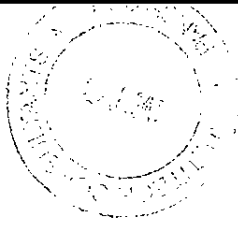
BH-III

Soil Characteristics

3

Depth In Meter	IS Classification	N-Value	Gravel	Sand	Silt	Clay	Atterburg Limit LL PL	Pl %	Water Content	Bulk Density	Cin T/M ²	φ in Degree
0.75	SM	5	--	62	23	15	N	P	10.0	1.78	Nil	31.0°
1.5	SM	9	-	63	22	15	N	P	10.5	1.80	Nil	31.0°
3.0	SM	10	-	64	21	15	N	P	10.8	1.83	Nil	31.2°
4.5	SM	11	-	65	21	14	N	P	11.0	1.84	Nil	31.5°
6.0	SM	14	-	65	20	15	N	P	11.5	1.85	Nil	31.5°
8.0	CL	16	-	12	34	54	31.8	19.0	11.5	1.87	1.5	14.5°
9.0	CL	19	-	11	33	56	32.0	19.2	11.8	1.88	2.0	15.0°
10.5	ML	20	-	34	33	33	28.0	19.5	12.0	1.88	2.5	24.0°
12.0	SM	23	-	67	19	14	N	P	12.2	1.90	Nil	24.5°
13.5	SM	24	-	68	18	14	N	P	12.7	1.93	Nil	31.8°
15.0	SM-SP	26	-	92	3	5	N	P	13.0	1.95	Nil	32.0°

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Soil Characteristics

BH-IV

Depth In Meter	IS Classification	N- Value	Gravel	Sand	Silt	Clay	Aterburg Limit LL PL %	Water Content	Bulk Density	C in T/M ³	Ø in Degree
0.75	SM	6	--	61	24	15	N P	10.2	1.80	NHl	31.2°
1.5	SM	10	-	63	23	14	N P	10.5	1.80	NHl	31.5°
3.0	SM	11	-	64	21	15	N P	10.8	1.82	NHl	31.5°
4.5	SM	12	-	65	21	14	N P	11.0	1.84	NHl	31.8°
6.0	SM	14	-	67	19	14	N P	11.2	1.86	NHl	31.8°
8.0	CL	15	-	11	38	51	32.0 19.5	11.7	1.86	1.0	15.0°
9.0	CL	17	-	12	36	52	32.2 19.7	11.8	1.88	1.5	16.0°
10.5	ML	19	-	32	36	32	28.2 19.7	12.0	1.88	2.0	25.0°
12.0	ML	20	-	33	33	34	28.5 19.8	12.4	1.90	2.5	25.5°
13.5	SM	22	-	69	17	14	N P	12.7	1.90	NHl	32.0°
15.0	SM-SP	24	-	94	3	3	N P	13.0	1.92	NHl	32.0°

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BH-V

Soil Characteristics

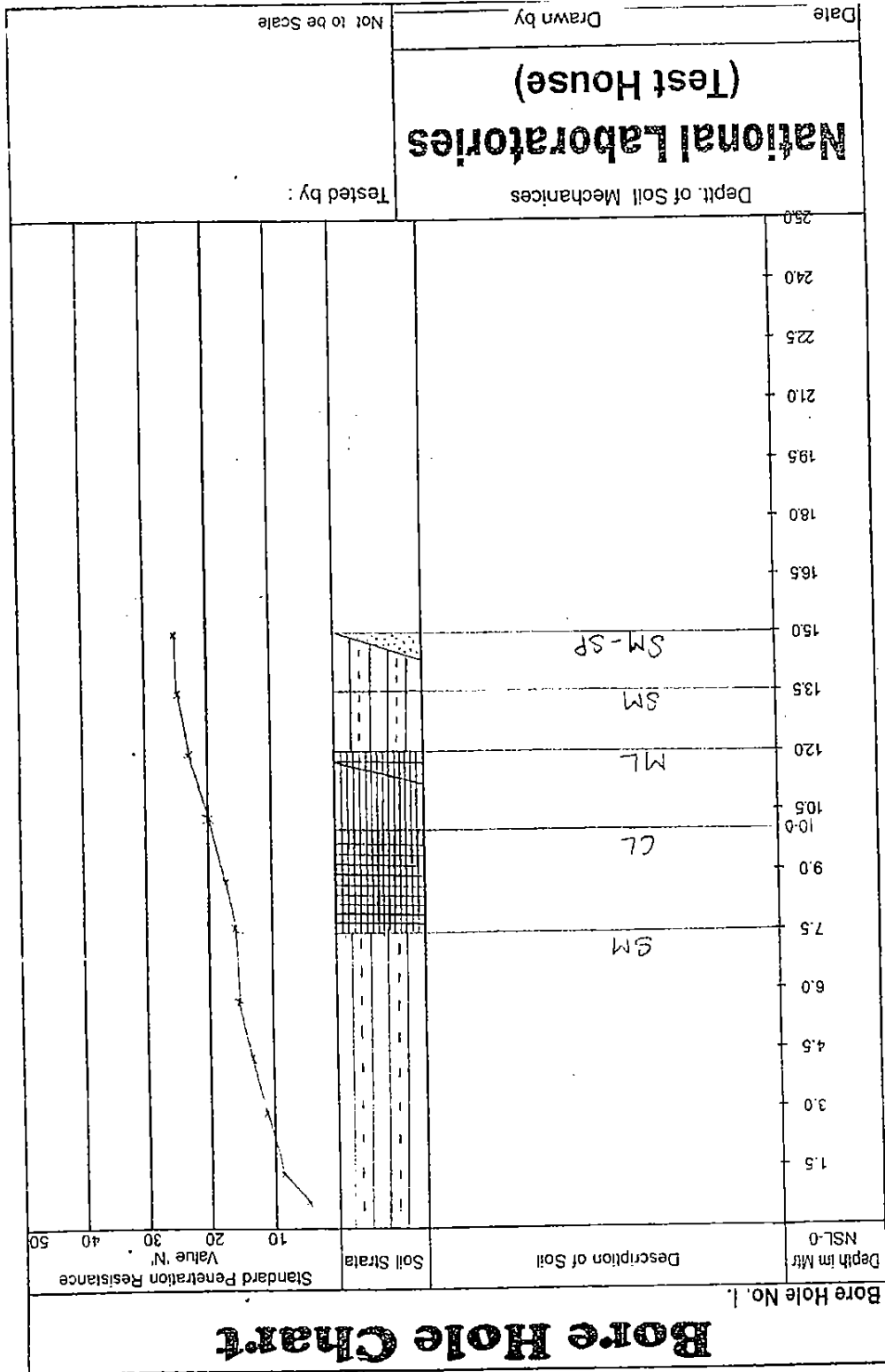
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Depth In Meter	IS Classification	N-Value	Gravel	Sand	Silt	Clay	Atterburg Limit LL PL	PL %	Water Content	Bulk Density	C in T/M ²	φ in Degree
0.75	SM	5	-	62	24	14	N P	P	10.0	1.80	NH	31.0°
1.5	SM	9	-	62	23	15	N P	P	10.2	1.82	NH	31.0°
3.0	SM	10	-	64	21	15	N P	P	10.5	1.83	NH	31.2°
4.5	SM	12	-	65	21	14	N P	P	11.0	1.84	NH	31.5°
6.0	SM	13	-	66	19	15	N P	P	11.2	1.84	NH	31.8
8.0	CL	14	-	12	35	53	31.8 19.0	19.0	11.5	1.86	1.5	15.0°
9.0	CL	16	-	11	34	55	32.0 19.5	19.5	11.8	1.87	2.0	15.5°
10.5	ML	18	-	32	34	34	28.2 19.7	19.7	12.0	1.88	2.0	23.0°
12.0	SM	20	-	67	19	14	N P	P	12.5	1.90	NH	24.0°
13.5	SM	22	-	68	18	14	N P	P	12.7	1.92	NH	32.0°
15.0	SM-SP	25	-	91	4	5	N P	P	13.0	1.95	NH	32.5°

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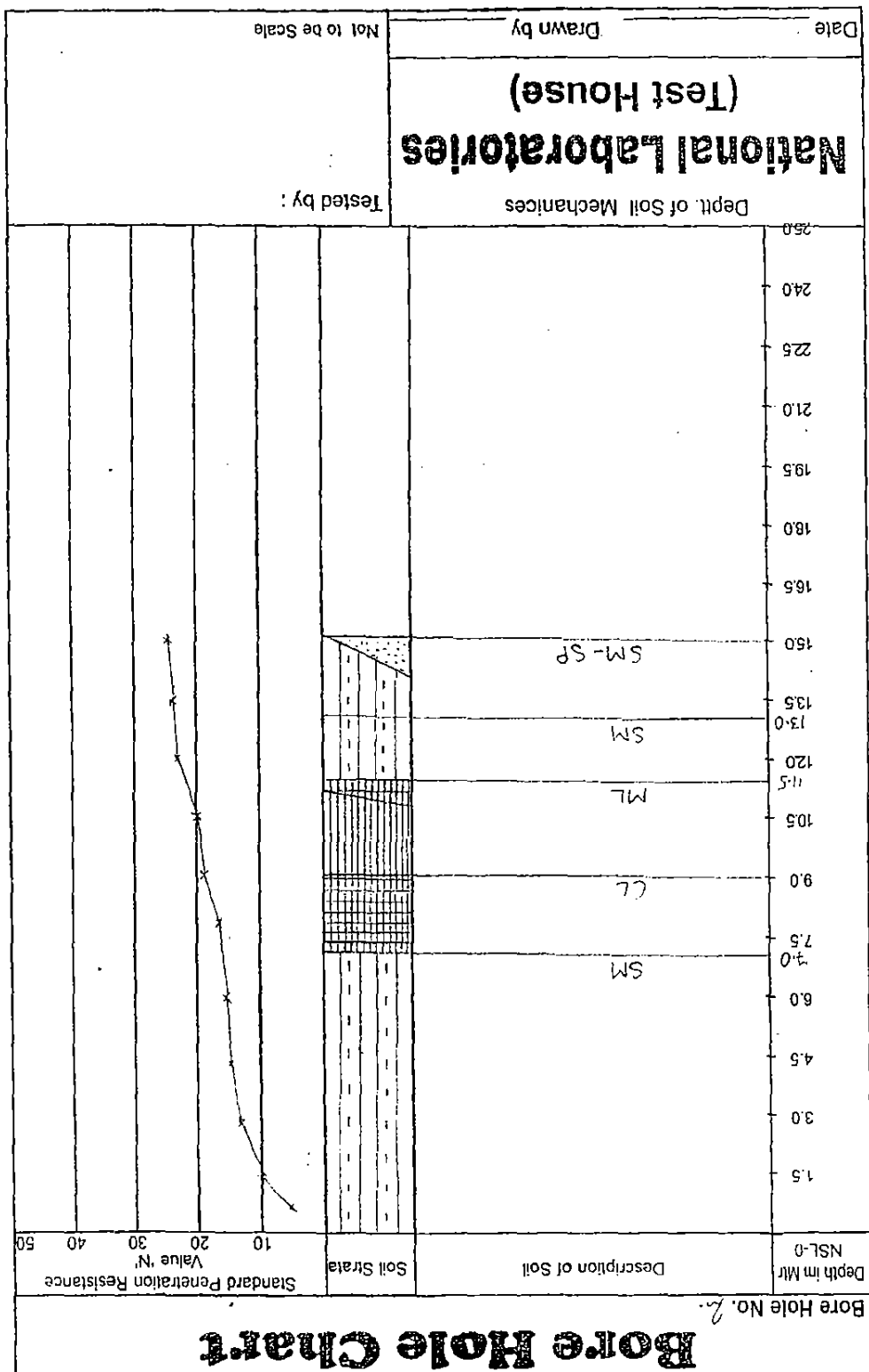


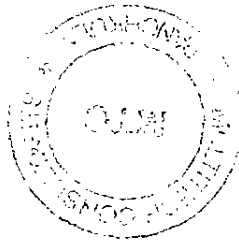
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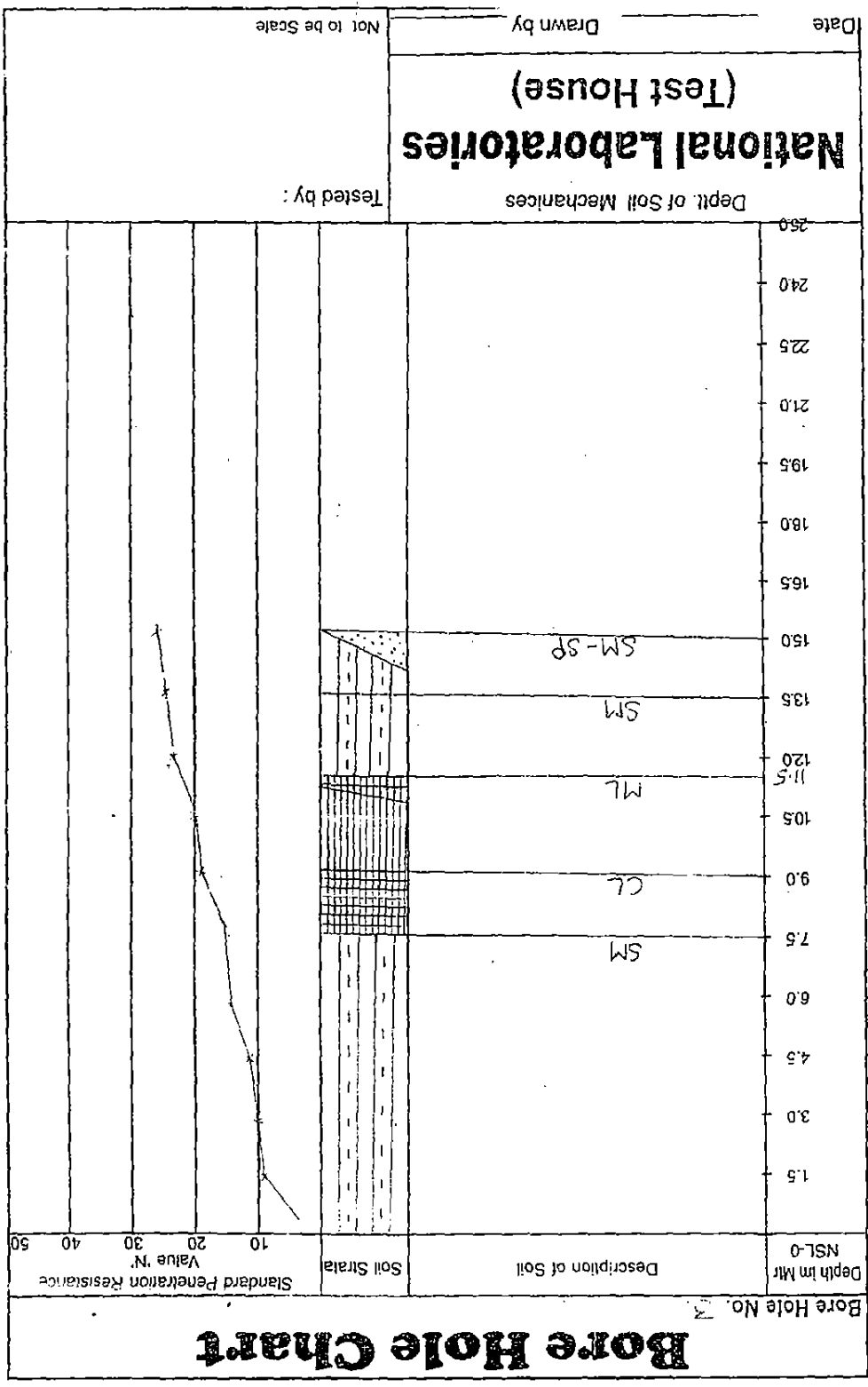


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Bore Hole Chart

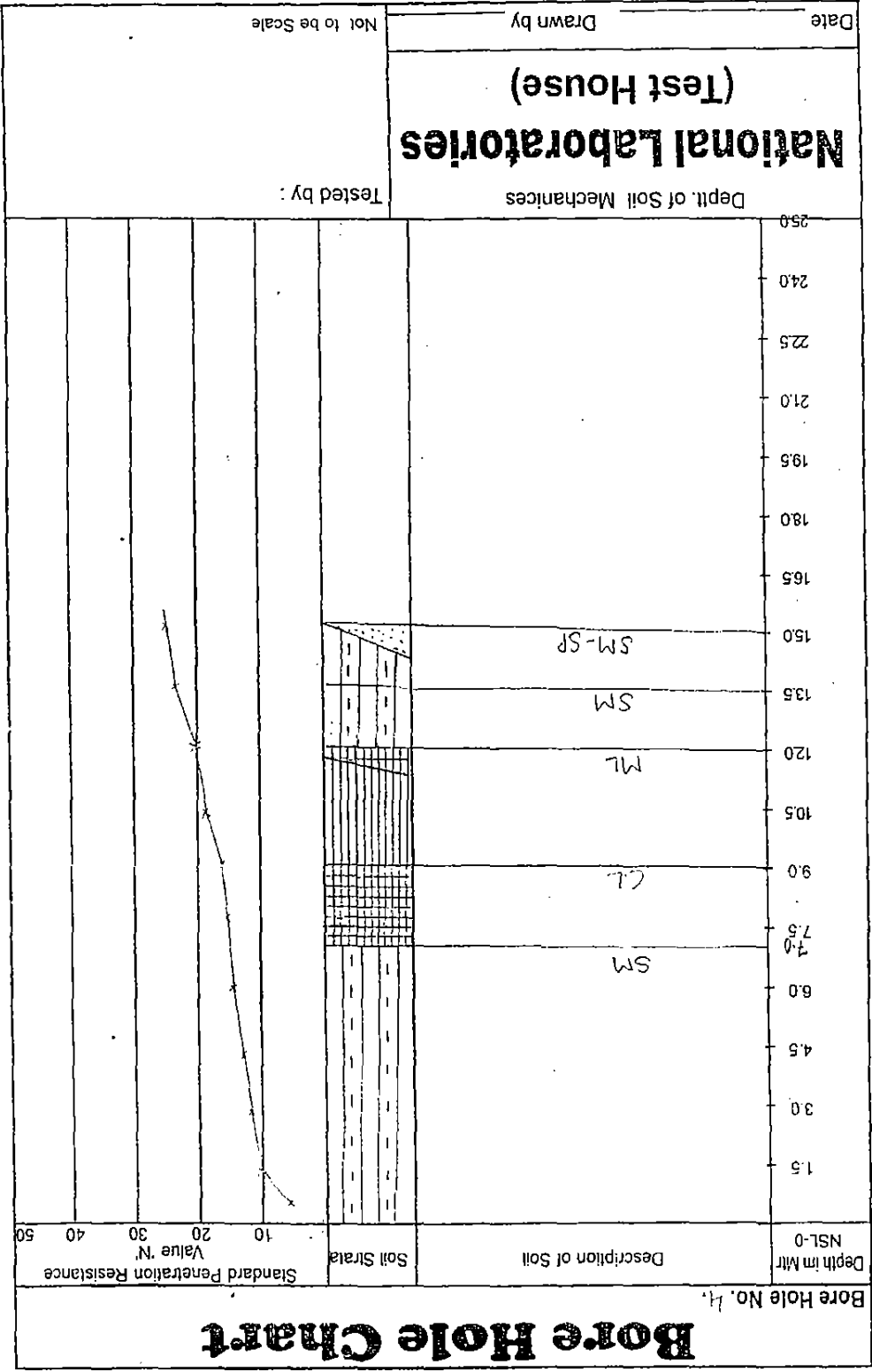
Bore Hole No. 4.

