Maharashtra Pollution Control Board
महाराष्ट्र प्रदूषण नियंत्रण मंडळ

Model Tender Document for Waste Water Treatment Plant

Using MBBR/ SBR/ ASP / Conventional Technology of capacity 1MLD, 5MLD & 10MLD

Prepared by, Maharashtra Pollution Control Board

November 2019

1. Form I&CL: Index & checklist

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9.	Form PEP	Personnel Resource Format & Resume of proposed personnel
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21.	Form LoPB	Letter of Price Bid – Issue of ITB 8
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2. Form PTN:
Press Tender Notice

FORMAT FOR TENDER PRESS NOTICE

Tender Notice No:----------

TENDER DOCUMENT FOR PURCHASE OF:
DESIGN, SUPPLY, CONSTRUCTION, ERECTION, TESTING, COMMISSIONING,
OPERATION & MAINTENANCE OF
WASTE WATER TREATMENT PLANT OF
CAPACITY----------
USING ----------TECHNOLOGY

Tender Number:----------, Dated: ----------

This Tender Document Contains Pages.

1. The detailed Notice Inviting Tender is available at our web site www.mpcb.gov.in
2. The detailed time schedule for tender activities and other details can be seen in the detailed notice.
3. Member Secretary, MPCB reserves the right to reject any or all tenders or not to accept the lowest tender without assigning any reason whatsoever.

Details of Contact person in MPCB regarding this Tender;
Name:
Designation:

Address & Signature

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3. Form NIT – Notice Inviting Tender

NOTICE INVITING TENDER

[*Insert name of personnel / designate]*, on behalf of [*insert name of local body]* invites item rates sealed tenders under two bid systems for the work of "Design, Installation, Erection & Commissioning for 5 Years of Sewage Treatment Plant for capacity of ____MLD at [*insert place of activity*] by using [*insert technology name*]" from the agencies having valid registration of CPWD/State PWD/Railway/MES/BSNL/Govt./Semi Govt. organization including valid licensees from the Technology Owners. The agency should have successfully carried out minimum one /two /three similar works of 80% / 60% / 40% of the estimated cost respectively and above under single contract in Govt., Semi-Govt. Organizations or reputed private organizations during last seven years ending last day of the month previous to the one in which tender is invited.

Documents Required: Tenderers are required to produce attested copies of valid registration of CPWD/State PWD / Railway / MES / BSNL / Govt. / Semi Govt. organization /valid license/ agreement from reputed technology owners for application of said Technology, valid GST registration, PAN, EPF registration and similar work completion certificate along with technical bid.

Name of work	Estimated cost (Rs)	Earnest Money (Rs.)	Time for Completion	Similar Work experience
Design, Installation Erection & Commissioning for 5 years of Sewage Treatment Plant for ___MLD capacity at [*insert location*] using [*insert name of technology*]		[*insert 2% of the estimated cost*]	[*insert estimated time*]	Similar work shall mean: Providing proof of experience in installing & commissioning as well as O&M for at least 1 year of said technology in form of Work order & completion certificates signed by personnel not less than Rank of Executive Engineer / Dy. GM in Private Organization

Tender documents can be downloaded free of cost from [insert website address] up to *[insert date]*. Tenders will be received up to 3.00 PM on *[insert date]* and the technical bid will be opened on the same day at 3.30 PM at [insert address]

[*Insert head of Institution*], [*insert name of local body*], [*insert place*] reserves the right to reject any or all the tenders or to accept them in part or to reject the lowest tender without

assigning any reason. For enquiries please contact [*insert name of personnel* / *Designate, affiliation and address of institution*], [*insert Telephone*]

[*Insert Designate calling tender*]

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Form DNIT - DETAILS OF NOTICE INVITING TENDER

1. [*Insert name of personnel / designate]*, on behalf of [*insert name of local body]* invites item rates sealed tenders under two bid systems for the work of "Design, Installation, Erection & Commissioning for 5 Years of Sewage Treatment Plant for capacity of ____MLD at [*insert place of activity*] by using [*insert technology name*]" from the agencies having valid registration of CPWD / State PWD / Railway / MES / BSNL / Govt. / Semi Govt. organization including valid licensees from the Technology Owners. The agency should have successfully carried out minimum one /two /three similar works of 80% / 60% / 40% of the estimated cost respectively and above under single contract in Govt., Semi-Govt. Organizations or reputed private organizations during last seven years ending last day of the month previous to the one in which tender is invited. Documents Required: Tenderers are required to produce attested copies of valid registration of CPWD /State PWD / Railway / MES / BSNL / Govt. / Semi Govt. organization /valid license / agreement from reputed technology owners for application of said Technology, valid GST registration, PAN, EPF registration and similar work completion certificate along with technical bid.

2. Estimated Cost is for Rs. _____(Rupees *Insert in Words*) based on PWD schedule of rates 2018-19 (Govt. of Maharashtra) and prevailing market rate

3. Time for carrying out the work will be said work is [*insert time scheduled*] and thereafter for O&M -5 years and the date of commencement shall be reckoned from the tenth day after the date of order to commence work or actual date of start whichever is earlier. In case the site is handed over at later date, the same shall be reckoned as date of start.

4. Tender documents can be downloaded free of cost from [insert website address]

5. The bidders may submit their duly sealed bids by post, courier or by hand. Bids are invited on two part basis hence the Bidder shall seal the application along with credential document as asked above along with requisite EMD duly marked as "Application along with credential document" (Envelope-I) and the financial bid in separate envelops marked as "Financial Bid"(Envelope-II). Both the envelopes shall then be sealed in one outer envelope i.e. Envelope –I superscribed as below

(a) The inner and outer envelopes shall be addressed to the [*Insert Designate & Address of Local Body*]

(b) Bear the name and address of the Bidder, Tender No., Due Date and a warning "Do not open before [*insert date of opening* of tender]" to be completed with the time and date as specified in the invitation for bids.

Sealed tenders must be submitted in an outer envelope duly super scribing "Design, Installation, Erection & Commissioning for 5 Years of Sewage Treatment Plant for capacity of ____MLD at [*insert place of activity*] by using [*insert technology name*]" and other details as mentioned in (b) above, in the Tender Box in [insert name of Local Body], [insert name of place]. First, an application along with credential documents will be opened on [insert date] at 3.30 P.M at [insert name & address]. After scrutinizing of application along with credential documents, the financial bid of the qualifying bidder will be opened. Request for extension of submission date of tenders will not be considered. Tender received after due date and time of submission, will not be accepted.