Depth in Mtr NSL-0	Description of Soil	Soil Strata	Standard Penetration Resistance Value 'N'						
			10	20	30	40	50		
1.5									
3.0									
4.5									
6.0									
7.0	SM								
7.5									
9.0	CL								
10.5									
12.0	ML								
13.5	SM								
15.0	SM-SP								
16.5									
18.0									
19.5									
21.0									
22.5									
24.0									
25.0									

Deptt. of Soil Mechanics National Laboratories (Test House)	Tested by : _____
Date _____ Drawn by _____	Not to be Scale

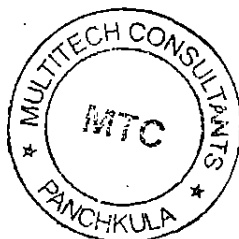


S



“Notations”

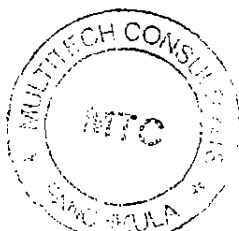
N	:	Observed SPT Value
N _n	:	Normalized SPT Value
Y	:	Bulk unit weight
ȳ	:	Submerged unit weight
Y _d	:	Dry unit weight
Y _{sat}	:	Saturated Unit weight
G	:	Specific gravity of soil
W _l	:	Liquid limit
W _p	:	Plastic limit
L _p	:	Plasticity index
Q _u	:	Unconfined compressive strength
C _u	:	Undrained shear strength
C	:	Effective cohesion parameter
Ø	:	Effective angle of shearing resistance
Ø _m	:	Mobilized angle of shearing resistance
NØ	:	Flow value ($\tan^2 \psi + \sqrt{\phi/2}$)
GSF	:	General shear failure
LSF	:	Local shear failure.
C _c	:	Compression index
B	:	Width of foundation
L	:	Length of foundation
D	:	Depth of foundation
q	:	Effective surcharge
N _y , N _q & N _c	:	Bearing capacity factors
S _y , S _q & S _c	:	Shape factors
d _y , d _q & d _c	:	Depth factors
SSWL	:	Sub soil water level
W	:	W.T. Correction factor
H	:	Thickness of clayey layer
σ _o	:	Original effective overburden pressure.
σ	:	Vertical stress increment .
e _o	:	Original void ratio
W	:	Water content
H _t	:	Thickness of sandy layer
B _t	:	Top width of sandy layer
	:	Stress increment at the top of a sandy layer
D _f	:	Depth factor



M

----- 2 -----

L _{yf}	:	Lateral yield factor
R _f	:	Rigidity factor
q _{nf}	:	Net ultimate bearing capacity
q _{ns}	:	Net safe bearing capacity against shear failure
q _n	:	Allowable bearing capacity
S _o	:	Settlement due to a net foundation loading intensity (1 Kg/cm ²)
S _{oh}	:	Settlement due to net unit foundation loading intensity under submerged conditions (1 Kg/cm ²)
WT	:	Water table
S _t	:	Total Settlement
S _a	:	Maximum allowable settlement
G _w	:	Well graded gravels
G _P	:	Poorly graded gravels .
G _M	:	Silty gravels
G _C	:	Clayey gravels
S _W	:	Well graded gravels
S _P	:	Poorly graded Gravels
S _M	:	Silty sands
S _C	:	Clayey sands
M _L	:	Silt of low compressibility
C _L	:	Clay of low plasticity
M _I	:	Silt of medium compressibility
C _I	:	Clay of medium plasticity
M _H	:	Silt of high compressibility
C _H	:	Clay of high plasticity
M(NP)	:	Non plastic silt
M _L -C _L	:	Mixture of M _L and C _L



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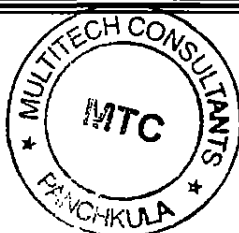
DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH.

VOLUME - II

(COMPRISING PARTS - 1, 2 & 3)

SPECIFICATIONS & APPROVED MAKES

**EXECUTIVE ENGINEER,
MUNICIPAL CORPORATION PUBLIC HEALTH
DIVISION NO. 1, CHANDIGARH**



R

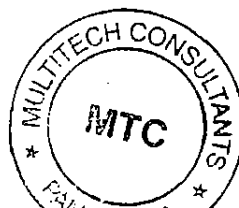


DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH.

VOLUME - II

TECHNICAL SPECIFICATIONS FOR CIVIL WORKS

**EXECUTIVE ENGINEER,
MUNICIPAL CORPORATION PUBLIC HEALTH
DIVISION NO. 1, CHANDIGARH**



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SUB SECTION – 6.1

GENERAL SPECIFICATIONS OF CIVIL & STRUCTURAL WORKS

1.0 General

All the works pertaining to Earthwork, Plain Cement Concrete, Reinforced Cement Concrete, Brick Masonry & Plastering shall be carried out strictly as per CPWD Specifications, latest relevant ISI Codes, Manual of Sewerage & Sewage Treatment & Manual of Water Supply & Treatment Published by Central Public Health & Environmental Engineering Organization (CPHEEO), all of latest editions and specifications contained in the tender document & also those based on good engineering practices. In case of any doubt / clarification, the decision of Engineer – in – Charge shall be final.

- 1.1 All surplus soil/earth shall be transported and disposed off as directed by the Engineer-in-charge. In case the excavated material falls short of requirement, the backfill soil/earth shall be taken from borrow pits approved by the Engineer in charge. The rates quoted by the contractor shall be deemed to be inclusive of all such works
- 1.2 A permanent baseline, cross lines & bench marks shall be established to serve as reference.
- 1.3 All excavated materials obtained from excavation shall be Departments property.
- 1.4 The cement used shall be ISI marked O.P.C. – 43 grades conforming to IS 8112.
- 1.5 The reinforcement / steel shall be TMT high strength deformed steel bars Fe-500 ISI marked (IS 1786).

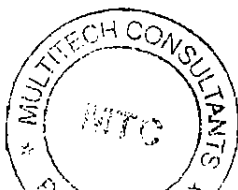
Wherever, reference to various ISI codes has been made in the technical specifications, it shall mean the latest edition of the relevant code.

2. Piping

2.1 General

The specifications given under this clause shall cover guide lines for providing all types of pipes for water supply, sewerage, rising mains, plumbing, interconnecting pipes in water, wastewater treatment units etc.

The diameters and types of pipes shall be as described in the approved drawings. The pipes shall include all types of pipes. All the materials shall be as per relevant Indian Standards. The specials and fittings like SV, FH etc. shall be installed in locations as per approved drawings or as directed by Engineer-in-charge.



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The work includes supply of all types of pipes at the site of work, road cutting and remaking, excavation of trenches in all types of soil, lowering of pipes into the trenches, concrete bedding where specified, aligning to line and grade, jointing, testing, back filling of trenches to meet the requirements of Indian Standards codes of practices in a best workmanlike manner.

The CPWD Specifications / IS Codes should be followed for work of pipe laying.

2.2 Puddle Collars

CI D/F Puddle Collars shall be provided wherever CI / DI pipe has to pass through RCC work. Puddle Collars shall be provided of sufficient length and puddle height.

The quality and thickness of puddle collar shall be equivalent to CI DF specials (as per IS: 1538)

2.3 HDPE pipes

2.3.1 Jointing

The HDPE pipes shall be jointed properly with HDPE socketted specials to get smooth inner side surface without any extrusion to avoid any obstruction to flow of wastewater. If in any particular case butt welding has to be done, smooth inner surface of pipe without intrusion inside shall be ensured.

2.4 Glazed Stone Ware Pipes

The drain pipes and filtrate pipes shall be of GSW. The GSW pipes to be provided should be ISI marked as per IS 651. They should be laid to proper gradient and as per CPWD specification as approved by Engineer in Charge.

2.5 RCC Pipes

The RCC pipes to be provided shall be NP-3 S&S ISI marked with rubber rings as ISI 458 (Latest edition) and these shall be laid to proper gradient and as per CPWD specification as approved by Engineer in Charge.

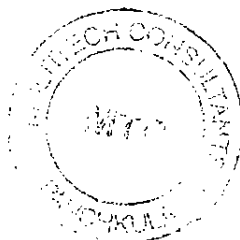
2.6 Pipes and Specials

2.6.1 DI S&S Pipes:

All DI pipes / fittings used for different units as described in the scope of work shall be Class K-9 as per IS 8329 and IS 9523 with up to date amendments. The pipes shall be cement mortar lined on inner face suitable for sewage and painted with bituminous paint on outer surface.

2.6.2 DI Double Flanged Pipes:

The DI welded D/F pipes shall be conforming to IS 8329 with up to date amendments Class K-9 barrel. The pipes shall be cement mortar lined on inner face



suitable for sewage and painted with bituminous paint on outer surface. The flange rating shall be PN 1.6 with working pressure of 10 kg/m².

2.6.3 CI Double Flanged Pipes:

The pipes shall be Double flanged horizontally cast iron pressure pipes ISI marked as per IS 7181 – latest edition Class B in standard length of 2.75 m.

2.6.4 CI Specials:

Cast iron standard socketted and / or flanged fittings shall be ISI marked as per IS 1538 – latest edition suitable for CI / DI pressure pipes. The metal used for manufacturing shall be of a quality not less than specified for grade 15 of IS 210.

2.7 VALVES

2.7.1 Sluice Valves

DI D/F Sluice valves / Gate Valves (soft seated) Resilient seated sealing gate valves (Sluice valves) with body bonnet of ductile cast iron of grade GGG 40/SG 400/12 or equivalent grade as per IS 3896 Part 2 – 1985 and subsequent revisions, wedge fully rubber lined with EPDM food grade quality and seals of NBR and the valves should be of vacuum tight and 100% leak proof with to face dimension as per BS5163-89/IS 14846-2000/DIN-2302 F4. All the valves should be with Electrostatic power coating both inside and outside pocket less body passage Drilled as per IS: 1538.

Material of Construction : (DN50 to DN 400) PN 10/16

Body	Ductile Iron to EN – JS 1030 (GGG-40)
Wedge	Ductile Iron to EN-JS 1030 (GGG-40), Fully vulcanized with EPDM Rubber.
Stem	Stainless steel with 13% chromium (1.4021)
Bonnet Gasket	EPDM Rubeer
Stem Sealing	3 'O' – Ring of NBR.
Surface Protection	Electro static epoxy powder coating min 250 microns thickness, color RAL 5005 Blue

These valves should be guarantee during defect liability period and full operation & maintenance period & in case of any damage, replacement would be given free of cost.



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Material of Construction: (DN450 to DN 600) PN 10,16 & 25

Body	Ductile Cast Iron of grade GGG-40/SG400/12
Wedge	Fully rubber lined with EPDM food grade quality
Stem Sealing	Stem seals of NBR and vacuum tight
Surface Protection	Electrostatic powder coating both inside and outside with 250 microns

These valves should be guarantee during defect liability period and full operation & maintenance period & in case of any damage, replacement would be given free of cost.

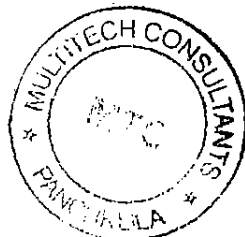
2.7.2 Non Return Valves

Non Return Valves shall be slanted / straight seated with metallic, corrosion proof and water resistant seat faces, body and disc of ductile cast iron GGG 40/SG Iron 420/12 or equivalent grade as per IS 3896 (Part – 2) – 1985 and subsequent revision. All the inside and outside of the body is to be coated with double coating of epoxy liquid. Drilled as per IS 1538 Specifications and dimensions as per IS 5312 or equivalent codes, kirloskar, AVC and AVK Brand be installed on the delivery side of the pumps.

Material of Construction: (DN40 to DN 300) PN 1.6

Body	Ductile Iron to EN – JS 1030 (GGG-40)
Disc	Ductile Iron to EN-JS 1030 (GGG-40), Fully coated with EPDM Rubber.
Cover Screw	Stainless steel (A2)
Plug	Brass
Elastomers	EPDM rubber (Grade W 270)
Surface Protection	Epoxy coating min 250 microns, color RAL 5005 Blue

These valves should be guarantee for a period of 120 months & in case of any damage, replacement would be given free of cost.



Material of Construction: (DN40 to DN 300) PN 1.6

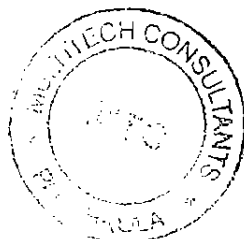
Body	Ductile Iron to EN – JS 1030 (GGG-40)
Disc	Ductile Iron to EN-JS 1030 (GGG-40/ SG Iron 420/12)
Cover Screw	Stainless steel (A2)
Plug	Brass
Elastomers	EPDM rubber (Grade W 270)
Surface Protection	Epoxy coating min 250 microns, color RAL 5005 Blue

These valves should be guarantee for a period of 120 months & in case of any damage, replacement would be given free of cost.

2.7.3 Butterfly Valves

1. Butterfly valve shall be of double eccentric and resilient seated. The valve shall generally conform to face to face dimensions accordingly to BS 5155 long body. The butterfly valves should be compatible for buried installations without the construction of chamber.
2. Material of construction of butterfly valves shall comply with following requirements:

Body	Ductile Iron to EN – JS 1030 (GGG-40)
Disc	Ductile Iron to EN – JS 1030 (GGG-40)
Shaft	Stainless steel with 13% chromium (1.4021)
Shaft Bearing Bushes	Bronze
Body Seat	Integral Nickel Weld Overlay & Micro finished
Disc. Sealing	EPDM Rubber
Internal Fasteners	Stainless Steel SS 316
Surface Protection	Up to DN 600, inside and outside with epoxy powder coating and above DN 600 with epoxy liquid lacquer min. 250 microns thickness, color RAL 5005 Blue.

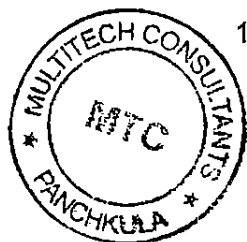


3. Butterfly valves shall be suitable for mounting in any position. The valve shall be free from induced vibrations.
4. Bearing bushes shall be supported with O rings to avoid entering of water from the disc side into the gear box.
5. Gear Box shall be irreversible worm gear, corrosion resistant, protection class of IP 67 with mechanical position indicator, 100% fluid grease filling.
6. The valves seal shall be of replaceable design. When the valve is fully closed, the seal shall seat firmly. The seat surfaces shall be micro finished to provide a long life for seal. All fasteners shall be set flush so as to offer the least resistance possible to the flow through the valves.
7. The shaft shall be stainless steel with self lubricating bearing.
8. All valve spindles and hand wheels shall be positioned to give good access for operational personnel. The valve disc shall have a 90 degree turn.
9. Valves shall be provided with a continuous mechanical position indicator to show the position of the disc, mounted on the drive shaft end.
10. Valves shall be capable of closing against maximum flow that can occur in practice. The breakaway torque under maximum differential head conditions shall be within the manufacture's limit.
11. All hand wheels shall be arranged to turn in a clock wise direction to close the valve.

2.7.4 Air Valves

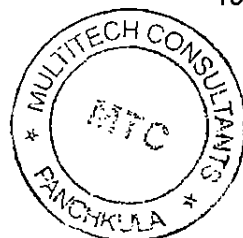
1. Air valves shall be installed at the high points in the systems and at regular intervals along the pipeline. Flange dimensions as per DIN 2501-1 .
2. Material of construction of air valves shall comply with the following requirement.

Body	Ductile Iron to EN – JS 1030 (GGG-40)
Float	Stainless steel (1.4021) : DN 50 Float of Hostafion
Shell	Stainless steel
Gsket & Seal	EPDM Rubber



Screws	Stainless steel (A4)
Surface Protection	Inside and outside with electro static epoxy powder coating min. 250 microns thickness, color RAL 5005 Blue.

3. Air valves shall be of single chamber double orifice type and internals of stainless steel. A buoyant rigid float shall seal the large orifice and the chamber housing shall be designed to avoid premature closing of the valve by the air whilst being discharged. Small orifice shall discharge small air volume during operation under full internal pressures.
4. Both the large and small orifices should be housed in 1 chamber.
5. The valve shall be capable of exhausting air from the pipe automatically when being filled, the air being released at a sufficiently high rate to prevent the restriction of the inflow rate. Similarly the valves shall be capable of ventilating pipe work automatically when being emptied or under water hammer condition, air inflow rate being sufficiently high to prevent development of vacuum in the pipe lines. The valve shall also automatically release air accumulating in pipe work during normal working conditions.
6. The valves shall be designed to prevent premature closure prior to all air having been discharged from the line. The orifice shall be positively sealed in the closed position with the float only raised by the liquid and not by a mixture of air and liquid spray. The sealing shall be so designed to prevent the float sucking after a long period in the closed position.
7. Air valves shall thus to be designed to automatically operated so that they will,
 - a) Positively open under internal pressure less than atmospheric Pressure to admit air in bulk during Pipe line draining operation.
 - b) Exhaust air in bulk and positively close as water, under low head, fills the body of the valves during filling operation.
 - c) Not blow shut under high velocity air discharge.
 - d) Exhaust accumulated air under pressure while the pipe is following full of water.



8. All air valves shall be constructed so that internal working parts which may become necessary for repairs shall be readily accessible.
9. Valves shall have nominal diameters up to DN 200, with working pressure for air valves shall not be less than PN 1.6.
10. The air valve shall be capable of handling air up to sonic velocities (300m/s).

2.7.5 Check Valves (Up to DN 300)

1. Material of construction of check valves shall comply with following requirements:

Body	Ductile Iron to EN – JS 1030 (GGG-40)
Disc	Ductile Iron to EN – JS 1030 (GGG-40), fully coated with EPDM
Cover screws & Nuts	Stainless steel (A2)
Plug	Brass
Elastomers	EPDM Rubber (Grade – W270)
Surface Protection	Epoxy powder coating min. 250 microns thickness, color RAL 5005 Blue.

2. Rubber lined one piece disk with integrated sealing and should be usable from both sides.
3. Bearing should be integrated in the rubber lining. There for there should be no friction.
4. Pre stressed rubber joint to reduce pressure surges.
5. Disk should be replaceable without dismantling the valve.
6. All parts in touch with the fluid to KTW and DVGW code of Practice W270 (no build – up of harmful bacteria).



2.7.6. Check Valve (Above DN 300):

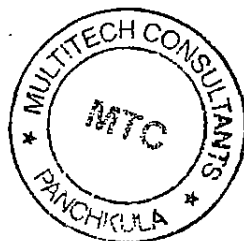
1. Face to face dimensions as per EN 558 – 1/ DIN 3202, F4
2. Material of construction of check valves shall comply with following requirements;

Body	Ductile Iron to EN – JS 1030 (GGG-40)
Disc	Ductile Iron to EN – JS 1030 (GGG-40)
Shaft	Stainless steel with 13% chromium (1.4021)
Seat	Integral Nickel weld overlay, Micro finished
Sealing	EPDM Rubber
Surface Protection	Epoxy liquid lacquer coating min. 150 microns thickness, color RAL 5005 Blue.

3. Non- return valve for drinking, service and sewage water (pre-cleaned and non – plait creating) upto 50^oc.
4. Disk geometry with optimum hydraulic flow pattern to ensure low pressure losses.
5. Wear – resistant, corrosion – resistant and infiltration – proof sealing seat in the body and on the disk.
6. The closing time should be reduced by at least 30% due to the slanted seat.
7. Provision to provide an internal damping unit which is operated by the water medium itself, to improve the water hammer shock absorption.

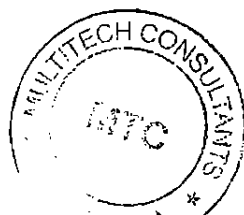
2.7.7 Knife Gate Valves:

1. Face to face dimensions as per EN 558 – 1 Series 20 / DIN 3203-2, K1. Flange connection dimensions to EN 1092 PN 10.
2. Material of Construction of Knife Gate valves shall comply with following requirements:



Body, bearing panel, Thrust Piece	DI to EN – JL 1040 (GG – 25)
Knife	Stainless Steel 1.4301/1.4571
Bracket Seal & Lateral Seal	U Shaped Elastomer (NBR)
Yoke	Steel Sheets
Surface Protection	Inside and outside with epoxy coated with GSK Type "heavy – duty corrosion protection" to DIN 30 677-2, Coating thickness > 250 um, color RAL 5005 Blue.

3. Knife – gate valve can be used as water type valve and end – of – line valve without counter – flange at full operating pressure.
4. Full flanged design; body screws locate outside the raised face of the flange.
5. Unrestricted passage through with purging spaces.
6. Resilient – seated knife guided in chambered U – shaped bracket seal, with enlarged bottom seal to ensure perfect tightness in all modes of operation.
7. Integrated scrapers on both sides to keep the knife permanently clean.
8. Additional safety in case of unilateral pressure overload by way of a metallic stop of the Knife.
9. Profiled lateral seal with integrated PTFE guiding rods to reduce operation forces; can be readjusted and replaced without dismantling the valve from the pipeline.
10. Solid and compact body design with retaining plates to protect the stem against Atmospheric influences.
11. Rolled stem thread; non-rising and should be tight in both directions.
12. Additional safety in case of unilateral pressure overloaded by way of a metallic stop of the knife.



2.8 Reference Codes

The pipes and specials shall conform to the Indian Standard Specifications (latest issue/revision). Commonly used IS codes are listed below:

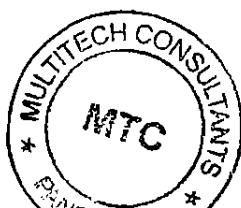
- I.S. 458 Concrete pipes with or without reinforcement
- I.S. 651 Salt glazed stone ware pipes and fittings
- I.S. 784 Pre stressed concrete pipes
- I.S. 1239 Mild steel tubes, tubular and other wrought steel fittings (parts I and II)
- I.S. 1536 Centrifugally cast (spun) iron pressure pipes for gas, water and sewage
- I.S. 1537 Vertically cast iron pressure pipes for water gas and sewage
- I.S. 7181 Horizontally cast Double Flange Pipes
- I.S. 1538 Cast iron fittings for pressure pipes for water, gas and sewage
- I.S. 1592 Asbestos cement pressure pipes
- I.S. 2685 Code of practice for selection, installation and maintenance of sluice valves.
- I.S. 3006 Chemical resistant salt glazed stone ware pipes and fittings
- I.S. 3076 Low density polyethylene pipes for potable water supply
- I.S. 4984 High density polyethylene pipes for potable water supply
- I.S. 4985 Unplasticised PVC pipes for potable water supplies
- I.S. 8329 Centrifugally cast (spun) Ductile Iron Pressure pipes for water, gas and sewerage – specifications
- I.S. 9523 Ductile Iron fittings for pressure pipes for water, gas and sewerage – specifications
- I.S. 14333 High Density Polyethylene pipes for Sewerage – specifications
- I.S. 13592 Specification for UPVC pipes for soil and waste discharge systems inside buildings including ventilation and rainwater system
- I.S. 14735 Unplasticised Polyvinyl Chloride (UPVC) Injection Moulded Fittings for Soil and Waste Discharge System for Inside and Outside Buildings Including Ventilation and Rain Water System Specification
- I.S. 14846 Sluice valve for water works purposes (50 t 1200mm size) – specification.

2.9 Construction

2.9.1 Transportation of pipes

The transportation of pipes to the site of works has to be done in such a way that pipes are not damaged while handling.

Light pipes and pipes of smaller diameter shall be handled manually. Heavy pipes shall be loaded and unloaded using lifting tackles like chain pulley blocks and shear



legs. The pipes shall be protected against impact, shocks etc. Pipes shall not be allowed to fall freely on to the ground and hard surfaces so as to cause cracks in pipes.

Transportation of pipes and stacking by the side of the trenches shall also be done in such a way that it causes minimum inconvenience to the traffic.

Lowering of the pipes into the trenches shall be done equally carefully so that the pipes are not damaged and also the trenches and bedding for pipes are not disturbed and damaged. Smaller and lighter pipes can be lowered using rope slings and shall not be dropped on to the trench bottom.

2.9.2 Transfer of levels to trench bottom

Permanent bench marks shall be established at convenient and frequent intervals all along the pipe alignment for carrying the levels to the place of laying of the pipes. The levels shall be transferred by using boning rods and sight rails. The lowering of pipes shall not be commenced until the Engineer has checked levels and permits the lowering of pipes.

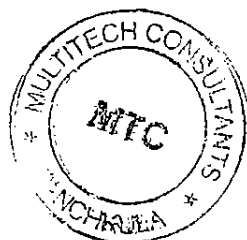
Heavy pipes shall be lowered into the trenches by means of shear legs, chain pulley blocks and tackle. Care shall be taken while lowering the pipe into the trench. Each pipe which is laid in the trench is examined for damage. Cracked, broken or damaged pipes shall not be allowed to be used in the works.

2.9.3 Cleaning of pipes

The pipes shall be checked for absence of cracks and damaged parts of pipe ends. The pipes shall also be cleaned to remove all dirt and soil and other foreign materials before lowering into the trenches. After jointing it shall be ensured that the extra jointing materials are removed. It shall also be ensured that no foreign material enters the pipes after they are laid by covering the pipe ends suitably.

The specified jointing materials shall be used and methods of jointing the pipes of different materials shall be followed as per relevant IS specifications/directions of the Engineer-in-charge. For flanged joints necessary gaskets/packing material, bolts and nuts shall be provided without any extra cost. The gaskets/packing materials shall be of full diameter and of approved quality.

The bedding of the pipes where specified shall be as detailed in the approved drawings/ direction of the Engineer-in-charge. The locations of the bedding, the thickness of the bedding, the width of the bedding, material specifications and proportion of mix shall all be as indicated in the approved drawings/ direction of the Engineer-in-charge.



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For laying and jointing of pipes the following codes of practices (latest edition) shall be followed unless otherwise stated.

- I.S. 783 Code of practice for laying concrete pipes
- I.S 2685 Code of practice for selection, installation and maintenance of sluice valves
- I.S. 3114 Code of practice for laying cast of iron pipes
- I.S. 4111 Code of practice for ancillary structures in sewerage system-manholes etc (part I to IV)
- I.S. 4127 Code of practice for laying of glazed stone ware pipes
- I.S. 5822 Code of practice for laying of welded steel pipes for water supplies
- I.S. 6530 Code of practice for laying asbestos cement pressure pipes
- I.S. 7634 Code of practice for plastic pipe work for potable water supplies(part I to III)
- I.S. 12288 Code of practice for use and laying of Ductile Iron Pipes

2.9.4 Manholes

The manholes on the gravity sewers shall be provided at appropriate locations. Normally they are located at the junctions of sewers, where the diameters of pipes, direction of pipes, grades of pipes change and also on straight lengths at specified intervals to facilitate cleaning operations. The sizes of the manholes depend upon the diameters of pipes, depths of pipes, number of junctions etc. A drawing showing all the above details shall be approved by the Engineer-in-charge before execution of the work.

The material specifications viz., brick masonry or concrete, the proportion of the concrete, mortar for masonry and plastering shall be as indicated in the approved drawings of manholes. The dimensions and thicknesses of masonry, concrete, plaster etc., shall be as specified in the drawings to be got approved by bidder for manhole chambers as well as access shafts in case of deep man holes.

RCC manhole covers of specified weight and thicknesses and type as specified in the approved drawing for manholes, shall be provided and fixed as directed by the Engineer-in-charge and as per relevant Indian Standards.

2.9.5 Thrust blocks

In case of rising mains/pressure pipes, at changes of directions of pipes thrust blocks to resist unbalanced forces shall be provided. The dimensions, material specifications shall be as approved by Engineer-in-charge / I.S specifications.



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2.9.6 Valve chambers

Chambers/masonry pits to protect the valves or other special fittings on the pipe lines shall be constructed as per site requirements. The dimensions and material specifications, covers shall be as approved by EIC.

2.9.7 Back Filling

Back filling of the trenches shall not be commenced till the pipes are tested for I.S. specified hydraulic pressure and till approval for filling of the trenches is given by the Engineer. Back filling of the trenches shall be done with approved back fill material free from boulders, sharp objects, rubbish. The filling shall be carried out in layers not more than 150 mm thick. The filled up material shall be well watered and consolidated, taking proper care to see that the pipes are not disturbed.

2.10 Hydraulic Testing of Pipes

Each section of the pipe shall be tested for water tightness of the pipe line as per I.S. Specification. Any sewer or part thereof that does not meet the above requirements shall be emptied and repaired, or re-laid as required and tested again.

2.11 Air Testing/Smoke Testing

The contractor shall be bound to follow the instructions of the Engineer regarding the test procedure, test pressures, lengths of sections for testing etc.. The tests shall be carried out only in the presence of the Engineer.

3. Joints

Movement joints such as expansion joints, complete contraction joints, partial contraction joints and sliding joints shall be designed to suit the structure. However, contraction joints shall be provided at specified locations spaced not more than 7.5 m in both right angle directions for walls and rafts. Expansion joints of suitable gap at intervals not more than 30 m shall be provided in walls, floors and roof slabs of water retaining structures. Construction joints shall be provided at right angles to the general direction of the member. The locations of construction joints shall be decided on convenience of construction. To avoid segregation of concrete in walls, horizontal construction joints are normally to be provided at every 2 m height. PVC water stops of suitable type and 230 mm width, shall be used for walls and base slabs.

Joints are to be provided in the structures as per approved drawing / I.S specification. The item of providing expansion joints and construction joints in



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concrete includes all the labour, tools and plants necessary for completing the item in best workman like manner. Either RCC key joints or PVC water bar joints shall be provided as per directions of Engineer-in-charge.

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

Construction joints will be as shown on the drawing or as approved by the Employer. Concrete shall be placed without interruption until completion of work between construction joints. If stopping of concreting becomes unavoidable anywhere, a properly formed construction joint shall be made with the approval of the Employer.

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

As soon as the exposed concrete has sufficiently hardened, the surface of the joint shall be water jetted or brushed with a stiff brush to expose the larger aggregate without being disturbed. Alternatively, if the preparation is not satisfactory, or proper joint preparation is not possible due to inclement weather, the Contractor shall thoroughly remove the laitance of hardened concrete by mechanical chipping after seven days of concrete work at his own cost. Before placing fresh concrete against a construction joint all loose material shall be removed and the surface sluiced with water until it is perfectly clean, thereafter all ponded water should be removed. When concreting is to be resumed on a surface which has not fully hardened, all laitance shall be removed by wire brushing, the surface wetted, free water removed and a coat of cement slurry applied. On this, a layer of concrete not exceeding 150 mm thickness shall be placed and well rammed against the old work. Thereafter work shall proceed in the normal way



4. Floor Finishes and Allied Works

4.0 General

This specification covers furnishing, installation, finishing, curing, testing, protection, maintenance till handing over, various types of floor finishes and allied items of work.

4.1 Base

The base to receive the finish is covered under other relevant specifications.

4.2 Installation

4.2.1 Special Materials

In general, all materials shall be as per CPWD specification or relevant IS Codes. In all cases these materials shall be of the best quality available indigenously unless specified otherwise.

The materials for finishing items must be procured from well-reputed specialised manufacturers and on the basis of approval of samples by Engineer-in-charge. The materials shall be as per the following:

White cement shall be white Portland cement in accordance with IS:8042 (Latest edition).

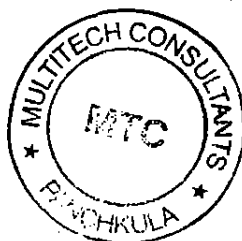
Sand shall be coarse screened, washed sand, free of organic materials, in accordance with IS: 2116 (latest edition).

Colour pigments, as selected shall be pure mineral pigments, lime proof and non-fading.

4.3 Preparation of the Base Surface

The surface to be treated shall be thoroughly examined by the Contractor. Any rectification necessary shall be brought to the notice of the Engineer-in-charge and his approval shall be taken regarding method and extent of such rectification work.

For all type of flooring, skirting, dado and similar location, the base to receive the finish shall be adequately roughened by chipping, raking out joints and cleaning thoroughly all dirt, grease etc with water and hard brush and detergent if required, unless otherwise directed by the manufacturer of any special finishing materials, or specifically indicated in this Specification under individual items.



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To prevent absorption of water from the finishing treatment the base shall be thoroughly soaked with water and all excess water mopped up.

The surface shall be done dry where adhesives are used for fixing the finishes.

Prior to commencement of actual finishing work the approval of the Engineer-in-charge shall be taken as to the acceptability of the surface.

4.4 Vitrified Tile (Double changed) Finish

This finish shall be composed of vitrified tiles with an under bed laid over a concrete or masonry base.

4.4.1 Tile: Ceramic

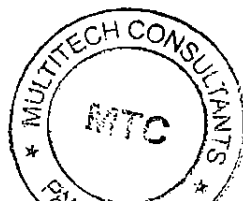
The tiles shall be of earthenware, covered with glaze, white or coloured, plain or with designs, or sizes as indicated on approved drawings and directed by Engineer-in-Charge and 5 mm thick unless otherwise specified. The tolerance shall be + or - 1.5 mm for length and breadth and + or -0.5 mm for thickness. Specials like internal and external angles, beads, covers, cornices, corner pieces etc. shall match. The top surface of the tiles shall be glazed with a gloss or matt unfading stable finish as desired by the Engineer-in-Charge. The tiles shall be strong, fine grained in texture, dense and homogeneous and free from faults such as cracks, chips, crazing, specks, crawling etc. and other imperfections. The edges and the undersides of the tiles shall be completely free from glaze and the undersides shall have ribs or indentations for better anchorage with the fixing mortar. The coloured tiles, when supplied shall preferably come from one batch to avoid difference in colour.

4.4.2 Mix : Under-bed

The mix for the under-bed shall consist of 1 part cement and 3 parts coarse sand by weight mixed with sufficient water or any other mix, if specified.

4.4.3 Laying

The under-bed mortar shall be evenly spread and brought to proper grade and consolidated to a smooth surface. The surface shall be roughened for better bond. Before the under bed has time to set and while it is still fairly moist but firm, cement shall be hand dusted over it or a cement slurry applied and the tiles shall immediately be placed upon and firmly pressed by wooden mallet on to the under-bed until it achieve the desired level. The tiles shall be kept soaked for about 10 minutes just before laying. The joints in tiles shall be as closed as possible and not more than 1.5 mm wide.



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Special care shall be taken to check the level of the surface and the lines of the joints frequently so that they are perfect. When tiles are required to be cut to match the dimensions these shall be sawn and edges rubbed smooth.

At the junction of horizontal surface with vertical surface the tiles or the former shall enter at least 12 mm under the latter. After fixing, the floor shall be kept moist and allowed to mature undisturbed for 7 days. Heavy traffic shall not be allowed for a further period of 14 days.

4.4.4 Finishing

The joints shall be cleaned and flush pointed with white cement or cement mixed with pigment for coloured tiles and cured for 7 days by keeping in wet. The surface shall be cleaned with soap or suitable detergent, washed fully and wiped with soft cloth to prevent scratching before handing over.

4.5 Stone Slab Finish: Marble Flooring.

This shall include natural stone slabs of regular shape and dimensions and capable of taking a good polish and under-bed over a concrete or masonry surface.

4.5.1 Thickness

The total thickness of the floor shall be as given in the approved drawing including the under bed.

4.5.2 Stone Slab

The stone slab shall be hard, sound, homogeneous, dense and white in texture and free from flaws. Angles and edges shall be true, squatter, free from chipping and surface shall be plane. The slabs shall be machine cut to the required dimensions. Tolerance of + or -5 mm in dimensions and + or -2 mm in thickness will be allowed. Unless otherwise specified the slabs shall not be smaller than 450 mm X 450 mm.

Stone slabs will come from specific regions and in specified quality with top surface fine chisel dressed. All sides shall also be fine chisel dressed to the full depth to allow for the finest possible joints.

Stone slabs shall be delivered to the site well protected against damage and stored in a dry place under cover.



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4.5.3 Mix : Under-bed

The mix for the under-bed shall consist of 1 part cement and 3 parts coarse sand by weight mixed with sufficient water or any other mixed as specified.

4.5.4 Laying

The sides and top surface of the slabs shall be machine polished and washed clean before laying.

The under bed mortar shall be evenly spread and brought to proper grade and consolidated to a smooth surface. The surface shall be roughened for better bond. Before the under-bed has time to set and while it is still fairly moist but firm, cement shall be hand dusted over it or a cement slurry applied and the slab shall immediately be placed upon and firmly pressed by wooden mallet on to the under bed until it achieve the desired level. The slab shall be kept soaked for about 10 minutes just before laying. The joints in slab shall be as closed as possible and not more than 1.5 mm wide.

Special care shall be taken to check the level of the surface and the lines of the joints frequently so that they are perfect. When slab are required to be cut to match the dimensions these shall be sawn and edges rubbed smooth.

After fixing the floor shall be kept moist and allowed to mature undisturbed for 7 days. Heavy traffic shall not be allowed for a further period of 14 days.

4.5 Ironite Flooring (IPS Flooring) :

12 mm IPS (metallic hardener) over 50 mm PCC M-25 concrete shall be provided. The sub base shall consist of 100 mm thick PCC 1:4:8.

1:4:8 (1 cement, 4 sand, 8 stone aggregate 40 mm nominal size) laid over 100 mm well compacted sand layer. The floor should be casted in panels not more than 900 mm x 900 mm. Aluminium strips 3 mm thick should be provided at the junction of two panels.