6. The Earnest Money amounting to [*insert amount of EMD*] as Demand Draft drawn on SBI/Nationalized Bank and drawn in favor of [insert Designate], [*insert name of local body*] should accompany the tender. Tenders received without application along with credential document and earnest money will be treated as invalid.

7. The Employer does not bind himself to accept the lowest or any tender and reserves to himself the right of accepting the whole or any part of the tender and the same at the rates quoted.

8. Canvassing in connection with the tenders is prohibited and the tenders submitted by the contractor who resort to canvassing are liable for rejection.

9. The tenderer shall not be permitted to tender for works in the concerned unit of [*insert name of local body*] in which a relative is posted in the grade between the Controller of Administration and Junior Engineer. (Both inclusive) He shall also intimate the names of persons who are working with him in any capacity or subsequently employed by him and who relatives are as mentioned above.

Note: *A person shall be deemed to be a relative of another if, and only if, (a) they are members of a Hindu undivided family; or (b) they are husband and wife; or (c) the one is related to the other in the following manner: Father, Mother (including step mother), Son (including step son), Son's wife, Daughter (including step daughter), Father's father, Son's son, Son's wife, Son's daughter, Son's daughter's husband, Daughter's husband, Daughter's son, Daughter's son's wife, Daughter's daughter, Daughter's husband, Brother (including step brother), Brother's wife, Sister (including step sister), Sister's husband.*

10. Tender submitted shall remain valid for 90 days from the date of opening for the purpose of acceptance and award of work, validity beyond 90 days from the date of opening shall be by mutual consent.

11. The tenderer shall quote rates both in figures and words. He shall also work out the amount for each item of work and writes in both figures and words. On check if there are differences between the rates quoted by the tenderer in words and in figures or in the amount worked out by him, the following procedure shall be followed:

i) When there is a difference between the rates in figures and in words, the rates, which correspond to the amounts worked out by the tenderer, shall be taken as correct

ii) When the tenderer does not work out the amount of an item or it does not correspond with the rate written either in figures or in words, the rate quoted by the tenderer in words shall be taken as correct

iii) When the rate quoted by the tenderer in figures and in word tallies but the amount is not worked out correctly the rate quoted by the tenderer shall be taken as correct and not the amount

iv) The schedule of quantity contains same item in different/same head. The bidder is supposed to quote same rate in different/same head. If quoted differently lowest rate in any of the head will be considered for preparation of comparative statement for complete bid document

12. The tenderer should see, drawings and in case of doubt obtain required particulars, which may in any way influence his tender from the Engineer as no claim whatsoever will be entertained for any alleged ignorance thereof.

13. Before tendering, the tenderer shall inspect the site to fully acquaint himself about the condition in regard to accessibility of sight, nature and extent of ground, working conditions of the site and locality including stacking of materials, installations of tools and plants (T&P) etc., conditions affecting accommodations and movement of labour etc. required for the satisfactory execution of the work contract. No claim whatsoever on such account shall be entertained by the Employer in any circumstances.

14. Earnest money will be forfeited fully if the contractor fails to commence the work as per letter of award. If any tenderer withdraws this tender within the validity period or makes any modification in terms and conditions of the tender which are not acceptable to the Department, then [*insert Name of Local Body*] shall, without prejudice to any right or remedy, be at liberty to forfeit 50% (fifty percent) of the Earnest Money absolutely.

15. Except writing rates and amount, the tenderer should not write any conditions or make any changes, additions, alterations and modifications in the printed form of tenders. Tenders who are desirous to offer rebate the same should be brought out separately in the covering letter and submitted along with the tender.

16. Some of the provisions of General Conditions of Contract are given below. Interpretation, however, shall be as given in the General Conditions of Contract.

A. DEFECTS LIABILITY PERIOD - Twelve months from the date of completion as certified by the Employer.

B. MINIMUM VALUE OF WORK FOR THE INTERMEDIATE CERTIFICATE 30,00,000 (Rupees Thirty Lakh only). Intermediate certificate or a lesser amount can be admitted for payment at the discretion of the Engineer.

C. SECURITY DEPOSIT - A sum @ 10% of the gross amount of the bill shall be deducted from each running bill of the contractor till the sum along with the sum already deposited as earnest money, will amount to security deposit of 5% of the tendered value of the work. In addition, the contractor shall be required to deposit an amount equal to 5% of the tendered value of the contract as Performance Security within the period prescribed for commencement of work in the letter of award issued to him.

D. COMPENSATION - Contractor shall pay as compensation an amount equal to one percent or such smaller amount as the Employer (whose decision in writing, shall be final) may decide on the cost of the whole work as shown in the agreement for every week that the work remains un-commenced or unfinished or due quantity of work remains incomplete after the proper dates. The compensation to be paid shall not exceed ten percent of the tendered cost of the work as shown in the agreement

17. Stores to be issued: The department will issue no material. The contractor has to arrange all materials, including cement & steel required for this work.

18. For all specialist jobs e.g. lights, air conditioning, public address, fire protection, security / surveillance and building management systems, technical (Covering also general conditions and commercial terms) and financial offers will be given separately in two sealed envelopes.

19. The contractor shall have to arrange all the material of approved make as approved by the Engineer in- charge.

20. Site Documents: After the commencement of work, the following site documents need to be maintained by the contractor as per the instruction of Engineer-in-charge and submitted to the department on a daily basis.

A. Site Order Book
B. Material Register
C. Hindrance Register

D. Cement Consumption Register

E. Labour Register

21. Other instructions

A. The rates should include for all safety measures, including scaffolding and tools & plants as required for the work mentioned in the schedule of quantity.

B. The contractor shall be required to bring the all material as per theoretical requirement of the work on site. All these materials shall be stored in an approved manner as per instructions of the Engineer-in-charge.

C. The contractor shall be required to bring the all material as approved by Engineer-in-charge and as per theoretical requirement of the work on site.

D. The contractor has to protect all the materials of the working area with tarpolin, polythelene as the work is required to be done in occupied area.

E. Plain / sand face / grooved surface shall be treated as plain surface and no additional coefficient shall be given while taking / recording the measurement.

F. The contractor shall clean the site in all respect after completion of work.

G. Time for execution of work: -

Working hours: - 9.30 AM to 6.00PM.

Lunch break: - 1.30PM to 2.00PM.

Working days: - Monday to Friday, excluding holidays.

H. On prior intimation in writing contractor may be allowed to work in extended hours beyond normal working hours and / or on Saturdays, Sundays & holidays, if, it is considered necessary in the interest of the work by the Engineer In-charge.

I. While quoting the rate contractor should take into consideration all the above points and nothing shall be paid as extra on the above accounts.

J. The contractor has to produce all Manufacturer Test Certificates (MTC) and Laboratory test certificates for all the materials as instructed by Engineer-in-charge before using at site.

K. Bidder should have valid electrical license or an undertaking confirming that electrical works shall be got done through a licensed electrical contractor (In case of electrical works only).

L. Third Party agency may be deployed by local body for periodic QA/QC inspection during execution of work for maintaining proper quality at site.

22. Additional Conditions Of Cement And Steel

23.1. Conditions For Cement

23.1.1 The contractor shall procure 43 grade (conforming to IS: 269) or 53 grade (conforming to IS: 8112) of Ordinary Portland Cement or Portland Pozolona Cement, as

required in the work, from reputed manufacturers or its authorized dealers or distributors of cement such as ACC, ULTRA TECH, Birla Gold, Manikgardh, others Cement as approved and having ISI certification marks of their product whose name shall be got approved from the Engineer-in-charge. Supply of cement shall be taken in 50Kg bags bearing the manufacturer's name and ISI marking, samples of cement arranged by the contractor shall be taken by the Engineer-in-charge and got tested in accordance with provisions of relevant BIS codes. In case test results indicate that the cement arranged by contractor does not conform to the relevant BIS codes, the same shall stand rejected and shall be removed from the site by the contractor at his own cost within a week's time of a written order from the Engineer-in-charge to do so.

23.1.2 The cement shall be brought at site as per the work requirement or as decided by the Engineer-in-charge.

23.1.3 The cement go- down of the capacity as per the nature of the work and shall be constructed by the contractor on site of work for which no extra payment shall be made. Double lock provisions shall be made for the door of the cement go-down. The keys of one lock shall remain with the Engineer-in-charge or his authorized representative and the key of the other lock shall remain with the contractor. The contractor shall be responsible for the watch and ward and safety of the cement godown. The contractor shall facilitate the inspection of the cement go-down by the Engineer-in-charge at any time.

23.1.4 The contractor shall supply free of charge the cement required for testing. The cost of tests shall be borne by the contractor.

23.1.5 The actual issue and consumption of cement on the work shall be regulated and proper accounts maintained as provided in Clause 6 of the contract. The theoretical consumption of cement shall be worked out as per the procedure prescribed in the contract and shall be governed by the conditions laid therein.

23.1.6 Cement brought to site and cement remaining unused after completion of work shall not be removed from site without written permission of the Engineer-in-charge.

23.2 Conditions For Steel

23.2.1 The contractor shall procure steel reinforcement bars conforming to relevant BIS codes from reputed manufacturers or its authorized dealers or distributors as approved by the Engineer-in-charge. The contractor shall have to obtain and furnish test certificates to the Engineer-in-charge in respect of all supplies of steel brought by him to the site of work. Samples shall also be taken and got tested by the Engineer-in-charge as per the provisions in this regard in relevant BIS codes. In case the test results indicate that the steel arranged by the contractor does not conform to BIS codes, the same shall stand rejected and shall be removed from the site of work by the contractor at his cost within a week's time from written orders from the Engineer-in-charge to do so.

23.2.2 The steel reinforcement shall be brought to the site as per the requirement of the work or as decided by the Engineer-in-charge.

23.2.3 The steel reinforcement shall be stored by the contractor at the site of work in such a way as to prevent distortion and corrosion and nothing extra shall be paid on this account. Bars of different sizes and lengths shall be stored separately to facilitate easy counting and checking.

23.2.4 For checking nominal mass, tensile strength, bend test, re-bend test, etc., specimen of sufficient length shall be cut from each size of the bar at random at a frequency not less than that specified below:

Size of Bar	For consignment below 100 tones	For consignment over 100 tones
Under 10 mm dia	One sample for each 25 tons or part thereof.	One sample for each 40 tons or part thereof.
10 mm to 16 mm dia	One sample for each 35 tons or part thereof	One sample for each 45 tons or part thereof.
Over 16 mm dia	One sample for each 45 tons or part thereof	One sample for each 50 tons or part thereof.

23.2.5 The contractor shall supply free of charge the steel required for testing. The cost of tests shall be borne by the contractor.

23.2.6 The actual issue and consumption of steel on the work shall be regulated and proper accounts maintained as provided in the contract. The theoretical consumption of steel shall be worked out as per procedures in various Clauses of the contract and shall be governed by the conditions laid therein.

23.2.7 Steel brought to site and steel remaining unused shall not be removed from site without the written permission of the Engineer-in-charge.

24. Tenderers should submit the proof of their registration with the GST Department of Maharashtra State. GST on work contract shall be deducted by the employer as per prevailing GST Law from the value of the work done payable to the contractor.

25. Use of correcting fluid, anywhere in tender document is not permitted. Such tender is liable for rejection. Contractors should quote rates in figures as well as words for all the items and should not leave the rate blank / un-quoted. In event, no rate has been quoted for any item(s), leaving space both in figure(s), word(s), and amount blank, it will be presumed that the contractor has included the cost of this/these item(s) in other items and rate for such item(s) will be considered as zero and work will be required to be executed accordingly.

26. Clause 28 of the General Condition of Contract for works, i.e. “ESCLATION” will not be applicable to this contract.

27. Building and other construction workers Cess as applicable in the state which is 1% (one percent) and shall be deducted by the employer from the value of work done payable to the contractor.

28. The rates quoted by the contractor must be inclusive of all taxes including GST.

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7. Form ITB –Instructions to Bidders

1.0 Import License and Foreign Exchange

In respect of the work on contractors own design, the contractor shall quote for the indigenous equipment only. Foreign exchange and import license required by the contractor if any shall have to be arranged by the contractor independently. Department shall not take any responsibility in this regards. Delay in getting any materials shall not be entertained for extension of time limit of the contract.