5. Painting, Whitewashing and Allied Works

5.0 General

This specification covers painting, white washing, distempering, wall finishing etc. of both interior surfaces of masonry, concrete, plaster, structural and other miscellaneous steel items, floor and roof drains, waste and service water pipes, and other ferrous and non-ferrous metal items as shown on approved drawings or as directed by the Engineer-in-Charge.

If surface to be finished cannot be put in suitable condition for painting by customary preparatory methods, the contractor shall notify the Engineer-in-Charge in writing or assume responsibility for and rectify any unsatisfactory finishing that results.

5.1 Materials

Materials shall be highest grade products of well known approved manufacturer and shall be delivered to the site in original sealed containers, bearing brand name, manufacturer's name, and colour shade, with labels intact and seal unbroken. All materials shall be subject to inspection & approval by the Engineer-in-Charge. It is desired that the materials of one manufacturer only shall be used as far as possible and paint of particular shade be obtained from the single batch. All paints shall be subjected to analysis from random samples taken at site from painter's bucket, if so desired by the Engineer-in-Charge.

All prime coats shall be compatible to the material of the surface to be finished as well as to the finishing coats to be applied.

All unspecified materials such as shellac, turpentine or linseed oil shall be of the highest quality available and shall conform to the latest I.E. Standards. All such materials shall be made by reputable recognized manufacturers and shall be approved by the Engineer-in-Charge.

All colours shall be as per painting/finish schedule and tinting and matching shall be done to the satisfaction of the Engineer-in-Charge. In such cases, where samples are required, they shall be executed in advance with the specified materials for the approval of the Engineer-in-Charge.



5.2 Storage

The contractor shall arrange for safe and proper storage of all materials and tools. Paints shall be kept covered at all times and mixing shall be done in suitable containers. All necessary precautions shall be taken by the Contractor against fire hazards.

5.3 Preparation of Surface

Before starting the work the Contractor shall obtain the approval of the Engineer-in-Charge regarding the soundness of the surface to be painted on.

5.3.1 Masonry, Concrete and Plastered Surface

Surface shall be free from all oil, grease, efflorescence, mildew, loose paint or other foreign and loose materials. Masonry cracks shall be cleared out and patch filled with mortar similar to the original surface and uniformly textured. Where this type of resurfacing may lead to the finishing paint being different in shade from the original surfaces, the resurfaced area shall be treated with minimum one coat of cement primer which shall be continued to the surrounding area for a distance of minimum 100 mm.

Surface with mildew and efflorescence shall be treated as below:

i. Mildew

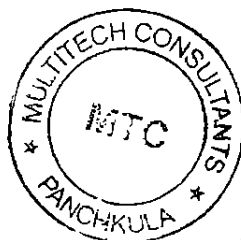
All mildewed surfaces shall be treated with an approved fungicide such as ammonia wash consisting of 7g. of copper carbonate dissolved in 80 ml liquid ammonia and diluted to 1 litre with water, or 2.5 per cent magnesium silicon fluoride solution and allowed to dry thoroughly before paint is applied.

ii. Efflorescence

All efflorescence shall be removed from affected surfaces with a solution of muric acid in water (1:6 to 1:8), washed fully with clear water and allowed to dry thoroughly.

5.3.2 Metal

All metal surfaces shall be absolutely clean, dry and free from wax, grease and soap films. All steel and iron surfaces in addition shall be free from rust. All galvanized iron surfaces shall be pre-treated with a compatible primer according to the manufacturer's direction. Any abrasion in shop coat shall be touched up with the same quality of paint as the original coat.



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5.4 Application

5.4.1 General

The method of application shall be as recommended by the manufacturer. In case of selection of special shades and colour (not available in standard shades) the contractor shall mix different shades and prepare test panels of minimum size 1 meter square as per instruction of the Engineer-in-Charge and obtain his approval prior to application of finishing paints.

Proper tools and implements shall be used. Scaffoldings if used shall be independent of the surface to be painted to avoid shade differences of the freshly repaired anchor holes.

Painting shall be done by skilled labours in a workmanlike manner. All materials shall be evenly applied, so as to be free of sags, runs, crawls or there defects. All coats shall be of proper consistency.

In case of application by brush, no brush marks shall be visible. The brushes shall be clean and in good condition before application of paints. All priming undercoats for painting shall be applied by brush only, and rollers, spray equipments etc. shall not be used.

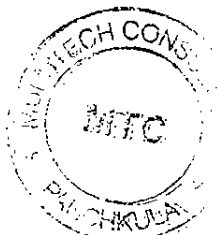
No work shall be done under conditions that are unsuitable for production of good results. No painting shall be done when plastering is in progress or is drying. Application of paint which seals the surface to moisture shall only be done after the moisture on and below the surface has dried out.

All coats shall be thoroughly dry before being sand papered or before the succeeding coat is applied. Coats of painting as specified are intended to cover surfaces perfectly. In case the surface is not covered properly by applying the specified number of coats, further coats shall be applied by the Contractor when so directed by the Engineer-in-Charge.

All primer and undercoats shall be tinted to approximate the colour of the finishing coats. Finishing coats shall be of exact colour and shade as per approved samples and all finish shall be uniform in colour and texture. All parts of mouldings and ornaments shall be left clean and true to finish.

5.5 Synthetic Enamel Paint

Shall be applied on properly primed surface. Subsequent coat shall not be applied till the previous coat is dry. The previous coat shall be lightly sand papered for better adhesion of subsequent coats.



5.6 Bituminous Painting

Two coats of bituminous paint of approved make and grade with 0.5 litre per sqm spread shall be provided on all internal surfaces of all water retaining structures including channels.

5.6.1 Application

All corners and junctions shall be properly rounded off to present a uniform and smooth finish. After complete curing of the plaster, it will be allowed to dry up. The surface should be well cleaned with smooth brush to make it dust free. The coating shall be allowed to dry and kept in dry condition till final setting takes place. The work should be done according to the entire satisfaction of the Engineer in Charge.

5.7 Painting of Structural Steel/ Miscellaneous Steel

5.7.1 Scope

The specification covers painting of the structural/ miscellaneous steel supplied and erected either by other agencies or by the Contractor for work under the scope of this contract. One shop coat of red oxide zinc chromate primer including necessary touching up has already been completed by the concerned agency. One coat of red oxide zinc chromate primer followed by a coat of undercoating and two or more finishing coats of synthetic enamel paint as described hereunder are only required to be provided under the item for painting structural /miscellaneous steel.

5.7.2 Type of Structures to be Painted

Painting shall be done on all exposed surfaces (including undersides wherever exposed of various structural steel members like columns, trusses, beams, roof girders, oil tanks, trestles, bracings, crane girders, chequered plates, gratings, brackets, base plates, CI / DI pipes, specials and equipments etc. in the plant as directed by the Engineer-in-Charge. It shall be clearly noted that all structures are already erected/placed in position or are under erection, hence the quoted rate by Contractor shall account for all aspects involved in painting keeping in view the heights, available access to members etc.

5.7.3 Painting

1. In general, painting work shall be in accordance with IS:1477 (Part I & II)
2. Surface of steel work to be painted shall be thoroughly cleaned of all grease, oil, dirt, rust, foreign matter like cement splashing, etc. by suitable solvent and mild rubbing with abrasive paper/hand scrapping to the full satisfaction of the Engineer-in-Charge. Cleaning with solvents/scraping shall be limited to the affected areas only.



3. In cases where the existing primer is removed while cleaning the surface, damaged portions shall be provided with a coat of wash or etching primer on suitable chemical pre-treatment solutions and another coat of red oxide Zinc chromate primer.
4. After the surface is prepared in a manner described above, the primer coat shall be dry cut without scratching or in any way damaging the primer coats and cleans the surfaces from dust.
5. Over this dry surface apply an optimum coat of undercoating (Synthetic enamel Paint) by brush or spray with minimum brush marks.
6. Finishing coats shall consist of two coats of synthetic enamel paint of approved colour and brand. The secondary coat, if so directed by Engineer-in-Charge, shall be applied only after the first coat is hard dry, it's gloss is gently removed over the entire surface and dusted off.
7. The total dry film thickness of each coat shall be not less than 23 microns.
8. The paint shall be applied by brushing/spraying; Spraying shall be adopted with prior approval of Engineer-in-Charge generally on large surface areas. Paints shall be stirred frequently to keep the pigment in suspension. Paint shall be ready mixed in original sealed containers as packed by the paint manufacturers and no thinners shall be permitted.

5.8 Protection

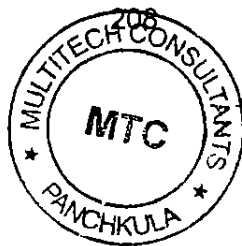
Furniture and other movable objects, equipments, fittings and accessories shall be moved, protected and replaced upon completion of the painting work. All stationary items of equipments shall be well covered so that no paint can fall on them. Work finished by other agencies shall be well protected. All protection shall be as per instruction of the Engineer-in-Charge.

5.9 Cleaning Up

The Contractor shall upon completion of painting etc. remove all marks and make good surfaces, where paint has spilled, splashed or splattered, including all equipments, fixtures, glass furniture, fittings, etc. to the satisfaction of the Engineer-in-Charge.

5.10 Acceptance Criteria

All painted surfaces shall be uniform and pleasing in appearance. The colour, texture, etc. shall match exactly with approved samples. All stains, splashes and splatters of paint shall be removed from surrounding surfaces.

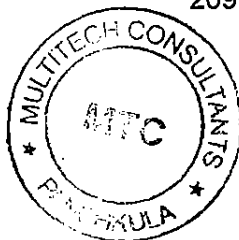


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5.11 Codes of Practice

The following Indian standards are applicable and shall be followed unless otherwise specified:

- IS:104 : Ready mixed paint, brushing, zinc chrome, priming
- IS: 124 (**Parts I, II, III**) : Ready mixed paint, brushing, finishing Semigloss, for general purposes.
- IS: 157 : Ready mixed paint, brushing, acid and alkali resistant, lead free for general purposes.
- IS:158 : Ready mixed paint, brushing, bituminous, black, lead free, acid alkali, water and heat resistant for general purposes.
- IS: 159 : Ready mixed paint, brushing, acid resisting for protection against acid fumes, colour as required.
- IS:168 : Ready mixed paint, air drying, semi-glossy/matt, for general purposes.
- IS:430 : Paint remover, solvent type non-inflammable.
- IS:431 : Paint remover, solvent type flammable
- I.S. 104 1979 : Ready mixed paint, brushing, zinc chrome, priming.
- IS: 5411 (**Parts I and II**) : Plastic emulsion paint.
- IS: 5660 : Ready mixed paint, brushing, aluminium red oxide primer.



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6. Doors, Windows, Grills & Rolling Shutters

6.0 General

The items under this clause cover doors, windows, grills, rolling shutters etc. normally required to be provided in a building used whether for residential, office, laboratory or industrial purpose.

Doors and windows Shutter shall be of Aluminum as approved or as directed by the Engineer-in-Charge. The sizes of the above items and locations of the same shall be as approved by Engineer-in-charge. The material used shall be of approved make and as per Indian standard.

The frames of Doors and Windows shall be of Aluminum section as approved by Engineer-in-charge.

They shall be provided with all necessary fittings like hold fasts, hinges, locking arrangements, stoppers, eyes and hooks, tower bolts, handles, fixing lugs etc., of sizes and quality grade as approved by the Engineer-in-charge.

They shall be provided in complete form including painting, glazing, fixing in position true to level and plumb.

Steel rolling shutters shall be of approved make and shall conform to IS:6248-1979.

The builders hardware shall all be as per relevant Indian Standards.

6.1 Door & Window Shutters

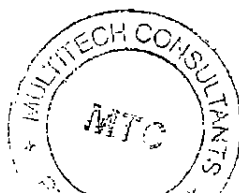
6.1.1 Doors:

The Contractor shall provide and fix anodized aluminum doors with partly glazing. The frame / chowkhat of the door shall be of 45.0 mm x 100.0 mm Aluminum section. Open able leaf frame section, top rail shall be of 48mm x 48 mm lock rail shall be of 84 mm x 45 mm, bottom rail shall be of 115 mm x 45 mm shall be provided. Snap beading for holding glass shall be of 0.18 kg/m with natural anodizing handle lock and tower bolt. Corner shall be fixed with heavy duty extended aluminum cleats. Inclusion of neoprene gaskets etc complete in all respects shall be provided.

The Contractor shall provide and fix 5 mm thick plain float glass for glazing.

The Contractor shall provide and fix both side prelaminated particieboard 12 mm thk. of approved make and colour, in the blind section of the door.

The Contractor shall provide and fix floor spring, of required size ISI Marked.



6.1.2 Windows

The Contractor shall provide and fix anodized aluminum hollow 'Z' windows partly fixed and partly open able with extended aluminum section equivalent to 44 series of approved make. The Snap beading for holding the glass shall be of Wt. 0.18 kg/m

The corners shall meet at 45 degrees and fixed by heavy duty extended aluminum sheets inclusive of 4 bar Stainless Steel friction hinges, The Contractor shall provide window locking handle and hardware to match with framing glazing gaskets and polysulphide sealant between building members and framing etc. complete and fully finished in all respects.

The Contractor shall provide and fix 5 mm thick plain glass for glazing

The design of the Doors and Windows shall be made as approved by the Engineer in Charge

6.2 Fittings

They shall be provided with all necessary fittings like hold fasts, hinges, locking arrangements stoppers, eyes and hooks, tower bolts, handles, fixing lugs etc., of sizes and quality grade as approved by Engineer-in-charge.

All doors shall be provided with handles on both sides and all windows with handles on the inner side. One of the doors of each room shall be provided with outside locking arrangement. Smooth finished handles, tower bolts, sliding bolts (for locking) of approved sizes and makes shall be provided.

They shall be provided in complete form including painting, glazing, fixing in position true to level and plumb.

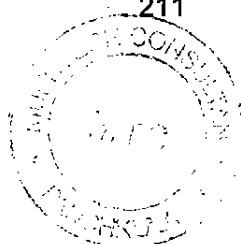
6.3 Rolling Steel Shutters / Grills

6.3.1. Scope

The specification covers the design, supply of materials, fabrication, delivery and erection of Rolling Shutters/grills crank & gear operated (manually operated) including all accessories as hereinafter specified. All Electrical work shall be in strict accordance with the latest Indian Electricity Rules. This shall conform to IS:6248.

6.3.2 Components

- Slates for rolling shutters shall be made from tested bright cold rolled, annealed M.S. strips, not less than 0.9 mm thick for shutters upto 3.5m width and above, machine rolled at 75 mm rolling centres, interlocking with each other. The profile will be such as to prevent excessive deflection under specified wind load.



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- End lock shall be heavy type MC/CI and shall be provided at each end of alternate slates.
- Guides shall be of such depth as to retain the shutter under a wind pressure of 150 Kg/sqm. The minimum thickness of guide to be of 12 G.
- Shafts shall be of steel pipe of sufficient size to carry the torsional load with a maximum deflection of 1/360 th of span. Grease packed ball bearings or bushings shall be provided for smooth trouble free operation.
- Bottom bars shall be finished with two angles not less than 6 mm thick external shutters when shown on drawings. A flexible weather strip shall be applied to make tight contact with the floor.
- Hoods shall be formed of not less than 20 gauge steel, suitably reinforced to prevent sag.
- Locks shall be slide bolt and hasp or cylinder lock opera table from one or both sides. Provision to securing hand chain with pad-lock, provision for immovable handle for hand cranks etc. shall be made as desired by the Engineer-in-Charge.

6.3.3 Manually Operated Shutters/Grills

Manually operated shutters shall be easily opera table by one person. Shutter shall be crank & gear operated. The crank handle shall be removable. All shutters shall be lockable from one or both sides as desired by the Engineer-in-Charge.

6.3.4 Shop Coat

Shutters shall be painted with one coat of red oxide or zinc chromate primer. Shutters shall be painted with one coat of zinc chromate for adhesion of field coat. At site one more coat Red oxide Zinc chromate primer shall be applied. These shall be followed by two coats of Synthetic Enamel paint of approved quality and conforming to IS: 2932, unless specified otherwise.

6.3.5 Inspection

After installing the shutters, the Contractor shall test the performance of the shutter in the presence of the Engineer-in-Charge. The doors shall be smoothly operable under all ambient conditions. All control and locking devices shall give fault free performance.

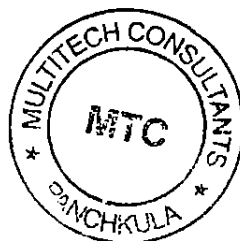
6.3.6 Guarantee

The contractor shall give one year guarantee for the successful operation and manufacturing defect of the shutters including aluminum doors, windows and their accessories.

6.4 IS Codes

All relevant IS codes with latest amendments shall be referred to.

- **IS:6248** Metal rolling shutters and rolling grills
- **IS:1038** Specifications for steel doors, windows and ventilators



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- **IS:1081** Code of practice for fixing glazing of metal (steel and aluminium) doors, windows and ventilators.
- **IS:1361** Specifications for steel windows for industrial buildings.
- **IS:1948** Specifications for aluminium doors, windows and ventilators

7. Structural Steel Fabrication Work

7.0 General

Structural steel fabrication work shall include all types of steel structural work required for installation of platforms for operation and installation of equipment where rolled steel sections are joined together either by bolting or welding as specified on the approved drawings/directed by the Engineer-in-Charge. It shall also include fabrication and installation of Electric Hoisting System, MS Stairs etc. Covers for electrical cable trenches along with their seating arrangements are also classified under this heading.

7.1 Materials

Structural steel rolled sections and plates shall conform to specified grade 'A' of IS: 2062. However, rolled sections and plates upto 20mm, conforming to IS:226 may be used in place of grade-A of IS:2062. Pipes used in Hand rails; embedment etc. shall conform to IS: 1161. Chequered plate shall conform to IS: 3502. All other materials shall be as per the list of standard codes given above or mentioned elsewhere in the relevant sections.

All steel sections and plates shall be straight, sound, free from twists, cracks, flaws, laminations, rough, jagged and imperfect edges and other defects.

In case any defect like laminations is noticed in the steel sections and plates during fabrication and erection, the same shall be brought to the notice of the Engineer-in-Charge. These sections and plates shall be rejected unless specifically approved for acceptance by the Engineer-in-Charge.

Structural steel that is used for fabrication shall be conforming to any of the following grades of steel as specified to each of the works:

- **IS:226-1975** Structural steel (standard quality)
- **IS:1977-1975** Structural steel (ordinary quality)
- **IS:2062-1980** Weldable Structural steel (fusion quality)



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Whenever steel is supplied by the contractor, he shall on demand produce the test certificates from the manufacturer.

The welding rods used for fabrication shall conform to IS:814-1974 (parts I and II).

The fasteners like bolts, nuts shall conform to IS:1367.

Rivets shall conform to IS:1148-1982.

Plain washers shall conform to IS: 2016-1967.

Spring washers shall conform to IS:3063-1972.

Note: All structural steel shall be ISI marked.

7.2 Fabrication

All the specified shop drawings shall be prepared by the contractor and got approved from Engineer-in-charge. The drawings shall be submitted in triplicate. Approval of the shop drawings however shall not relieve the contractor of his responsibility of correct conformation to the designs and fabrications of the structure to meet the requirements of the contract.