2.0 Acquaintance with Works And Site Conditions

The contractor shall be deemed to have carefully examined the scope of work, location and alignment of various components under this tender, site conditions, the general conditions, the specifications, drawing availability of material required etc. and has fully acquainted himself regarding all aspects of works, if he shall have any doubt as to the meaning of any portion of the tender papers. He shall set forth the particulars of the tender to the notice of Local Body before submission of tender and get the doubts cleared. Once the tender is submitted duly filled, he shall be supposed to have accepted the conditions and specifications full and interpretation of the conditions be entirely at the discretion of the competent authority of the department.

3.0 Obstructions in The Work

All obstructions such as electric cables, telephone line, water and sewer mains, manholes, natural drainage, culverts, storm water drains etc. corning in the way shall be carefully looked after against any damages which otherwise will have to be made good by the contractor at his own cost. Any work of removing, repairing or remaking etc will be carried out by the contractor without any extra claims for the same in contractor with the respective departments.

4.0 Land For The Use By The Contractor For Storing Materials Etc.

As far as possible the contractor shall be allowed to use the Municipal Land without any charge, in possession of concern MC for stacking his materials, stores, erection of temporary structures, sheds etc with prior written permission of Hydraulic Engineer /Commissioner, MC. The location of the temporary structures to be erected shall be got approved from the Hydraulic Engineer and all the products obtained after cutting the same shall be stacked at suitable place as directed by Engineer in charge. All concern MC land occupied by the contractor for temporary use shall be handed over back in good conditions to the entire satisfactions of the concern MC. as and when demanded by him. Any damage or alterations made in the area shall be made good by the

contractor. If the departmental land is not available the contractor has to make his own arrangements of land on hire or otherwise at his own cost.

5.0 Labour Camps

The contractor shall at his own expenses make all necessary provisions for land, housing grains, water supply and sanitary arrangements etc for employees and shall pay direct to the authorized concerned all rents, taxes and other charges. The contractor shall also comply with all requirements of health department in regard to maintenance of anti-epidemic conditions.

6.0 Works through other Agency in the Same Area

The Head of Local Body shall have the right to execute the works, not included in this contract, but within the premises occupied by the contractor for the purpose of this contract, through any other agency.

7.0 Specifications

The wording of items in Schedule shall be taken as guidelines for general provisions and coverage under the item. The detailed specifications for relevant items shall be as per detailed specifications enclosed as per P.W.D. Hand Book, Standard Specifications, Relevant and latest editions of I.S. Code. The other standard, wherever quoted, shall be applicable. If the standard specifications fall short for the items quoted in the Schedule of this contract, reference shall be made to the latest Indian Standard Specifications, IRC codes. If any of the items of the contract do not fall in reference quoted above, the decision and specification as directed by the Executive Engineer/Engineer in charge/Chief officer shall be final.

It is presumed that the Contractor has gone carefully through the standard specification (Vol. , ft II, 1981 edition) and the Schedule of rate of the Division, and has also studied site conditions before arriving at rates quoted by him. The special provisions and detailed specification of wording of any item shall gain precedence over the corresponding contrary provisions (if any) in the standard specification given without reproduction the details in contract. Decision of Executive Engineer /Engineer in charge/Chief Officer shall be final in case of interpretation of specifications.

8.0 Water and Electricity

The contractor shall make his own arrangements at his own cost for water required for construction and hydraulic testing as well as for labour camp. The Local Body does not take any responsibility for supply of water to contractor for construction or testing

purposes during the entire work. If water is supplied by Corporation, Contractor shall take connection at his cost and provide water meter on it. Water charges shall be paid by contractor as per prevailing water rates to Local Body regularly every month. Power supply from MSEDCL if required for construction of work as well as for labour camp will have to be arranged by the contractor at his cost. Local Body does not take guarantee for continuous power supply at site.

9.0 Line Out

The contractor shall himself carryout the line out of works in the presence of the representative of the Corporation and the contractor shall be responsible for accuracy of it. He shall employ a qualified Engineer for this purpose as well as for supervision of works.

10.0 Programme And Progress Schedule

The contractor shall furnish within 15 days from the date of work order a progress schedule indicating the date of starting, quarterly progress expected to be achieved and anticipated date of completion of each major item of the work. The schedule should be capable of achievement towards completion of whole work in the stipulated time.

The Contractor shall submit his own programme as per time limit stipulated in the tender, in the form of Bar Chart which should give details of milestones of physical stages of each sub work. Simultaneously with the execution of the Contract Agreement, the Contractor shall submit to The Engineer his item· wise monthly programme, which shall be nothing but detailing of the programme,

The programme shall also state the milestones of part commissioning and part completion of the sub·work included in the tender. The programme shall also provide the information as to required approvals to drawings, samples, materials, equipments and their time of submissions to the Corporation. The progress shall be submitted by the Contractor visa·a·vis programme every month. The works team of the Contractor shall be so motivated to know the balance work at the end of each week and the rate required in the balance period to complete the work and therefore, shall endeavor to complete the task assigned for each week timely. In case, where the updated and revised schedule is required, the same shall be submitted to the owner for approval.

If deviation exceeds 10% in scheduled programme, competent authority has right to reject the tender of successful tenderer

In the event of contractor failing to execute the work as per scheduled programme submitted by him or in the event of unreasonable delay in the part of contractor, he shall

be liable to as compensation an amount at the fixed rate subject to maximum amounting to 10% of the tender cost.

11.0 Checking Quality Of The Work

The Engineer in charge should consider it necessary to satisfy himself to the quality of work, the contractor shall at any time during continuance of the contract period produce sample of work done or if necessary pull down a responsible part of the work enough for such inspection and testing as the Engineer in charge may direct.

The contractor shall make good the same at his cost and to the satisfaction of the Engineer in charge without extra cost.

12.0 Changes

Any marginal and minor changes as may be found necessary by the Engineer in charge during execution shall have to be carried out by the contractor without extra cost.

13.0 Insurance Of Workers

The successful tenderer should get the labour insurance done, on account of risk involved within a month from the date of work order, failing which 1% will be withheld from the R. A. bills of the work and it will not be refunded till labour insurance is done and a documentary evidence to this effect is produced by the contractor. The successful contractor tenderer should purchase insurance policy identifying the Commissioner therein.

14.0 Arbitration

In case any dispute arises out during execution of works, no arbitrator shall be appointed for redressal of the dispute. In this regard, decision of the Local Body shall be final and remain binding on both parties.

15.0 Intent And Interpretation Of Contract Documents

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

The contractor shall furnish and pay for all labour, supervision, materials, equipment, transportation, construction, equipment and machinery tools, appliances,

water, fuel, power, energy, light, heat, utilities, telephone, storage, protections, safety provisions, and all other facilities like service, incidentals, approaches to site etc any nature whatsoever necessary for the satisfactory and acceptable execution, testing and completion of the work in accordance with the contract documents, ready for use and operation by the owner. The cost of all these arrangements shall be deemed to be included in the contract offer and no separate payment shall be admissible thereof.

16.0 Interpretations

Written clarifications or interpretations necessary for the proper execution or progress of the work, in the form of drawings or otherwise, will be issued with reasonable promptness by the Engineer and in accordance with any schedule agreed upon.

16.1 Drawings

Figured dimensions on drawings shall govern over scaled dimensions and detailed drawings shall govern over general drawings. The Contractor shall submit six sets of drawings according to the design.

16.2 Signed Drawings

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

16.3 Technical Words

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

17. Lands, Condition And Layout (Line Out Of The Work)

17.1 Surveys & Measurements

The contractor shall carefully preserve all surveys as also setting out stakes, reference points, bench marks and monuments. If any stakes, points or benches be removed or destroyed by any act of the contractor or his employees, they may be reset at the contractor's expense. The contractor shall supply without charge the requisite number of persons with the means and materials necessary for the purpose of working survey, setting out works, and counting, weighing and assisting in the

measurement or examination at any time and from time to time of the work or materials.

17.2 Contractors Verification

The Contractor will establish at the work site a substantial B.M. and connect it to a permanent B.M. available in the area with known value. The contractor will then carryout necessary surveys and leveling, covering his work, in verification of the survey data on the working drawings furnished by the Engineer and he will be responsible for establishing the correct lines and levels and verification of the lines and level furnished on the working drawings. If any error has occurred in the work due to non-observance of this clause, the contractor will be responsible for the error and bear the cost of corrective work.

17.3 Site Office

The Contractor shall construct at his cost a semi-permanent nature site office with minimum of 20Sq.m area and shall be provided with minimum two tables, two almaries, six Nos of chairs. The office and the furniture shall be provided and maintained by the contractor throughout the contract period at his cost. The use of the site offices shall be adequate size to accommodate the inspecting Engineers of MJP /IRMA/any other inspection committee/agency appointed by the Government of India /Maharashtra /Collector / Municipal Administration to discuss and review progress of work. No extra payment will be made on this account.

The site office shall be provided at all the conspicuous structures to be constructed I components to be executed.

18. Security Deposit And Indemnity Bond

18.1 Security Deposit

The security deposit shall be returned to the contractor without any interest when the contractor ceases to be under any obligation under the contract. This shall be read with other Clauses of Form for Security Deposit and Defect Liability Clause respectively.

18.2 Loss or Damage Indemnity Bond

The contractor shall be responsible during the progress as well as maintenance for any liability imposed by law for any damage to the work or any part thereof or to any of the materials or other things used in performing the work or for injury to any person or persons or for any property damaged in or outside the work limit.

The contractor shall indemnify and hold the owner and the Engineer harmless against

any and all liability, claims, loss or injury, including costs, expenses, and attorney's fees incurred in the defense of same, arising from any allegation, whether groundless or not, of damage or injury to any person or property resulting from the performance of the work or from any material used in the work or from any condition of the work or work site, or from any cause whatsoever during the progress and maintenance of the work.

19. Supervision And Superintendence

19.1 Supervisory Staff

The contractor shall have experienced technical qualified general supervisor for the work, who is capable of managing and guiding the work and also capable of understanding the instructions given to him by the Engineer in charge from time to time and shall be responsible to carry them out promptly. The contractor shall have during working hours, supervisor of sufficient training and experience to supervise the various items and operations of the work. Further, the Engineer in charge may notice, desire contractor high ranking member to be present on any specified date, the contractor shall comply with such directions Contractor's Supervision

The contractor shall supervise and direct the works efficiently and with his best skill and attention. He shall be solely responsible for means, methods, techniques, procedures and sequences of construction. The contractor shall co· ordinate all parts of the work and shall be responsible to see that the finished work complies fully with the contract documents, and such instructions and variation orders as the Engineer may issue during the progress of the works.

19.2 Agent

The Contractor shall keep on the work at all times during its progress a competent resident agent preferably a qualified and experienced Engineer, capable of managing and guiding the work and understanding the specifications and contract conditions. For this purpose the contractor shall communicate to the Department, name, qualification and experience of such Engineer to be appointed for execution of this work. The agent appointed by the contractor shall not be replaced without ten (10) days written notice to the Engineer except under extraordinary circumstances. The agent shall be the Contractor's representative at the site and shall have authority to act on behalf of the contractor. All communications, instructions and directions given to the agent shall be binding as if given to the Contractor by the Engineer not otherwise required to be in writing will be given or confirmed in writing upon request of the Contractor or in work· order book

20. Care And Use Of Site

The Contractor shall not commence operations on land allotted for work without prior approval of the Engineer. If these lands are not adequate the Contractor may have to make his own arrangements for additional lands required for his use. The contractor shall not demolish, remove or alter any of the structures, trees or other facilities on the site without prior approval of the Engineer. All the area of Contractor's operations shall be cleared before returning them to the Engineer.

21. Overloading

No part of the work or new and existing structures, scaffolding, shoring, sheeting, construction machinery and equipment, or other permanent and temporary facilities shall be loaded more than its capacity. The Contractor shall bear the cost of correcting damage caused by loading or abnormal stresses or pressures.

22. Use Of Explosives

The Contractor shall comply with the laws, ordinances, regulations, codes, orders, other governing the transportation, storage and use of explosives, shall exercise extreme care not to endanger life or property and shall be responsible for all injury or damage resulting from the use of explosives for or on the work.

23. Manufacturer"S Instructions

The Contractor shall compare the requirements of the various manufacturer's instructions with requirements of the contract documents, shall promptly notify to the Engineer in writing of any difference between such requirements and shall not proceed with any of the works affected by such difference shall until an interpretation or clarification is issued pursuant to article.

The contractor shall bear all costs for any error in the work resulting from his failure to the various requirements and notify the owner of any such difference.