Fabrication work shall be carried out as laid down in IS: 800-1984, code of practice for general construction in steel.

In the shop drawings to be submitted by the contractor for approval, standard symbols as described in the IS: 813-1961 shall be followed, as well as the stipulations contained in these specifications.

Welding shall be carried out in accordance with the following specifications as applicable:

- IS: 803-1976 : Code of practice for design fabrication and erection of vertical mild steel cylindrical welded oil storage tanks.
- IS: 816 -1969 : Code of practice for use of metal arc welding for general construction in mild steel.
- IS: 822-1970 : Code of practice for manual arc welding of mild steel.
- IS: 9595-1980 : Recommendations for metal arc welding of carbon
Radiographic tests are required to be carried out as directed by the Engineer-in-Charge in case of pressure vessels.



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- IS: 818-1968 : Code of practice for safety and health requirements in electric and gas welding and cutting operations.
- IS: 3016-1982 : Code of practice for fire precautions in welding and cutting operations. Code of practice for fire precautions in welding and cutting operations.
- IS: 7205-1973 : Safety code for erection of structural steel work.

The stanchions shall be fixed absolutely vertical or to the specified angle as shown on the approved drawings/as desired/directed by the Engineer-in-Charge.

All connections like angle brackets, cleats, gusset plates, anchor bolts, bearing plates shall be fixed as shown on the approved drawings or as directed by the Engineer-in-Charge.

The item of work shall include supply of materials, fabrication and erection in position on site as shown on the approved drawings. This shall also include all labour costs, materials and equipment required for all fabrication, hoisting, erection, and satisfactory completion of the item of work.

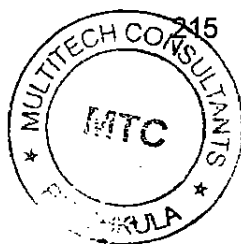
The supply of materials includes all structural members like rolled sections, plates, brackets, rivets, bolts and nuts and welds.

The steelwork shall be painted as specified in the approved drawings, or as directed by the Engineer-in-Charge. Unless otherwise provided for the rate quoted for the item is inclusive of all costs for painting like cost of paint, cost of labour, scaffolding etc. Welding work shall be done generally using electric arc welding.

Gas welding shall not be allowed to be resorted to for welding. Under special circumstances if in the opinion of the Engineer-in-Charge it cannot be avoided, gas welding can be done with the prior permission of the Engineer-in-Charge. However gas welding shall not be used where structural strength is the criteria for consideration.

All arrangements shall be made by the contractor for access for inspection by the Engineer-in-Charge or his representative to the workshop where the welding work is being carried out and necessary equipment like gauges, measuring instruments etc., shall be made available to the inspecting personnel.

Painting work shall not be started without the approval of the Engineer-in-Charge and the painting shall be started only after his inspection and approval of the works after carrying out surface preparations.



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All holes shall be carefully marked and drilled. Holes shall have their axis perpendicular to the surfaces bored through. Holes through two or more members shall be truly concentric. Holes shall not be formed by gas cutting process.

All the temporary connections of parts during assembly shall be done in the following ways: For welded structures: Tack welding fastening devices, fixtures.

For riveted and bolted structures: Jointing shall be done by adequate number of bolts. If tack welding is permitted by the Engineer-in-Charge the same shall be adopted but they shall be removed after the work is completed.

For the riveted structures in which holes are to be drilled after assembly, jointing shall be done by appropriate fixtures.

Welded joints shall be free from defects that would impair the service performance of the construction. All the welds shall be free from incomplete penetration, incomplete fusion, slag inclusion, burns, un-welded craters undercuts and cracks in the welded metal, porosity etc. All the defects shall be rectified as directed by the Engineer-in-Charge. Defective portions shall be removed to the sound metal and re-welded. Rectification of the welds by caulking shall not be permitted.

All welds shall be cleaned of slag and other deposits after completion.

7.3 Straightening

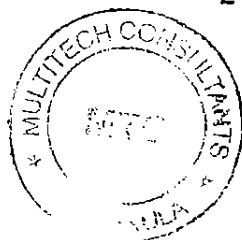
All steel materials shall be straight and free from bends or twists. If the sections are distorted or twisted during transit, storage etc. they shall be straightened and/or flattened by straightening machine at ambient temperature, though minor kinks or bends may be corrected by limited heating under careful supervision. Normally all steel issued by the department shall be reasonably straight although it may have minor kinks and bends.

7.4 Bending

The bending of plates and sections to specially required shapes shall be done either on appropriate machine or by angle smithy and black smithy processes.

7.5 Cutting

Cutting may be affected by shearing, cropping, sawing or by gas cutting by mechanically controlled torch. Gas cutting by hand may only be used when specifically authorized in writing by the Engineer-in-Charge. The edges of all plates shall be perfectly straight and uniform throughout. Shearing, cropping and gas cutting shall be clean, square and free from distortion and burrs, and shall the Engineer-in-Charge find it necessary the edges shall be ground afterwards by the Contractor.



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7.6 Grinding

All the edges cut by flame shall be ground before they are welded. Ends of all bearing stiffeners shall be ground to fit tightly at both top and bottom. The maximum permissible gap between the bearing stiffeners and the flanges shall not be more than 0.2 mm locally.

In case of gantry girders the bottom of the knife-edge support shall be accurately ground to provide effective bearing on the column bracket with a clearance not exceeding 0.2 mm locally at any place. The top surface of the column bracket shall also be ground similarly. The column splices and butt joints of struts and compression members shall be accurately ground and closely butted over the whole section with tolerance not exceeding 0.2mm locally at any place. Notwithstanding the above, full load shall be transferred through welds.

The ends of shafts together with attached gussets, angles, channels, etc. after welding together shall be accurately ground so that the parts connected, butt over the entire surface of contact. Care shall be taken to see that these connecting angles or channels are fixed with such accuracy that they are not reduced in thickness by grinding by more than 1 mm.

The slab bases shall be similarly ground over the bearing surface and shall have effective contact with the end of the shaft. The bearing face which is to be grouted direct to a foundation need not be ground if such face is true and parallel to the upper face. To facilitate grouting and escape of air, holes shall be provided wherever necessary in column bases.

7.7 Clearances

The erection clearance for cleated ends of members connecting steel to steel shall not be greater than 2 mm at each end unless specifically approved by the Engineer-in-Charge.

7.8 Holes

Holes through more than one thickness of materials for members, such as compound stanchion and girders, flanges, shall where possible, be drilled after the members are assembled and tightly clamped or bolted together. Sub-punching may be permitted before assembly, provided at the holes are punched 3 mm less in diameter than the required size and reamed after assembly to the full size. Punching shall not be adopted where the thickness of metal exceeds 16 mm.

When holes are being drilled in one operation through two or more separable parts, those parts, when so specified by the Engineer-in-Charge, shall be separated after drilling and burrs removed.



Holes in connecting angles and plates, other than splices, also in roof members and light framing, may be punched full size through material not over 12 mm thick, except where required for close tolerance.

Matching holes for rivets and black bolts shall register with each other so that a gauge of 1.5 mm or 2.0 mm (as the case may be, depending on whether the diameter of the bolts is less than or more than 25 mm) less in diameter than the diameter of the hole will pass freely through the assembled members in a direction at right angles to such members. Finished holes shall not be more than 1.5 or 2.0 mm (as the case may be) larger in diameter than the diameter of the black bolts passing through them unless otherwise specified by the Engineer-in-Charge.

Holes for bolts shall not be formed by a gas cutting process, except in special cases with specific permission of the Engineer-in-Charge. Wherever a horizontal member is likely to collect water, suitable holes for drainage shall be provided.

7.9 Notches

The ends of all joints, beams and girders shall be cut truly square unless required otherwise and joist flanges shall be neatly cut away or notches where necessary, the notches being kept as small as possible.

7.10 Assembly

The component parts shall be assembled in such a manner that they are neither twisted nor otherwise damaged and shall be so prepared that the specified camber, if any is provided. In order to minimize distortion in a member the component parts shall be positioned by using clamps, clips, dogs, jigs and other suitable means and fastener (bolts and welds) shall be placed in a balanced pattern. If the individual components are to be bolted, parallel and tapered drifts shall be used to align the parts so that the bolts can be accurately positioned.

For columns which are fabricated in two or more parts, controlled assembly shall be carried out before dispatch to the erection site.

7.11 Bolting

Every bolt shall be provided with a washer under the nut so that no part of the threaded portion of the bolt is within the thickness of the parts bolted together.

Flat washers shall be circular of a diameter 2.5 times that of bolt and of suitable thickness. Where bolt heads/nuts bear upon the beveled surfaces they shall be provided with the square tapered washers of suitable thickness to afford a seating square with the axis of the bolt.



All bolts and nuts shall be of specified steel, with well-formed hexagonal heads unless specified otherwise, forged from the solid and shall be dipped in hot boiled linseed oil as soon as they are made. The nuts shall be good fit on the bolts and clear threads shall show through the nut when it has been finally tight end up.

Notwithstanding anything to the contrary contained in IS:1363, IS:1364 and IS:1367, the unthreaded length of the bolt shall be equal to total thickness of metal being bolted together plus 2 mm. The threaded length shall be equal to at least the diameter of bolt plus 6 mm.

7.12 Chequered Plate

Chequered plates shall be fixed to supporting members by welding as shown/specified in relevant approved drawings or as directed by the Engineer-in-Charge. The edges shall be made smooth and no burrs or jagged ends shall be left. While splicing care shall be taken so that there is continuity in pattern between the two portions. Care shall also be taken to avoid distortion of the plate while welding of stiffening angles/vertical-stiffening ribs. Surface shall be provided with primer paint.

7.13 Welding

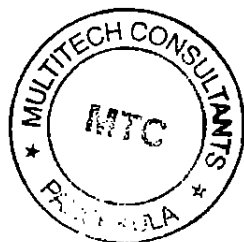
The works shall be done as per approved fabrication drawing or as directed by the Engineer-in-Charge which would clearly indicate various details of joints to be welded, type of weld, length and size of weld, whether shop or site weld. Symbols for welding on approved fabrication drawings shall be according to IS:813. Efforts shall be made to reduce site welding so as to avoid improper welding due to constructional difficulties.

7.14 Welding of Structural Steel Work

Welding of structural steel shall be done by an electric arc process. The procedure to be followed, materials, plant and equipment to be used, testing and inspection procedures to be applied shall be subject to the approval of the Engineer-in-Charge and shall conform generally to relevant acceptable standards viz. IS:816, IS:9595, IS:814, IS:4354 and Indian Standard Hand Book for metal arc welding, and other standard codes of practice internationally accepted.

Necessary jigs & fixtures and rotation of structures shall be so arranged that vertically down-hand position of welding becomes possible.

Open-Arc welding process employing coated electrodes shall be employed for fabrication of welded connections and field welding. The cost of electricity for arc welding shall not be charged extra. The lump sump rate quoted for the item shall be inclusive of cost of electricity.



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Wherever welding is done for assembling the components of structures, the job shall be so positioned that down hand welding is possible. In cases where down hand positioning of job is not possible other manual welding positions could be resorted to.

Any structural joint shall be welded only by those welders who are qualified for all welding procedures and positions required in such joint that is welded.

7.15 Girders for Movement of Hoisting System

All civil items related to Hoisting System shall be provided in Sludge sump, Filtrate sump etc. complete in all respect.

7.16 MS Stair

The Contractor shall provide MS staircase where ever required. The MS staircase shall be 1000 mm wide and the tread shall be 200 mm made of MS chequered plates. Rise of steps will be 150 mm. The main supporting beams shall be made of ISLC 200. The hand rail of the staircase shall be of SS 75 mm x 10 mm with PVC cover on it.

8. Water Proofing and Damp Proofing

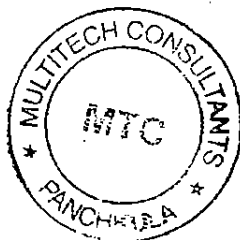
This specification covers furnishing, installation, finishing, curing, testing, protection, and maintenance till handed over of water proofing and allied works.

8.1 Water Proofing

Water proofing treatment of 110 mm avg thickness consisting of 12 mm thick layer in cement mortar 1:3 with water roofing compound at 1 kg per bag as base, constructing and laying brick bat coba in cement mortar 1:5 with water proofing compound at 1 kg per bag and having average thickness of 80 mm thick and finishing with 20 mm thick cement plaster layer in cement mortar 1:3 with water proofing compound 1 kg per bag including all lead, lift and laid to proper slope to drain off water entirely including treatment at junction of parapet and wall upto a height of 300mm or as directed including finishing the top layer of water proofing treatment with false marking of 30 x 30 cm or as directed.

8.2 Damp Proofing

Damp proof coarse shall consist of cement, coarse sand and stone aggregate of 1:2:4 proportion with standard water proofing compound (1 kg per bag of cement). The DPC shall be applied at the plinth level in the horizontal layer of 40 mm thickness. The DPC shall be properly cured as per specifications. Two coats of bitumen of 20/30 penetration at 1.65 kg/cm² spread shall be applied uniformly on the surface when the concrete is dry.



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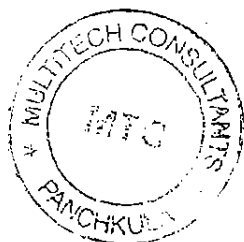
9.0 GATES**9.1 CI Control Gates**

Sluice gates shall be placed according to the general arrangement as per approved drawing. The dimensions of sluice gates shall be as per approved drawing. The sluice gate shall be single faced with head stock arrangement. The sluice gate shall conform to IS: 13349. Sluice gate shall have the following specifications:

S.No.	Description	Qty.	Material of Construction
1.	Frame	1	CI, IS 210, GR.FG 200
2.	Door	1	CI, IS 210, GR.FG 200
3.	Guide strip(wedge)	2	CI, IS 210, GR.FG 200
4.	Spindle	1	Mild steel
5.	Door ring/frame ring	1	Zinc Free Bronze
6.	Wall thimble	1	CI, IS 210, GR.FG 200
7.	Stop bar	1	CI, IS 210, GR.FG 200
8.	Flush Bottom seal	1	EPDM rubber
9.	Fastener, anchor, bolts, nuts	LS	ST to ASTM A276 type 316
10.	Spindle nut	LS	Bronze IS 318
11.	Cotter	1	Mild Steel
12.	Stem Coupling	1	Cast Steel
13.	Lifting mechanism, stem guide, Pedestal gear house	1	Cast iron to IS 210 Grade FG 200

9.2 Aluminum Control Gates

The construction of Aluminum open channel gate shall be in accordance with the specifications mentioned hereunder. The open channel gate shall be capable of performing the duties set out in this specification without undue wear or deterioration; They shall be constructed, so that maintenance is kept to a minimum. The open channel gate shall be rising spindle type.



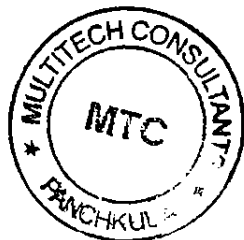
9.3 Specifications of Aluminum Open Channel Gate.

Shape of water way	Square / Rectangular.
Mounting	Suitable for mounting in between two parallel walls of an open channel.
Type	Self contained type gate with headstock mounted on the yoke of the gate frame.
Type of head	Seating as well as Unseating.
Distance between channel bed/invert of gate opening to top of operating platform	As per drawing approved by Engineer-in-charge.
Method of operation	Manually operated suitable for opening with maximum 18 kgs effort by a single person with maximum diameter of Hand wheel/crank being 750mm.
Specific Construction Requirement for gate	<p>Gate frame shall be manufactured of non-corrosion 6061 T6 high strength extruded aluminum section weighing minimum of 5 Kg/m.</p> <p>Frame guides shall be made of UHMWPE (Ultra High Molecular Weight Polyethylene) to prevent metal to metal rubbing between frame and shutter.</p> <p>The shutter shall be made of same composition as the frame and sufficiently reinforced to restrict deflection to less than 1/360 of span under the design head. All parts of shutter shall have minimum thickness of 6mm.</p> <p>The complete gate assembly shall be given a coating of suitable epoxy lacquer.</p>
Stem	Rising type unless otherwise specified.
Type of closure	Flush Bottom closure.

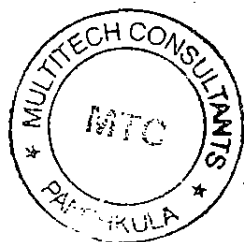
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Sealing	Only at two vertical and bottom sides of gate aperture due to open channel installation.
Seal seat clearance	With the slide in the closed position shall not exceed 0.10mm.
Fluid flowing	Raw unscreened sewage.
Pipe hood cover to cover the threaded portion of spindle and with additional mechanical stop nut on threaded stem.	
Indicate number of hand wheel revolutions required to fully open the gate.	
MATERIAL OF CONSTRUCTION :	
PART	MATERIAL
Gate frame, shutter/Door	Aluminium Alloy 6061-T6
Side Guides	Ultra High Molecular weight polyethylene
Seating faces	Aluminum
Rubber Seals	EPDM Rubber
Rubber seal retainer bar	Stainless Steel AISI-304
Drive Nut	Leaded Tin Bronze to Is : 318 LTB-2
Assembly bolts, nuts and fasteners	Stainless Steel AISI-304
Stem & connecting pin	Stainless Steel AISI-304
Yoke	Mild Steel to IS : 2062
Headstock	Cast Iron
Pipe hood	Transparent Polycarbonate



PAINTING :	
Paint for gate assembly	Epoxy primer and finish paint.
Paint for yoke and headstock	Epoxy primer and finish paint. Minimum coating thickness to be 250 microns.
SHOP TESTING :	Following shop tests at manufacturer site will be conducted as per procedure mentioned hereunder.
Movement Test	Movement test should be conducted in assembled condition using stems & headstock. The gate should be operated once from full close to full open and back to full close condition with a max. force of 135 Newton-meter on the crank or hand wheel.
Dimensional Check	: Important Dimensions shall be checked with reference to approved drawing.
Seat clearance check	With the gate in closed condition 0.1 mm thick feeler gauge should not pass through the sealing faces.
Material Test Certificates	Material test certificates for important components such as Frame, Side guides, Shutter, Rubber seals & Fasteners to be furnished at the time of inspection.



10.0 Electrical Requirements

10.1 General

The bidder shall execute all works related to electrical lighting requirements of operations building. The bidder shall provide all indoor/outdoor lighting fixtures complete with lamps, ceiling fans complete with speed controlling device, receptacles, fuses, lighting panels for each unit, earthing and all other miscellaneous works required to fulfill the lighting requirements.

10.1.1 Internal Lighting of Buildings

Internal Lighting of Buildings includes the following work:

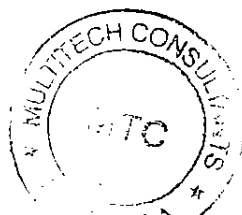
- a) Furnishing and installation of lighting fixtures (complete with Lamps).
- b) Executing works related to cabling, internal wiring, lighting fixtures components and support material.
- c) Earthing

10.1.2 Conditions

The decision of the Engineer-in-charge regarding the acceptability of any fixture shall be final.