24. Protection

The contractor shall take all precautions and furnish and maintain protection to prevent damage, injury or loss to other persons who may be affected thereby. All the works and all materials and equipment to be incorporated therein whether in storage or on the site, under the care, custody or control of the contractor or any of his sub-contractors and other improvements and property at the site or where work is to be performed including building, tools and plants, pole lines, fences, guard rails, guide posts, culvert and works markers, sign structures, conduits, pipelines and

improvements within or adjacent to streets, right-of-way, or easements, except those items required to be removed by the Contractor in the contract documents. The Contractors protection shall include all the safety precautions and other necessary forms of protection, and the notification of the owners of utilities and adjacent property.

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

25. Utilities And Sub-Structures

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

25.1 Restoration and Repair

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

26. Workmen

The contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the works any unfit person or anyone not skilled and experienced in the assigned task. The Contractor shall in respect of labour employed by him comply with or cause to be complied with the provisions of various labour law and rules and regulations as applicable to them in regard to all matters provided therein and shall indemnify the owner in respect of all claims that may be made against the owner for non-compliance thereof by the Contractor

In the event of the contractor committing a default or breach of any provisions of labour laws and rules and regulations, the Contractor shall without prejudice to any other

liability under the acts pay the owner a sum as decided by the engineer

26.1 Work during Night or On Sundays & Holidays

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

26.2 Workmanship

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

27. Materials And Equipment

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

27.1 Optional Materials

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

27. Use Of Approved Substitutions Or Equals

The contractor shall bear all extra expenses resulting from providing or using approved substitutions or equals where they affect the adjoining or related work, including the expenses of required engineering, redesigning, drafting and permits where necessary, whether the Engineer's approval is given after receipt of tenders.

29. Laws And Regulations

29.1 Governing Law

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

Resolving the disputes: In case of disputes, between a Contractor and Local Body, the

decision of the Commissioner /Chief Engineer / Head of Local Body shall be final and binding. In case of any further dispute, the decision of Member Secretary, MJP, or any other person appointed by the Local body will be final.

30. Burried And Concealed Work

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

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8. Form LLA – Labour Laws Applicable

1.0 Labour Laws to Be Complied By the Contractor

The Contractor shall obtain a valid license under the Contract Labour (Regulation and Abolition) Act1970, and the Contract Labour (Regulation and Abolition) Central Rules 1971, before the commencement of the work, and continue to have a valid license until the completion of the work. The Contractor shall also abide by the provisions of the Child Labour (Prohibition and Regulation) Act, 1986 and the Child Labour (Prohibition and Regulation) Rules, 1988. Any failure to fulfil this requirement shall attract the penal provisions of this Contract arising out of the resultant non-execution of the work.

1.1 Minimum Age Limit for Labour

No labour below the age of 14 (fourteen) years shall be employed on the work.

1.2 Payment of Wages

(i) The Contractor shall pay to labour employed by him either directly or through sub-Contractors, wages not less than fair wages as defined in the Employer's contractor's Labour Regulations or as per the provisions of the Contract Labour (Regulation and Abolition) Act 1970 and the Contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.

(ii) The Contractor shall, notwithstanding the provisions of any Contract to the contrary, cause to be paid fair wage to labour indirectly engaged on the work, including any labour engaged by his sub-Contractors in connection with the said work, as If the labour had been immediately employed by him.

(iii) In respect of all labour directly or indirectly employed in the Works for performance of the Contractor's part of this Contract, the Contractor shall comply with or cause to be complied with the labour regulations made by central government from time to time in regard to payment of wages, wage period, deductions from wages recovery of wages not paid and deductions unauthorized made, maintenance of wage books or wage slips, publication of scale of wages and other terms of employment, inspection and submission of periodical returns and all other matters of the like nature or as per the provisions of the Contract Labour (Regulation and Abolition) Act 1970, and the Contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.

(iv) The Engineer-in-Charge concerned shall have the right to deduct from the moneys due to the Contractor any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfillment of the conditions of the Contract

for the benefit of the workers, non-payment of wages or of deductions made from his or their wages which are not justified by their terms of the Contract or non-observance of the Regulations.

(v) Under the provisions of Minimum Wages (Central) Rules 1950, the Contractor is bound to allow to the labours directly or indirectly employed in the Works one-day rest for 6 days continuous work and pay wages at the same rate as for duty. In the event of default the Engineer-in-Charge shall have the right to deduct the sum or sums not paid on account of wages for weekly holidays to any labours and pay the same to the persons entitled thereto from any money due to the Contractor by the Engineer-in-Charge concerned. 1979 as amended from time to time are inclusive of wages for the weekly day of rest, the question of extra payment for weekly holiday would not arise.

(vi) The Contractor shall comply with the provisions of the Payment of Wages Act, 1936, Minimum. Wages Act, 1948, Employees Liability Act, 1938, Workmen's Compensation Act, 1923, Industrial Disputes Act, 1947, Maternity Benefit its Act, 1961, Factories Act, 1948 and the Contractor's Labour (Regulation and Abolition) Act 1970, or the modifications thereof or any other laws relating thereto and the rules made there under from time to time.

(vii) The Contractor shall indemnify and keep indemnified Employer against payments to be made under and for the observance of the laws aforesaid and the Employer Contractor's Labour Regulations without prejudice to his right to claim indemnity from his sub-Contractors.

(viii) The laws aforesaid shall be deemed to be a part of this Contract and any breach thereof shall be deemed to be a breach of this Contract.

(ix) Whatever is the minimum wage for the time being, or if the wage payable is higher than such wage, such wage shall be paid by the Contractor to the workmen directly without the intervention of jamadar and that jamadar shall not be entitled to deduct or recover any amount from the minimum wage payable to the workmen as and by way of commission or otherwise.

(x) The Contractor shall ensure that no amount by way of commission or otherwise is deducted or recovered by the Jamadar from the wage of workmen.

1.3 Safety provisions for labour

In respect of all labour directly or indirectly employed in the Works for the performance of the Contractors part of this Contract, the Contractor shall at his own expense arrange for the

safety provisions as per Employer's safety Code framed from time to time and shall at his own expense provide for all facilities in connection therewith. In case the Contractor fails to make arrangement and provide necessary facilities as aforesaid he shall be liable to pay liquidated damages of Rs.200/- for each event of default subject to a maximum of 5% of Contract Value, and in addition the Engineer-in- Charge shall be at liberty to make arrangement and provide facilities as aforesaid and recover the costs incurred in that behalf from the Contractor.