10.1.3 General Lighting Requirements

- a) Provide a lighting fixture for each lighting outlet as per the Lighting Schedule
- b) Provide complete fixtures including glassware, diffusers, lenses, canopies, sockets, reflectors, ballast, wiring, hangers and any other auxiliaries necessary to complete such fixture installation.
- c) Verify ceiling materials employed and co-ordinate fixtures to mount to the ceiling system used.
- d) All lighting fixtures and fittings shall be ISI marked.
- e) Provide support materials of all types necessary to secure lighting fixtures to the building structure. Such support shall include all material required to support lighting fixtures to the basic building structural members. Method of support shall comply with local codes and ordinances effecting each type of installation.
- f) Submit an initial sample of each fixture and obtain an approval from EIC before manufacturing total quantities required.
- g) The actual location of fixtures shall be as per the site condition and shall be finalised with the Engineer-in-charge before starting the work.
- h) All products shall be as per Indian Standards



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10.1.4 Lighting Schedule for Buildings & Plants

S.No.	Unit	Type of Fittings	No. of Fittings	No. of Ceiling Fans	No. of Exhaust Fans
1	Blower/ MCC/ PLC/ Room	Single forty watts tube	20	10	8
		Decorative Fluorescent Fittings (2 x 40 W)	10		

10.1.5 Lighting Panels for Different Units of Building

The lighting distribution panel shall be of sheet with Bakelite top. The switches shall be 5 A, single pole, rocker type and shall conform to IS: 3854. Each light fixture, fans and plug point shall have an individual switch.

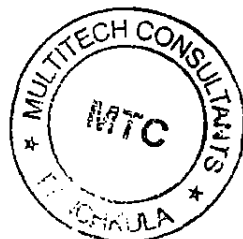
Each lighting panel shall have fuse on incoming side and shall have one 5 ampere multi-pin (3+2 pins) plug socket with switch.

A. Point Wiring

Unless otherwise specified, the point wiring shall be with heavy duty I.S. marked PVC conduit as approved by Engineer-in-charge.

B. Fixture Finish

- a) Cold-rolled sheet steel shall be degreased, washed and have a corrosion resisting, paint bonding surface applied, using a non-metallic phosphate or equivalent coating.
- b) Cast-iron or steel shall be degreased, and washed with a primer containing a phosphoric or equivalent thinner.
- c) Aluminium shall be degreased, washed and etched as required to provide proper paint bonding, unless anodised Aluminium finishes are specified.
- d) Aluminium alloys and similar alloy metals shall be degreased and washed with a primer containing phosphoric or equivalent thinner.
- e) Reflectors in fluorescent fixtures shall be finished with white enamelbaked as per specifications and shall have a reflection of not



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less than 82 percent. Porcelain enamel shall be used where specified.

- f) Fixture parts not finished by anodising shall be given a baked enamel finish. Finish shall be white unless otherwise specified. Enamels shall be baked as per specifications and where a white finish is used the reflection efficiency shall not be less than 82 percent.
- g) Where fixtures are noted to have standard finish, the normal colour scheme used by the manufacturer will be acceptable. Exterior Aluminium shall be anodised. Where finish colour is not evident obtain correct finish information from the EIC prior to ordering lighting fixtures.

C. Fixture Location

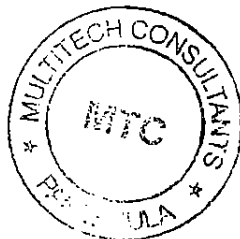
Prior to installing fixture outlets, approval from EIC is necessary.

- a) Locate fixtures to suit site condition and as directed by the Engineer-in-charge.
- b) Locate fixtures symmetrical with patterns and room dimensions.
- c) Fixture outlets shall be accessible and fixtures shall hang clear of ducts and piping. Verify exposed duct and piping locations prior to final location of electrical outlets. Adjust outlet locations to co-ordinate with ducts and piping.
- d) Follow standard mounting heights.

10.1.6 Fixture Support and Installation Conditions

A. General

- a) Lighting installation shall be carried out strictly in accordance with relevant Indian Electricity Rules, I.S. codes of practice, Fire Insurance and other applicable codes and regulation.
- b) Lighting fixtures, receptacles and junction boxes shall be properly earthed by 14G GI wire run along with the Lighting Wires/Cables.
- c) All junction boxes shall be fabricated from galvanised iron sheet steel as per I.S. 2667.
- d) Lighting wiring from lighting panel to junction box shall be carried out with 2.5/4 mm² PVC insulated solid copper conductor and from junction box to lighting fixture with 2.5 mm² PVC insulated flexible copper conductor.



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- e) A separate neutral shall be provided for each circuit.

B. Fluorescent Fixture

- a) Provide material required for complying with code requirement.
Install in perfect vertical and horizontal alignment.
- b) Support surface fixtures with a minimum of 2 fastenings per fixture, located near each end of fixture.
 - a) Locate fastening for all surface-mounted fixtures to provide maximum fixture support and optimum fixture alignment.
 - b) Individually mounted, suspended fluorescent fixtures shall have a minimum of two supports per fixture.
 - c) Fastening for suspended fixture supports attached to concrete slab shall consist of a minimum of 10mm screws fastened to concrete inserts for each individual fixture support.
 - d) Provide canopies on stems fitting to and concerning outlet boxes and support devices.
 - e) Cable entries shall be sealed with cable compound.

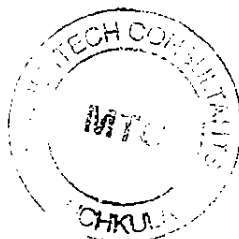
10.1.7 Expansion Shield Anchors

Expansion shields may be used for supporting lighting fixtures instead of concrete inserts under the following conditions:

- a) Fastening and expansion shield anchors shall be one trade size larger than specification requirements for fastening used with concrete inserts.
- b) Holes for expansion shield anchors, clinch anchors, etc. shall be self-drilled with carbide tipped rotary type concrete drills.
- c) Drill holes for expansion shields carefully in a workmanlike manner. Drill to the depth of the expansion shield anchor and in a manner that will develop the full strength of the fastening.

10.1.8 Fixture Schedule

- a) A1- Decorative fluorescent fitting with 2 x 40 W (or 2 x 36 W) fluorescent tube pendent support of 500 mm. Fitting comprises of basic channel fully wired and provided with attachments like plates opal acrylic diffuser. It will comprise ballast, capacitor, starters and holder for starters etc. Ballast are copper wire wound encapsulated in a CRCA can with polyester resin, conforming to IS 1534.



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- b) F1- High Breeze 48" (120 cm) ceiling fan shall comply with IS 374. They shall be suited for 220/240 volts, single phase, 50 C/S and shall have three Aluminium blades hanging shackles cover and top cover. The fan shall have two ball bearings one at upper end and the other at lower end. The fan regulator shall be of electronic type and shall be mounted on the distribution board where its control switch is provided. The fan regulator switch shall not cause humming at all its positions of regulation.

10.1.9 Receptacles

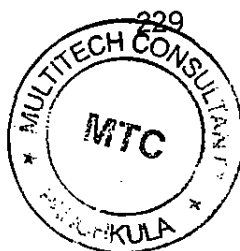
The Contractor/ bidder shall provide suitable number of indoor receptacles as per requirement of site conditions.

General

- a) Protective metallic plug and deeply recessed contacts in the sockets shall be provided such that it gives very high degree of safety for operating personnel against risk of accidental exposure of live contacts.
- b) Earthing connection of plug while inserting and removing shall be made first and broken after the main circuit connections.
- c) Plug shall be provided with compression gland to grip the cable firmly.
- d) Casting of plug, sockets and conduit boxes shall be of non- corroding Die-cast Aluminium alloy.
- e) Guide pin shall ensure the non-reversibility.
- A. Receptacle Type Z-2**
Receptacle Z-2 shall be 15 or 20-Ampere single phase metal clad totally enclosed wall-mounting type, interlocked switch, socket and plug unit shall conform to the relevant Indian Standards. Switch shall be interlocked with plug such that plug cannot be inserted or removed while the switch is in 'ON' position. Plug and sockets shall be Crompton make ASSP 20 type.
- B. Office Receptacles Type Z1**
Receptacle shall be single phase 15 Ampere multi-pin, plus ground plastic moulded with switch, fuse and plug mounted in common enclosure. Receptacle shall conform to IS 1293 and switch shall conform to IS 3854.

10.1.10 Exhaust Fans

Exhaust fans of approved make shall be provided in the operations building 6 nos. 300 mm dia heavy duty, noise free, wall cowl acoustic lining shall be provided and fixed.

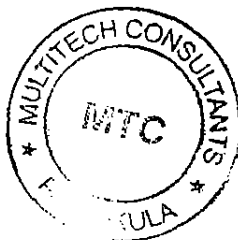


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11. Internal Water Supply & Sanitary System

Water supply system consists of providing water pipe lines, connections, taps etc. complete with all the fittings to Operations Building. The water pipe lines include excavation, laying, refilling, jointing etc. Fittings such as stop cock, bib cock, valves, taps, etc. of various capacities are to be provided as complete work. The service connections and internal pipe line shall be of GI (Class – B) having diameter of 15 & 20 mm. Peet Valves, Bib cock, stop cock etc. shall be of Chromium plated brass as per relevant IS Code. Sufficient no. of taps, stop cock, bib cocks etc. should be provided in MCC/PLC building. The schedule / plan and make of all fixtures of building will be got approved from Engineer – in – charge before execution of works. One number water tank of 1000 Liters capacity on the roof shall be provided.

Sanitary works consist of water closet, wash basin / sink, footrest, flushing cistern, mirror, flushing pipe, tower rail, etc. Gulley traps, floor traps and inspection chambers shall be provided wherever required. In the toilet, one water closet (European Type), along with ablution jet one wash basin, three urinals, one towel rail, flush cistern, footrest shall be provided. Additional tap for bathing shall also be provided. The scope of work also includes provision of floor traps, gully traps, manhole chamber, vent pipe and interconnections required their of. Carriage & disposal system beyond manhole chamber is included in this contract. The sanitary wares shall be first quality of Hindustan / Hind ware / Johnson / Parry ware make I.S.I marked and other fittings shall confirm to relevant IS code. White glazed tiles shall be provided in bath room, kitchen and laboratory as approved by Engineer – in – Charge before execution of work.



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12. Roads and Pavements

12.0 General

This shall include the construction of RCC kerb channels, Concrete roads / Bituminous roads and Cement Concrete topping footpaths. An adequate longitudinal and cross gradients shall be provided in the kerb channel and the roads for proper drainage of storm water.

These Roads shall be 4.2 m wide bituminous road constructed as per the Punjab CPWD specifications and as directed by the Engineer-in-charge. Cement Concrete topping foot paths will be 2.2 m wide

12.1 Road Works

The specifications of the Cement Concrete roads are as under:-

- On the properly compacted sub grade 100 mm thick GSB is proposed to be laid.
- On properly laid GSB, 100 mm thick DLC i.e, Dry Lean Concrete is proposed to be laid.
- On properly compacted DLC, 150 mm thick PQC i.e Plain Concrete with 43 Grade cement @400 kg/ cum is proposed to be laid.
- Kerbs are proposed on both side of the roads however channel is proposed on one side for 4.2 mtr wide road 7 parking.
- Camber @2% has been provided, sloping toward the kerb side.

12.2 METHODOLOGY AND OTHER SPECIFICATIONS

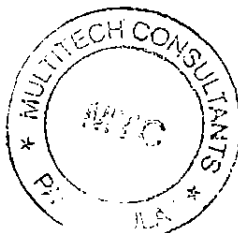
12.2.1 DRY LEAN CONCRETE

COARSE AGGREGATE

- Aggregates for lean concrete shall not be alkali reactive as per IS: 383
- Coarse aggregates shall be clean, hard, strong, dense, non porous
- It should be devoid of flaky, elongated, very angular pieces.
- Max. Size of coarse aggregates shall be 25 mm

FINE AGGREGATES

- Shall consist of clean, natural sand or crushed stone.
- Shall free from clay, shale, loam, mica, organic matter.
- Shall conform ot IS: 383



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12.2.2 CEMENT CONTENT AND CONCRETE STRENGTH

- The minimum cement content in the lean concrete shall not be less than 150 kg/cum of concrete.
- The average compressive strength of each consecutive group of 5 cubes shall not be less than 10 MPa at 7 days.
- Minimum compressive strength of any individual cube shall not be less than 7.5 MPa at 7 days.

12.2.3 COMPACTION

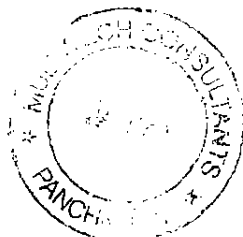
- The compaction shall be carried out immediately after the material is laid and leveled.
- The minimum dry density obtained shall be 97 per cent of that achieved during the trial length.
- The densities achieved at the edges i.e 0.5 m from the edge shall not be less than 95 percent of that achieved during the trial construction.

12.2.4 CONSTRUCTION

- The sub-base shall be overlaid with cement concrete pavement only 7 days after sub-base construction.
- The batching plant shall be capable of proportioning the material by weight. Plant mix lean concrete shall be discharged immediately from the mixer , transported directly to the point where it is to be laid and protected from the weather by covering the tippers/ dumpers with tarpaulin during transit.

12.2.5 TOLERANCE

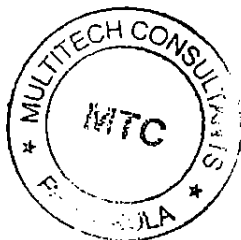
- LEVEL + 6 mm - 10 mm
- THICKNESS + 25 mm - 5 mm
- DENSITY 97% of MDD
- STRENGTH 10 MPa (7Days Cube)



WEATHER AND SEASONAL LIMITATIONS

- No concreting shall be done when the concrete temperature is above 30 degree Centigrade.
- When concrete is being placed during monsoon months and when it may be expected to rain, sufficient supply of tarpaulin or other water proof cloth shall be provided along the line of the work.

Note: All the road work will be executed as per the CPWD specifications and approval of Engineer in Charge. The section of road shall be as per the drawing given & approved by Engineer in Charge before execution.



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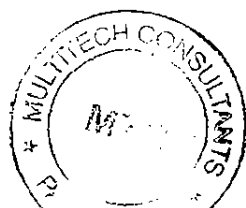


DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH.

VOLUME - II : PART - 2

**TECHNICAL SPECIFICATIONS FOR
ELECTRICAL & MECHANICAL WORKS**

**EXECUTIVE ENGINEER,
MUNICIPAL CORPORATION PUBLIC HEALTH
DIVISION NO. 1, CHANDIGARH**



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1. GENERAL REQUIREMENTS FOR ELECTRICAL & MECHANICAL WORKS

This section covers mainly the job requirements before and after the supply of Electrical & Mechanical equipment at site and before / after start of work. This section also covers the liabilities of the contractor and the quality standards that the contractor has to maintain for the work to be carried out by him.

1.1 Prerequisites before the supply of equipment

- i) Submission of Drawings / design sheets / Data sheets
- ii) The Contractor shall submit the following detailed drawings for review and approval of the Engineer- in -Charge.
 - a) Detailed Design Calculation sheets for electrical and mechanical works / equipment.
 - b) General arrangement drawings for all electrical works/equipments to be supplied.
 - c) Technical Specification sheets showing rating, make and quantity of various components used in a specific mechanical/electrical item.

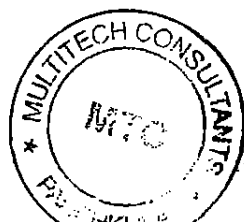
1.1.1 Approval of Drawings \ Documents \ Technical Data Sheets

Drawings will either be approved by EIC or he will convey comments that contractor shall incorporate by modifying the drawings accordingly.

The review of design calculations and drawings shall be carried out only in respect of orientation and sizes of important members, general design principles and approach, adherence to requirements of the relevant IS or other statutory codes, compliance with the technical specifications given in the tender document, general or specific notes and with the requirements of good engineering practice. Check for any interference and taking remedial action is the responsibility of the contractor.

Approval by the Engineer-in -charge of the contractor's design or drawings shall not relieve the contractor of any of the contractual obligations or liabilities under the contract or his responsibilities for correctness of dimensions, material of construction, weights, quantities, design details, assembly fits, performance particulars and conformity of the supplies with the Indian statutory laws as may be applicable.

Should it be found at any time after approval has been given by the Engineer-in-charge that any drawings or documents submitted by contractor are not consistent with any technical data, drawings or documents submitted or approved previously or substantially deviate from any major aspect of the contract, then such



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alterations or additions as may be deemed necessary by the Engineer-in-charge shall be made therein by the contractor and the works carried out accordingly without any extra cost.

The contractor shall make no revision after a design; drawing or document is "approved" by the Engineer-in charge. In case the contractor desires to incorporate any amendments in any amendments in an "approved" drawing, he shall re-submit the same for formal approval giving reasons for the change required.

1.1.2 Tests and Inspection before supply of equipment

Prior to the supply of any equipment, the contractor shall submit a schedule to Engineer-in-charge for inspection of shop tests to be carried out at the manufacturer's factory from where the equipment is supposed to be brought / supplied. The contractor shall inform Engineer-in-charge at least 15 days prior to the commencement of the shop tests for the equipment he wishes to supply as per the schedule of supply of equipment. Engineer-in-charge shall either witness the tests or a representative authorized by him shall witness the tests.

1.1.3 Shop Tests

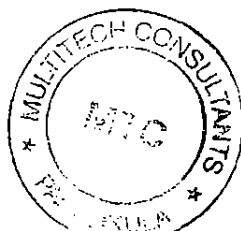
For tests carried out at the manufacturer's factory, relevant test certificates shall accompany the supply of equipment however two copies of test certificates shall be provided by the contractor immediately to the Engineer-in-charge at the time of completion of the shop test. Some of the equipment may have to be tested for certain parameters only when installed in position at site. The Engineer-in-charge or his representative reserves the right to visit manufacturer's workshop or at site on their own without informing the contractor. Where certificates are required by the specification or relevant reference standard, the original and one copy of each such certificate shall be provided by the contractor.

1.2 Prerequisite along with supply of equipment

Submission of Document related to installation, operation and maintenance

The contractor shall submit instructions / operation & maintenance manual to the Engineer- in -Charge at the time of delivery of items at site.

- Information supplied by the sub-contractor and Manufacturers employed by the contractor shall be coordinated into the comprehensive manual. The instruction manual shall describe the installation as a whole and shall give a step by step procedure for any operation likely to be carried out during the life of each item of the plant including the erection, commissioning, testing, operation, maintenance, dismantling and repair.



- Where applicable, fault location charts shall be included to facilitate tracing the cause of manufacture or breakdown.
- Technical Specifications of equipment.
- Schedule of preventive, maintenance, calibration and repair instructions.
- Parts list and spare parts recommendations.
- Safety precautions to be furnished while handling different units and First aid instructions.
- Do's and don'ts in equipment operation. Operators attention shall be drawn to all operations considered to be dangerous to operate or likely to cause damage to the plant.
- A complete list of recommended lubricants, oils and their charts.

1.3 Prerequisites after completion of supply of equipment

Contractor shall make arrangements for proper storage of the equipment supplied by him at site before being installed at their respective positions.

All equipment shall be installed in accordance with the equipment manufacturer's recommendations and good practice. Sufficient notice shall be given to the EIC prior to equipment installation in order that the EIC or his representative may be present during installation.

Some of the equipment may have to be tested for certain parameters only when installed in position at site.

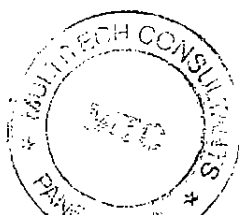
Contractor shall also submit a proper commissioning schedule for commissioning of the STP as agreed by the Engineer-in-charge. The commissioning of machinery shall be run in order to ensure the normal functioning of the plant to the satisfaction of E.I.C. The problems faced shall be trouble-shooted immediately.

Final test certificates carried out during the construction or on completion of the whole works/at the successful commissioning of the equipment shall be submitted within seven days of the completion of the test.

1.3.1 Tests on Items of Plant during Erection

Devices and equipment shall be checked for correct functional performance in accordance with apparatus rating, operating sequence and code requirements. All motors shall be checked and adjusted for correct direction of rotation. Loading of circuits and feeders in panel boards shall be checked and balanced.

Interior installation and distribution systems, 600 volts and less, shall be tested for insulation resistance after all wiring is completed and fixtures and equipment are



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connected being ready for use. Tests shall be made with an instrument capable of measuring accurately the resistance involved and having a voltage rating as specified by IS Reading shall be taken after the high voltage test of insulation resistance between conductors and also between each conductor and ground.

The contractor shall carry out all tests on plant witnessed by the Engineer-in-charge or his authorized representative. All tests shall be to the satisfaction of the Engineer-in-charge / authorized representative appointed by him who may require tests to be repeated prolonged or modified as may be necessary to ensure that any or all items of plant confirm with the contract.

If during or after testing any item of plant fails to achieve its intended duty or otherwise proves defective, it shall be modified or altered as necessary and re-tested and re-inspected as required by the Engineer-in-charge and the contractor shall bear all costs for such rectification/modification / replacement work.

The Engineer-In-Charge or his representative will have the power to omit, add, modify or adjust during stages of erection of any item of work as may be necessary or expedient for the work. No claim for compensation or damage will be entertained on the account of such changes.

1.3.2. Commissioning and testing

Commissioning shall commence after installation of all equipments and their installation checks carried out successfully and inspected / approved by the Engineer-in-charge's or his authorized representative.

Ground Tests

Ground readings shall not exceed 5 ohms and tested as per I.S. 3043.

After installation and before placing in service, the system shall be given a high potential test by applying alternating or direct current between each conductor of the system as one terminal consisting of the ground. Prior to making the tests, the wires and cables shall be disconnected from the equipment. The method, voltage, length of time shall be in accordance with the cable manufacturer's and I.S.I Standards.

1.3.3 Special tools and accessories

All special tools, equipment, or accessories required for the installation and maintenance for plant equipment as well as five sets of copies each of instruction manuals necessary for the proper use of such tools, equipment or accessories shall be provided by the equipment manufacturer.



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1.4 Quality Assurance from contractor side

The contractor shall provide all the required labour, permanent equipment and materials, tools, safety equipment, transportation and test equipment for supplying, installing, adjusting and fully testing all the mechanical work shown on the approved drawings or included in the tender document or ordered by the Engineer-in-charge.

1.4.1 Standards

All mechanical equipment and the materials used shall comply with the relevant Indian Standards unless a more rigorous requirement is specifically stipulated. If no applicable Indian Standard is available for any item of equipment or materials, the specifications will be decided by EIC. In every situation the latest specifications, standards etc. shall apply unless otherwise stated.

All main items of electrical equipment such as switchgear and motor controllers, motor control centers, panels, starters etc. shall have an etched metal or laminated Bakelite name plate identifying these pieces of equipment and securely mounted on the equipment by screws.

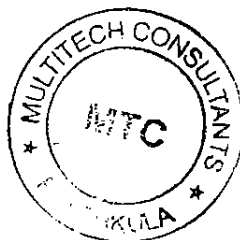
1.4.2 Packing and Transport

The equipment shall be transported to site packed in wooden crates. They shall be wrapped with polythene sheets to prevent damage to the finish.

1.4.3 Materials and Workmanship

All equipment furnished under this or allied sections shall be new and guaranteed free from defects in materials, design and workmanship. If inadequate information is provided in the specifications, it shall be the contractor's responsibility to ascertain the conditions and service under which the equipment is required to operate and to warrant accordingly that operation under such conditions shall be successful. All parts of the equipment shall be adequately proportioned to safely withstand all stresses that may occur or be induced in them during fabrication, erection and intermittent or continuous operation.

All equipment shall be designed, fabricated and assembled in accordance with the latest standards and workshop practice. Individual parts shall be manufactured to standard sizes and gauges so those spares, furnished at any time, can be installed in the field. Corresponding parts of duplicate units shall be fully interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required for tests.



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All materials used shall be appropriate for the service conditions. Iron castings shall be tough, close-grained grey iron free from blowholes, flaws or excessive shrinkage and shall comply with the requirements of IS 210. Except where otherwise specified structural and miscellaneous fabricated steel used in items of equipment shall conform to the relevant Indian Standards. All structural members shall be considered as subject to shock or vibratory loads.

Contractor shall assign a competent representative who shall supervise the electrical construction work from beginning to completion and final acceptance.

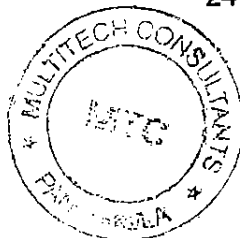
1.4.4 Cutting, Drilling and Welding

1. The Contractor shall provide the required cutting, drilling and welding etc. that will be required for the mechanical/electrical construction work.
2. Cutting and drilling of structural members shall not be permitted, except when approved by the Engineer-in-charge. A core drill shall be used wherever it is necessary to drill through concrete or masonry.
3. The Contractor shall provide the required welding for equipment supports as desired by Engineer in Charge.
4. Junction Pull Boxes and Hand holes shall have covers stencilled with box number when shown on the drawings. Data shall be lettered in a conspicuous manner with a colour contrasting to finish.
5. Switch plates in designed areas shall be suitably engraved with a legend showing function or areas when required by Codes or shown on the drawings.

1.4.5 Drives:

To ensure vibration free operation all rotating components of each pumping unit shall be statically and dynamically balanced. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case, the amplitude of vibration as measured at any point on the pumping unit shall not exceed the limits set forth in the latest edition of the Indian Standards.

Upon completion of the electrical work, the Contractor shall remove all surplus materials, rubbish, and debris that accumulated during the construction work. The entire area shall be left neat and acceptable to the Engineer-in-charge.



P

1.4.6 Lubrication

Contractor shall ensure constant presence of lubricant on all wearing surfaces. Lubricant filling and draining openings shall be readily accessible. Easy means for checking the lubricant level shall be provided. Prior to testing and/or operation, the equipment shall receive the prescribed amount and type of lubricant as required by the equipment manufacturer.

1.4.7 Painting

Shop painting should conform to the standard requirements. Electric motors, gears, starters and other similar self-contained or enclosed components shall be shop primed and finished with high-grade, oil-resistant acrylic enamel or other coating. Surfaces that will be in accessible after assembly shall be painted or otherwise protected before assembly by a method that provides effective protection throughout the expected economic life of the equipment.

Unless otherwise required in the detailed equipment specification, surfaces to be painted at the plant site shall be shop-painted with one or more coats of a primer which will adequately protect the equipment until finishing coats are supplied at site.

Machined and polished metallic surfaces that are not to be painted shall be coated with an approved rust-preventive compound.

Before applying paint, the surfaces to be painted shall be cleaned and shall be free from rust, dust, oil etc. The painting shall be with two coats of zinc rich /chrome primer and two coats of finish paint. Each coat shall not be less than 50 micron.

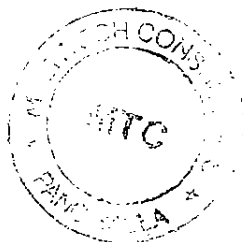
Electrical equipment, which shall be installed outdoors shall be provided with a proper cover and the protection provided shall conform to the latest IS codes for outdoor installations.

Contractor shall provide the required painting for all unfinished surfaces of electrical materials, including supports.

All scratched or marred surfaces shall be refinished with touch-up paint to match the original finish.

1.5 Equipment Guarantee

This requirement shall conform to the conditions given in volume 1 of the tender document. Unless specified otherwise elsewhere, the Contractor shall furnish and replace at no cost to the Department any component of the equipment that is defective or shows undue wear within guaranteed period of twelve months from



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the date of stabilization of STP. In addition to performance guarantees, processes or systems shall comply with the requirements stipulated in the relevant sections of the specifications.

1.6 Liability of the contractor

The contractor shall obtain and pay for the required bonds, insurance's, licenses, permits and inspections and pay all taxes, fees and utility charges that shall be required for the mechanical/electrical works.

If during the period of erection, Contractor or his workmen damage willingly or accidentally any part of the building structure or materials without written permission of Engineer-in-charge, the contractor shall be completely responsible for the damages and he will have to make rectification /replacement at his own cost.

Incidental items not included in the tender drawing and specifications, that can legitimately and reasonably be inferred to belong to the electrical work shall be provided by the Contractor at no additional cost to the Department. The decision of the Engineer-in-charge in this matter shall be final.

All equipment and materials shall be of latest design, and standard products of established manufacturers.

The equipment approval at the factory only allows the manufacturer to ship the equipment to the project site. The contractor shall be responsible for the proper installation and satisfactory start-up operation of the equipment in accordance with the manufacturer's requirement and to the satisfaction of the Engineer-in-charge.

Inspection of the equipment at the factory by the Engineer-in-charge will be made after the manufacturer has performed satisfactory checks, adjustment tests and operations.

Contractor shall make arrangement of all power required during the construction period and tests performed during erection of equipment.

The contractor shall be absolutely and solely responsible for damages due to accidents, injuries or losses, occurring to any person and property by his sub-contractors, agents or employees involved on his behalf in the execution of the work.

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1 TECHNICAL SPECIFICATIONS FOR E&M WORKS

2.1.1 Manual Bar screen

The manual bar screen will be of opening not more than 10 mm for FINE screen and inclination about 60° with respect to horizontal. Specifications for Manually raked screen shall be as under.

The trash screen shall be rectangular in shape. The screen shall be fabricated out of stainless steel SS 304 of not less than 8 mm thick and 50 mm wide in section. The assembly (bars and frames by using ISLC, 75 mm X 40 mm X 6 mm) shall be installed in such a way that it can be installed and removed as and when required.

2.1.2 Belt Conveyor

The conveyor shall be common to the mechanical and manual screens. The conveyor system shall be a combination of a horizontal conveyor and upward inclined conveyor (if required) and shall have a capacity to transfer the maximum screenings anticipated at the peak flow. The conveyor provided for discharge of screenings shall be inter-locked with all the screenings discharging on to the conveyor so that it operates when the screenings are discharged on to it and stops automatically after a time lag when the screen stops discharging the screenings on to the conveyor.

Conveyor type	=	Horizontal
Capacity	=	To handle screenings of peak flow
Speed	=	15 m / minute (maximum)
Type	=	Troughed
Belt	=	3 ply Z duck, 3 mm top, 1.5 mm bottom, rubber cover CR M -24

2.1.3 Mechanical Bar Screens

GENERAL

Mechanically operated step Screen completely made of Stainless Steel having 6 mm clear spacing between the bars shall be provided in inlet screen channel for screening out floating materials such as



Reference Signals

The drive should be capable of the following input reference signals:

- Digital pulse input
- Digital MOP
- Remote potentiometer
- Serial
- 0-10 V DC
- HIM (program / control panel)
- 4-20 mA

The remote potentiometer should be also programmable to be used as a trim pot for the 0-10V DC or 4-20 mA signals. Programmable gain adjustments for both upper and lower setting shall allow for system calibration. The analog inputs shall be programmable for normal for normal, inverted or square be root operation.

Loss of Reference

In the event of loss of the 4-20 mA reference signal, the drive should be user programmable to the following:

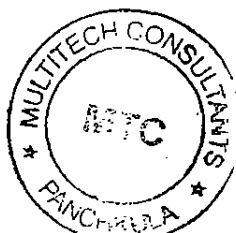
- Fault and maintain last reference within 10%
- Alarm and go to preset speed
- Alarm and go to minimum speed
- Alarm and go to maximum speed
- Active for Process PI reference or feedback

Operator Devices

The drive shall provide an option for Start, Stop, Jog, Reverse and Speed Control as an integral part of the Human Interface Module.

Control Interface

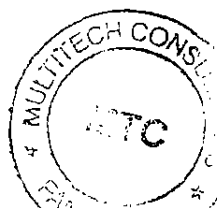
All control interface cards shall provide input terminals for access to fixed drive functions that include start, stop, external fault, speed and enable.



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Four additional inputs shall be to be programmed to one of 24 different input modes for functions such as reverse, present speed access, jog, second accel/ decel time access, process trim, speed / torque, and local control selection.

Inputs shall be programmable to configure and drive for standard 3-wire, 2-wire,EC, 4-20mA DC and serial operation requirements.



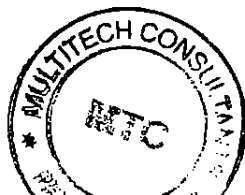


DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH.

VOLUME - II : PART - 3

LIST OF APPROVED MAKES FOR MAJOR ITEMS

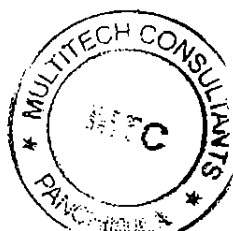
**EXECUTIVE ENGINEER,
MUNICIPAL CORPORATION PUBLIC HEALTH
DIVISION NO. 1, CHANDIGARH**



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List of Approved Makes for Major Items

S.NO.	ITE	APPROVED MAKES
1.	HDPE Pipes	Reliance (Nocil) , Duraline, Jain Irrigation
2.	MS Pipes	Tata Steel / Jindal
3.	DI Pipes	Jindal / Electrosteel / TATA / Electrotherm
4.	GI Pipes	Tata / Jindal (Hissar)
5.	GI Fittings	KS / SVW/ R-Brand/ AVR
6.	C.P. Pillar Cock, Bibcock, Stopcock and other CP Fittings	Essco, Jaquar
7.	Brass Bib & Stop Cock	GPS, Sant, L&K
8.	Gun Metal Valves	Leaders, Kent, Zoloto, Viking
9.	UPVC Pipes	Finolex, Prince, Reliance, Jain Irrigation, Supreme
	Self Sustaining Breathing	Drager
10.	Apparatus	
11.	Gas Mask	Drager
12.	Glazed Tiles	Somany, Kajaria, Orient / NITCO
13.	Epoxy Paint	Hindustan Ciba Giegy Fosroc , Sika, Shalimar
14.	Bituminous Paint	Berger, Asian Paints and Shalimar Tar Products.
15.	Synthetic Paint / Exterior Emulsion	Berger, Asian, Nerolac, Dulux
17.	Doors & Windows	
	(a) Aluminium Section	Hindalco, Jindal
	(b) Glass Section	Modi, Saint Gobain
	(c) Hinges	Earl Bihari or equivalent
	(d) Laminated Board	Kit ply, Nova pan
18.	Structural Steel	SAIL/TATA/Rashtriya Ispaat Nigam Limited/ IISCO
19.	Fabrication of Aluminium Items	Hindalco, Jindal

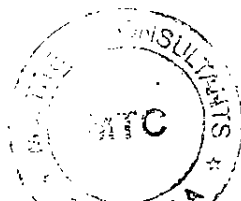


S.NO.	ITEM	APPROVED MAKES
20.	Aluminium Open Channel Gate	Jash / Yashwant / Upadhyay / BIC / Oriental Castings / IVC/ BS
21.	CI Open Channel Gate	Jash / Yashwant / Upadhyay / BIC / Oriental Castings / IVC/BS
22.	MS Open Channel Gate	Jash / Yashwant / Upadhyay / BIC / Oriental Castings / IVC/BS
23.	Water Tanks	Sintex / Diplast
24.	Sanitary wares	Hindware / Johnson / Parryware / Cera
25.	Sluice Valves, NRV, Reflux Valves, Check Valves, Butterfly Valves	VAG Valves / AVK/ IVC / Kirloskar/DVD/ Jash
26.	Knife Gate Valves	VAG Valves / Audco / AVK/ Kirloskar
27.	Ball Valve	Fouress / Audco
28.	Needle Valve	Fouress / Audco / DVD
29.	Anti-Termite Treatment	NOCIL or Equivalent
30.	Zinc cromate primers	Asian Paint, Berger, ICI
31.	Glass	Modiguard, Saint Gobain, Asahi, Atul
32.	Water proofing compound admixtures / Equipments	Choksey, Sika Qualcrete, Degussa, Fosroc, India, Waterproofing, Hindustan Waterproofing, Impermo
33.	Dash Fasteners	Hilti / Fischer
34.	Concrete Admixtures	Sika, Fosroc, STP, Degussa
35.	Lab Equipments	Hach USA / MERC
37.	PLC / SCADA	Siemens / Schneider / ABB Automation / Tata Honeywell / Alstom/ Indotech / Allen Bradley
38.	Computers	HP / Compaq / Dell
39.	Cables	NICCO / Unistar / Finolex / CCI/ ICL/ Glostar
40.	Cable Trays / Glands	Alcon / Comet
41.	Starters for motors	Schneider / ABB / Siemens/ BHEL
42.	Ceiling Fan	Usha / Khaitan / Orient / Crompton / GEC / Havells
43.	Exhaust Fan	Bajaj / Crompton Greaves / GE / Khaitan



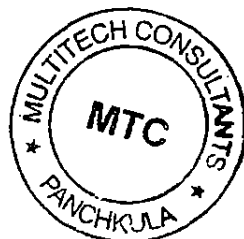
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44.	Bus Duct	Best & Crompton Engg. Ltd., Power Gears Pvt. Ltd., Control & Switchgear Zeta Switchgear, Advance Panels & Switch Gear (P) Ltd.,
45.	Distribution Boards	MDS / Siemens / Schneider / Hager
46.	Crimping Lugs / Glands of double compression type	Dowells / Jainson / Lotus
47.	MCC / L.T Panels / PDB / LDB Panel	Seimen, ABB, Schnieder
48.	Current Transformer	AE, Gilbert & Maxwell, IMP, VM Electricals, SEGC(C.S.) or U.T. ED approved
49.	Distribution Transformer 33/11 KV / 433 V	Crompton, Kirloskar, Emco, Bharat Bijalee, Voltas, Andrew Xule, Pactil, NGEF, Voltamp.
50.	33/11 KV VCB breaker & panel	ABB / Siemens / AREVA / ALSTOM / L&T / ESSEN / Kirloskar
	33/11 KV SF6 insulated 3 panel / 4 panel extensible type RMU.	ABB, Siemens, Alstom, Schneider
52.	ACB 8 way / feeder pillar 6 way / 4 way &	ABB / Siemens / Mitsubishi / Schneider
53.	Control Cables	Finolex, Polycab .
54.	11 KV End termination & straight through joint	Raychem, Xicon.
55.	Measuring Instruments	MECO, IMP, KEW, Rishiline (L&T).
56.	Air Conditioners	Samsung, Voltas, Carrier, Hitachi
57.	Cables	
	(a) PVC Insulated Cable for working voltage up to 1.1	Finolex, Asian, Polycab, Reliance, Fixolite, Torrent, Universal, Fortgloster, Vardhaman, Fixolite, Macro, CCI.
	(b) XLPE – LT Cables as per IS:7098 Part – I : 1988	CCI, Asian, Finolex, Torrent, Macro, Fixolite, KEI, Polycab with Nitrogen Corring, Gloster.
	(c) XLPE – HT Cables as per IS:7098 Part II – 1985	CCI, Asian, Finolex, Torrent, Macro, Fixolite, Polycab, Vardhaman.