1.4 Submission of monthly record of labour

The Contractor shall submit by the 4th and 19th of every month, to the Engineering- Charge a true statement showing in respect of the second half of the preceding month and the first half of the current month respectively:

(i) The number of labourers employed by him on the work,

(ii) Their working hours,

(iii) The wages paid to them,

(iv) The accidents that occurred during the said fortnight showing the circumstances under which they happened and the extent of damage and injury caused by them, and

(v) The number of female workers who have been allowed maternity benefit according to clause 1.6 and the amount paid to them. Failing which the Contractor shall be liable to pay to Employer a sum not exceeding Rs.1000/- for each default or materially incorrect statement. The decision of divisional officer shall be final in deducting from any bill due to the Contract the amount levied as fine and be binding on the Contractor.

1.5 Compliance with health and sanitary arrangements for workers

In respect of all labour directly, or indirectly employed in the Works for the performance or the Contractor's part of this Contract, the Contractor shall comply with or cause to be complied with all the rules framed by Government from time to time for the protection of health and sanitary arrangements for workers employed by the Employer and its Contractors. Further, the Contractor is required to follow the Employer's Safety Code and guidelines published by National Human Rights Commission (N.H.R.C) attached with the tender.

1.6 Leave and pay for female workers

Leave and pay during leave shall be regulated as follows:

1. Leave:

(i) In the case of delivery - maternity leave not exceeding 8 weeks. 4 weeks up to and including the day of delivery and 4 weeks following that day,
(ii) In the case of miscarriage - up to 3 weeks from the date of miscarriage.

2. Pay:
(i) In the case of delivery - leave pay during maternity leave will be at the rate of the women's average daily earnings, calculated on total wages earned on the days when full time work
(ii) Total wages earned on the days when full time work was done during a period of three months immediately preceding the date of such miscarriage.

3. Conditions for the grant of Maternity Leave: No maternity leave benefit shall be admissible to a woman unless she has been employed for a total period of not less than six months immediately preceding the date on which she proceeds on leave.

4. The Contractor shall maintain a register of maternity (benefit) and the same shall be kept at the place of work.

1.7 Noncompliance with Labour rules & regulations

1.7.1 In the event of the Contractor committing a default or breach of any of the provisions of the Employer, Contractor's labour Regulations and model rules for the protection of health and sanitary arrangements for the workers as amended from time to time or furnishing any information or submitting or filing any statement under the provisions of the above Regulations and Rules which is materially incorrect, he/they shall, without prejudice to any other liability, pay to the Employer a sum as liquidated damages equal to Rs 200/- for each event of default per day subject to a maximum of 5% of the Contract Value. In the event of the Contractor defaulting continuously in this respect the liquidated damages may be enhanced to Rs.2000/- per event for each day of default subject to a maximum of 5 % of the Contract Value. The decision of the Engineer-in-Charge shall be final and binding on the Contractor.

1.7.2 Should it appear to the Engineer-in-Charge that the Contractor is not properly observing and complying with the provisions of labour regulations and model Rules and the provisions of the Contract Labour (Regulation and Abolition) Act 1970, and the Contract Labour (Regulation and Abolition) Central Rules 1971, for the protection of health and sanitary arrangements for work- people employed by the Contractor (hereinafter referred as "the said Rules") the Engineer-in-Charge shall have power to give notice in writing to the Contractor requiring that the said Rules be complied with an the amenities prescribed therein be provided to the work-people within a reasonable time to be specified in the notice. If the Contractor shall fail within the period specified in the notice to comply with and/observe the

said Rules and to provide the amenities to the work-people as aforesaid, the Engineer-in-Charge shall have the power to provide the amenities hereinbefore mentioned at the cost of the Contractor. The Contractor shall erect, make and maintain at its own expense and to approved standards all necessary huts and sanitary arrangements required for its worker on the Site in compliance with the execution of the Works, and if the same shall not have been erected or constructed, according to approved standards, the Engineer-in-Charge shall have power to give notice in writing to the Contractor requiring that the said huts and sanitary arrangement be remodeled and/or reconstructed according to approved standards, and if the Contract shall fail to remodel or reconstruct such huts and sanitary arrangements according to approved standards within the period specified in the notice, the Engineer-in- Charge shall have the power to remodel or reconstruct such huts and sanitary arrangements according to approved standards at the cost of the Contractor.

1.8 Labour camps and huts

The Contractor shall at his/her own cost provide his/their labour with a sufficient number of huts (hereinafter referred to as the camp) of the following specifications on a suitable plot of land to be approved by the Engineer-in-Charge. In case adequate space is available, the Contractor shall provide labour camps at site, the Employer shall not charge anything for the same. If the space available is not sufficient to house the labour camp, the Contractor shall arrange the land beyond the Site as per his requirement. The Employer may extend help in getting permissions from the land owning agencies but it shall be the responsibility of the Contractor for arranging the same at his own cost. No excuse whatsoever shall be entertained.

(i)a The minimum height of each hut at the eaves level shall be 2.10m (7 ft.) and the floor area to be provided will be at the rate of 2.7 sq.m. (30 sq.ft.) for each member of the worker's family staying with the laborer.

(i)b The Contractor shall in addition construct suitable cooking places having a minimum area of 1.80m x 1.50m (6'x5') adjacent to the hut for each family.

(i)c The Contractor shall also construct temporary latrines and urinals for the use of the labourers each on the scale of not less than four per each hundred of the total strength, separate latrines and urinals being provided for women.

(i)d The Contractor shall construct sufficient number of bathing and washing places, one unit for every 25 persons residing in the camp. These bathing and washing places shall be suitably screened.

(ii)a All the huts shall have walls of sun-dried or burnt-bricks laid in mud mortar or other suitable local materials as may be approved by the Engineer-in- Charge. In case of sundried bricks, the walls should be plastered with mud gobri on both sides. The floor may be kutcha but plastered with mud gobri and shall at least 15cm (6") above the surrounding ground. The roofs shall be laid with thatch or any other materials as may be approved by the Engineer-in-Charge and the Contractor shall ensure that throughout the period of their occupation the roofs remain water-tight.

(ii)b The Contractor shall provide each hut with proper ventilation.

(ii)c All doors, windows, and ventilators shall be provided with suitable leaves for security purposes.