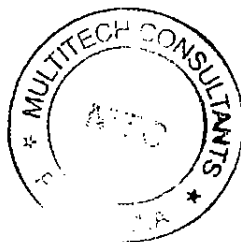


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	(d) PVC Insulated (HD) Cable up to 1.1 KV as per IS:1554 Part I – 1988	Torrent, Macro, Vardhaman, Finolex, CCI, Asian, Polycab.
58.	Lamps HPMV/HPSV Metal Halide Lamps & Accessories	Vallient, Fixolite, Bajaj, Philips, Wipro.
59.	Ring Main Unit/HT, switch and fuse unit	ABB, Schnieder, Crompton, South Andrew Yule or UT Electricity Department Approved
60.	C.T./P.T.	UT Electricity Department approved
61.	Soft Starter	ABB / Danfoss / Eaton / Mitsubishi
62.	Variable Frequency Drive (VFD)	ABB, Rockwell, Nord, Mitsubishi, Siemens
63.	Capacitors	GEC, Khatau Junkar, Crompton, L&T, Madhav, EPCOS, Asian (S+M)
64.	Steel Tubular Poles	Indian Electric Poles, Bombay Tubes, Nityanand, Rajan Tubes, Bajaj
65.	Chokes/ignitors	Bajaj, Wipro, Crompton, Philips, Genlec, Keselac, GE- Apar, Glolite, ECE, Indo-Asian
66.	Compressor	Ingersoll Rand, Elgi.
67.	Blowers	SWAM Pneumatics / Coral / NYB / Halifax
68.	CTS & PTS	Kappa, Automatic Electric, Control Switchgear
69.	HRC Switch Fuse Unit / Fuses	Siemens, General Electric, L&T, Schneider, Electric control Gears Pvt. Ltd., Crompton Greaves, Control Switch Gear, Standard, HPL
70.	Luminaries	Wipro / Phillips / Crompton / Osram / SSK / Bajaj / Anchor / Havells
71.	Receptacles	Anchor / Kalinga / SSK / Crompton
72.	Actuators	Marsh Automation (Pune) / L&T / Rotork / AUMA
73.	Switchgear	Siemens / GE / ABB / Alstom
74.	Control Gear	L & T / Siemens / GE / ABB
75.	Indicating Meter	AE / IMP/ UE/MI



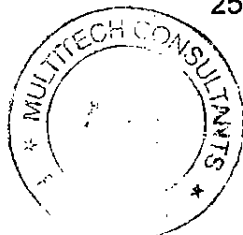
76.	LPBS / Indicating Lights	Siemens / ABB / BCH / Hansu / Pustron / Elcon
77.	Transformer	Kirloskar / NGEF / Crompton Greaves / BHEL / ABB
78.	Vacuum Circuit Breakers	Schneider / Crompton Greaves / Siemens / BHEL / ABB
79.	Air Circuit Breaker	Siemens-3wL/Schneider- NW/ ABB- E max
80.	Moulded Case Circuit Breaker (MCCB)	Schneider-NSX / Siemens-Sentron / ABB-T MAX.
81.	Volt and Ampere Meter	L&T / AE
82.	Selector Switch	L&T Salzer
83.	Indicating Lamps	L&T / Esbee / Siemens
84.	Contactors	BHEL / Siemens / Schneider / ABB / GE / Havells / BCH
85.	Over Load Relay	Siemens / Schneider / ABB / GE / Control & Switchgear
86.	Street Light / Flood Light Fixtures	Phillips, Crompton
87.	Aluminium Bus Bar	Indal / Valco / Balco / Hindalco
88.	Bus Bar Supports	Powermat / Everest Electricals
89.	Single Phase Preventor	L&T / Minilec
90.	Engine for DG set	Cummins / Kirloskar / Caterpillar / Ashok Leyland /Greaves Cotton / Volvo Penta
91.	DG Set	Crompton Greaves / Alstom / BHEL / Kirloskar / Cummins
92.	Mechanical Bar Screens	Jash / Voltas / Triveni / Shivpad / HUBER / Johnson
93.	Belt Conveyor	Indiana / Konal Corporation / Voltas / Batliboi /Dynamic
94.	Gear Box	Radicon – Greaves / Elecon / Flender
95.	Mechanical Detritor	Voltas / Triveni / Shivpad / HUBER/ JASH
96.	Submersible Non clog pump sets	Kishor / Grundfos / KSB/ Kirloskar
97.	Air Blowers	Usha / Everest



98.	Diffusers	OTT / EDI / REHAU
99.	Screw Pump	ROTO / Tushaco / Ramo
100.	Centrifuge Unit	Humboldt / Pennwalt / Alfa Laval
101.	Electric Hoist	Indef / Reva / W.H. Brady & Co / National / International
102.	Chain Pulley Block	Indef / Reva / W.H. Brady & Co
103.	Motors	Siemens / Crompton / Bharat Bijlee / Kirloskar/ ABB
104.	Agitators / Mixers	Milton Roy / Fibre & Fibre / Remi / Voltas
105.	Dosing Pumps	Milton Roy / Positive Metering
106.	Instrumentation	
	(a) Level Transmitter , Flow transmitter, Level Switch	Forbes Marshall / Endress Hauser / ABB / Emerson / Toshniwal / Nivo Control
	(b) DO Meter	Endress Hauser / ABB / Forbes Marshall / Fischer Rosemount / HACH
	(c) Air Flow Meter	Fitzer Instruments / George Fitcher / Toshniwal
	(d) Wastewater Flow Meter	Forbes Marshall / Endress Hauser / ABB / Emerson/ Toshniwal
	(e) Pressure Gauge	H. Guru / Gluck/ Fiefig
107.	Chlorinators	Jesco (USA), Enchlor / Metito, Pennwalt, Capital Control
108.	Cement	Ultratech / AMBUJA / JK / Bangur / ACC / Shree/ JP

Note:

- i) In case make of any item is not figuring in the list of approved makes specified in the tender document, the EIC shall decide make for the same and his decision shall be final and binding.
- ii) The firm shall install equipment as per the make decided by EIC out of the above listed makes and his decision shall be final and binding.
- iii) Makes of those items which are not part of current tender may be ignored.



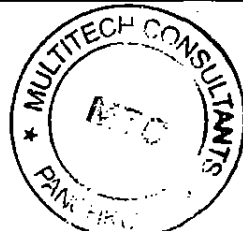


DESIGN, CONSTRUCTION, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 5 MGD (22.73 MLD) CAPACITY SEWAGE TREATMENT PLANT (STP) & MAIN PUMPING STATION (PHASE I), BASED ON SEQUENTIAL BATCH REACTOR (SBR) TECHNOLOGY AND ALL OTHER WORKS CONTINGENT THERETO ALONG WITH OPERATION AND MAINTENANCE FOR A PERIOD OF 120 MONTHS AFTER SUCCESSFUL COMPLETION OF TRIAL RUN FOR A PERIOD OF 180 DAYS AT MALOYA CHANDIGARH.

VOLUME - III

PRICE BID

**EXECUTIVE ENGINEER,
MUNICIPAL CORPORATION PUBLIC HEALTH
DIVISION NO. 1, CHANDIGARH**



Ⓢ

FINANCIAL OFFER

1.0 PRICE SCHEDULE

1.1 General

- (i) The price Schedule shall be with reference to the Notice Inviting Tender, Instruction to Bidders, Conditions of Contract, Scope of Work and Technical Specifications of the Tender Documents.
- (ii) Each item in the price Schedule shall be individually priced and the same shall be added up to the Bid Cost. No column in the price Schedule shall be left blank.
- (iii) The rates and prices in the price Schedule shall, except in cases separately provided for, be deemed to cover all the contractual obligations under this contract.
- (iv) Broad Break-up of Price for different parts of work has been mentioned in this document. The break-up of price given is only for the purpose of release of payment. **Only the Price quoted in BOQ will be considered as quoted price.**
- (v) In case of any discrepancy between the amount quoted in words and figures, price quoted in words shall be considered as final and valid.
- (vi) Bids shall be evaluated on the basis of life cycle cost as detailed in Volume I part III.

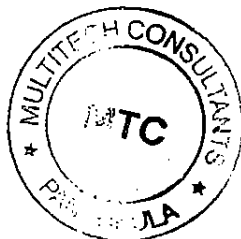
1.2 Validity of Offer

The Price Offer is valid for a period of 90 days from the date of opening of e-price bid.

1.3 Taxes

The total price quoted by the bidder shall include sales tax, income tax, service tax, work tax, water charges and all other Central Govt. and State Govt. taxes / duties as applicable. The rates shall be inclusive of all taxes & duties and other statutory taxes etc. Any variation in the statutory charges (GST) shall be borne by the Contractor without any extra cost to the Department.

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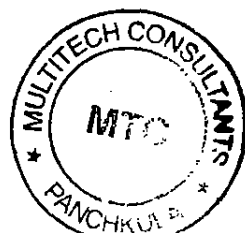
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1.4 PRICE SCHEDULE

As per enclosed BoQ in excel form.

NOTES :

- It is certified that no material of any kind shall be issued by the Department for execution of this work.
- This Price Bid is to be submitted online only without any change and condition.
- Any condition given on this page shall not be considered and offer will be summarily rejected.



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Tender Inviting Authority : MUNICIPAL CORPORATION, CHANDIGARH (O/o E.E.M.C.P.H DIVISION NO. 1, SECTOR - 17, CHANDIGARH)

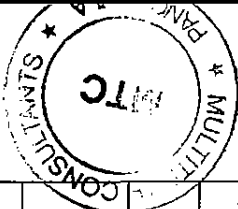
Nature of work: Construction of 5 MGD (22.70MLD) capacity Sewage Treatment Plant (STP) & Main Pumping Station (Phase-I), based on Sequential Batch Reactor (SBR) Technology at Maloya, Chandigarh, India : Approx Amount: Rs.; EMD: Rs. 60.00 Lacs; Time limit : 15 Months.

Bidder Name

SCHEDULE OF WORK

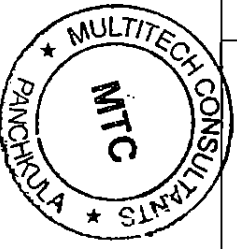
(This BoQ template must not be modified / replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values Only).

S. No.	Description of Work	No. or Qty	Unit	Estimated Rate (in Rs.)	Rate in Figures to be entered by the Bidder Rs.	Words	Amount in P
1.0	Construction of 5 MGD (22.70 MLD) capacity Sewage Treatment Plant (STP) & Main Pumping Station (Phase - I) at Maloya, Chandigarh (India) based on Sequential Batch Reactor (SBR) technology and all other works contingent thereto including Design, Construction, Civil Works, Supply of Mechanical and Electrical equipments, Erection, Testing, Commissioning along with stabilization period (180 days or longer till complete stabilization) on turnkey basis complete in all respects.				Figures	Words	



1.1	Capital Works							
1.2	a) Civil Works	1	job	0.00				
1.3	b) Electrical Works	1	job	0.00				
1.4	c) Mechanical and other works	1	job	0.00				
2.0	Operation & Maintenance for 10 years							
2.1	1st Year	1	job	0.00				
2.2	2nd Year	1	job	0.00				
2.3	3rd Year	1	job	0.00				
2.4	4th Year	1	job	0.00				
2.5	5th Year	1	job	0.00				
2.6	6th Year	1	job	0.00				
2.7	7th year	1	job	0.00				
2.8	8th Year	1	job	0.00				
2.9	9th Year	1	job	0.00				
2.1	10th Year	1	job	0.00				

R



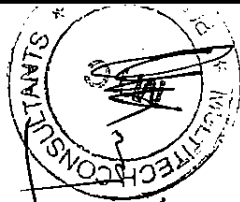
3.0	Average Daily Gauranteed Power consumption 'A' (as defined in Volume 1 Part - 3) in kWh/day. Figures given in column no. C of BOQ is net present value of power consumption in Rupees and bidder has to fill average guaranteed power consumption per day in kWh in Column F of BoQ.	13455.36	kWh/day	0.00			
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Recommended for approval

Recommended for approval

[Signature]
Superintending Engineer
M.C.P.H. Circle
Chandigarh

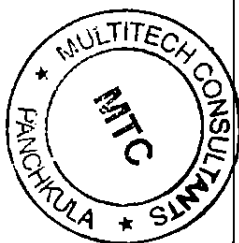
[Signature]
Executive Engineer
M.C. P.H. Divn, No.
Chandigarh



[Signature]
Chief Engineer
Municipal Corporation
Chandigarh
 1376112

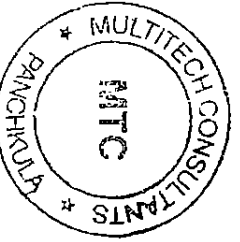
(i) Detailed % Break-up of Costs
 (A) Civil Works

S No.	Process Units & Buildings	Percentage
1.	Main Pumping Station – Sewer connection, Pipe Laying	1%
2.	Main Pumping Station – Inlet Chamber	1%
3.	Main Pumping Station – Screening Chamber	2%
4.	Main Pumping Station – Collection Sump	5%
5.	Main Pumping Station – Valve Chamber	1%
6.	Inlet Chamber/Stilling Chamber	2%
7.	Fine Screen Chambers	2%
8.	Mechanical Grit Chambers & Distribution box	5%
9.	SBR Reactors	50%
10.	Sludge Sump	2%
11.	DWPE Dosing Tank	0.2 %
12.	Sludge Pump House	2%
13.	Centrifuge Shed	2%
14.	Sludge Storage Platform	0.2%
15.	Blower Platform	1%
16.	Operations Building	2%
17.	Toilet Block for Workers	0.2%



18.	Process Piping & Drain Piping	6%
19.	Effluent Disposal Channel / Pipe including End Protections	1%
20.	Chlorine Contact Tank, Chlorine Mixing Tank	3%
21.	Tonner Shed and chlorination Room	1%
22.	Road & Pavements	1%
23.	Byepass pipe / channel	0.5%
24.	Service Water Supply in the Plant (UGSR, Service Water Pumps, Piping etc)	0.2%
25.	External sewerage system	0.2%
26.	External storm water drainage	0.2%
27.	Painting, Whitewashing and allied works	1%
28.	TTP units including secondary sump, filter beds complete	7.8%

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(B) MECHANICAL WORKS

S No	Item	Percentage
1.	Mechanical Coarse Screens	3%
2.	Submersible Raw Sewage Pumps	10
3.	Mechanical Fine Screens & Bar screen	3%
4.	Mechanical Detritor	5%
5.	Air Blowers (SBR)	12%
6.	Fine Bubble Diffusers	12%
7.	Decanters	16%
8.	Sludge Pumps	3%
9.	Air Blowers (Sludge Sump)	2%
10.	Centrifuge Feed Pumps	2%
11.	Centrifuge Units	8%
12.	Polyelectrolyte Agitator	2%
13.	Polyelectrolyte Dosing Pumps	2%
14.	Electric Hoist / Chain Pulley Block etc	1.5%
15.	Manual & Auto Valves for the plant, Control Gates (Sluice Gates)	9%
16.	Chlorination System	1.5%
17.	Laboratory Equipment	0.5%
18.	Secondary Treated lifting pump sets	5.5%

Date :

Contractor

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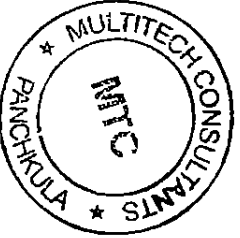


(C) ELECTRICAL & INSTRUMENTATION WORKS

S No	Item	Percentage
1.	HT Breaker Panel	7%
2.	Transformer & Accessories	10%
3.	DG Sets	25%
4.	Main PCC with APFC	10%
5.	Sub MCC & DB	12%
6.	PLC - SCADA	10%
7.	Instrumentation	8%
8.	HT / LT Cables	12%
9.	Plant Lighting	6%

Date :

Contractor



2.0 Payment Schedule

2.1 Schedule of Payment for Sewage Treatment Plant (STP)

The Bidder shall raise his invoice on the basis of the work completed in different stages. The invoice will be checked with reference to the progress of works and quality as per the Scope of Work and Technical Specifications in the Tender Document.

2.1.1 Civil Works

2.1.1.1 Payment for Civil Works

- (a) 1% payment shall be made on approval of concept of design and detailed drawings.
- (b) 7% of the construction work price on pro-rata against completion of excavation and lean concrete work in foundations.
- (c) 20 % on completion of foundation upto plinth level in building work and work of raft / RCC footings in other works.
- (d) Balance 25% on completion of structure up to half staging in all R.C.C. work and up to roof level in building work.
- (e) Balance 30% on completion of structure up to full staging and after laying of roof slab in building work.
- (f) Balance 10% on completion of structure upto full staging and on hydraulic test of structure for its hydraulic levels, hydraulic gradient and leakages etc. and for building after full completion of finishing item including flooring, white washing including glass panes etc.
- (g) Balance 7% on completion and satisfactory testing commissioning and handing over of plant upto the satisfaction of Engineer in charge after the stabilisation period. This balance amount shall be released only after a certificate furnished by the EIC that all the parameters of treatment of sewage has been tested/ fulfilled as per requirement of DNIT. Further in case any additional cost is increased on chemicals/after consumables due to faulty/defective design, the recovery of additional cost shall be made from its balance 10% (Ten Percent).



2.1.2 Payment for Mechanical Works

1	Supply payment as per approved billing schedule on pro- rata against delivery in good condition at site.	65	%
2	Item price on pro rata against erection/installation/laying of the equipment	15	%
3	On successful commissioning	10	%
4	On handling over of fully functional system to the department after completion of stabilization period	10	%
	Total	100	%

2.1.3 Payment for Electrical Works

1	Supply payment as per approved billing schedule on pro- rata against delivery in good condition at site.	65	%
2	Item price on pro rata against erection/installation/laying of the equipment	15	%
3	On successful commissioning	10	%
4	On handling over of fully functional system to the department after completion of stabilization period	10	%
	Total	100	%

2.1.4 Operation, Maintenance & Monitoring for 120 months after stabilization.
The payment for this work shall be released after stabilization of the plant at the following.

1	On monthly basis after completion of one month.	100	%
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Note: In case for any item / unit the Schedule of Payment is not mentioned above, it shall be decided by the Engineer- in – charge during execution and his decision shall be final and binding.