(ii)d There shall be kept an open space of at least 7.2m (8 yards) between the rows of huts which may be reduced to 6m (20 ft.) according to the available of Site with the approval of the Engineer-in-Charge. Back to back construction will be allowed,

(iii) Water Supply: The Contractor shall provide adequate supply of water for the use of labourers.

(iv) The site selected for the camp shall be high ground, removed from Jungle.

(v) Disposal of Excreta: The Contractor shall make necessary arrangements for the disposal of excreta from the latrines by trenching or Incineration, which shall according to the requirements lay down by the Local Health Authorities. If trenching or incineration is not allowed the Contractor shall make arrangements for removal of the excreta through the Municipal Committee/Employer and inform it about the number of labourers employed so that arrangements may be made by such committee/authority for the removal of the excreta. All charges on this account shall be borne by the Contractor and paid direct by him to the Municipality/Employer. The Contractor shall provide one sweeper for every eight seats in case of dry system.

(vi) Drainage - The Contractor shall provide efficient arrangements for draining away a sullage water so as to keep the camp neat and tidy.

(vii) The Contractor shall make necessary arrangements for keeping the camp a sufficiently lighted to avoid accidents to the workers.

(viii) Sanitation - The Contractor (s) shall make arrangements for conservancy and sanitation in the labour camps according to the rules of the Local Public Health and Medical Authorities. On completion of the Works the Contractor shall remove

hutments failing which the Employer will dismantle and clear the site at his risk and cost.

1.9 Employment of Controlled Area Labour Not Permissible

1.9.1 The Contractor shall not employ controlled area labour falling under any category whatsoever on or in connection with the Works or recruit labour from area within a radius of 32 km (20 miles) of the controlled area. Subject as above the Contractor shall employ imported labour only i.e., deposit imported labour or labour imported by Contractors from area, from which import is permitted.

1.9.2 Where ceiling price for imported labour has been fixed by State or Regional Labour Committees not more than that ceiling price shall be paid to the labour by the Contractor.

1.9.3 The Contractor shall immediately remove any labourer who may be pointed out by the Engineer-in-Charge as being a coal mining or controlled area labourer. Failure to do so shall render the Contractor liable to pay to Employer a sum calculated at the rate of Rs.10/- per day per labourer. The certificate of the Engineer-in- Charge about the number of controlled area labourer and the number of days for which they worked shall be final and binding upon all parties to this Contract.

1.9.4 It is declared and agreed between the parties that the aforesaid stipulation in this clause is one in which the 'public are interested within the meaning of the explanation in Section 74 of Indian Contract Act, 1872.

Explanation: Controlled Area means the following areas: Any other area, which may be declared a Controlled Area by or with the approval of the Central Government.

1.10 Apprentices Act Provisions To Be Complied With

The Contractor shall comply with the provisions of the Apprentices Act, 1961, Apprenticeship Rules, 1992 and other rules and orders issued there under from time to time. If he fails to do so, his failure will be a breach of the Contract and the Engineer-in-Charge may, in his discretion, cancel the Contract. The Contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the said Act.

1.11 Labour Disputes

1.11.1 The Contractor shall at all the times during the progress of Works 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 work and shall preserve peace and protection of the inhabitants and the security of property in the neighborhood of the Works.

1.11.2 In case of any disputes with labour (skilled or unskilled) and charges are claimed against the Contractor, the Engineer-in-Charge shall have the full authority to deduct the same from the bill of the Contractor, so as to enable him to settle the disputes.

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9. Form HSE – Health Safety & Environment

Health, Safety and Environment Standards

The Contractor shall at all times maintain a safe system of working and working environment and shall comply with all enactments, regulations and working rules relating to safety, security, health and welfare of all persons who may be affected by his work. CPWD/ State PWD/ state Government/ local body's code shall be followed by the contractor for maintaining safety and security at plant site.

Nothing which has been written into or omitted shall be taken to relieve the Contractor from his obligations under this clause. No clause in this Employer's Requirements shall prevent the Contractor from drawing the attention of the Employer's Representative to any feature of the Works which is not consistent with normal safety practices nor prevent him from putting forward proposals at any time which would increase the safety of the installations.

Not later than four weeks before work commences on the Site, the Contractor shall submit to the Employer's Representative his comprehensive proposals relating to the safety, health and welfare of all personnel on the Site.

The Contractor shall appoint a suitably qualified representative as Safety Officer who shall be responsible for the implementation of site safety procedures.

The proposals shall be appropriate for all grades of labour and personnel who will work on or visit the Site on behalf of the Employer, Employer's Representative or Contractor. The Employer's Representative shall have the power to stop any activity or work in any area where there is a breach of the published site safety rules due to which health or life is put at risk.

The Contractor shall bring any violation of Site safety rules by others to the attention of the Employer's Representative in writing. The Contractor shall provide at the Site such life-saving apparatus as may be appropriate and an adequate and easily accessible first aid outfit or such outfits as may be required by any government ordinances, factories acts, etc, published and subsequently amended from time to time.

The Contractor shall possess the valid electrical contractor's license of appropriate class from the concerned statutory bodies governing the area of work place. The Contractor shall fully comply with the relevant statutory rules and regulations and shall ensure safety of personnel and equipment. A prior approval from the Employer shall be sought before employing the electrical contractor. The Contractor shall be responsible for the electrical safety of all Plant supplied and installed. Whilst any equipment is being installed or tested,

the Contractor shall ensure that all necessary precautions are taken to safeguard personnel working on site.

The Contractor shall ensure that the operations entailed in the construction of the Works do not cause annoyance to others working on the Site or to persons living adjacent to the Site.

During construction of the Works, statutory safety signs shall be adequately provided throughout the Works, both indoors and outdoors. These safety signs shall cover mandatory, prohibition, warning, emergency, fire-fighting and general notices. All signs shall be positioned around the Works at highly visible points with fluorescent colors where necessary. Provision of signs and the positions of signs shall be subject to the Employer's Representatives approval. Special attention shall be given to areas designated hazardous. Warning signs shall be written in English, Urdu, Hindi & Marathi as applicable.

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10. Form ELI-1: Bidder Information Form

Date: *[insert day, month, year]*

Page*[insert page number]*of *[insert total number]*pages

[Bidders shall provide the following information:]

Bidder's legal name *[insert full name]*
In case of a JV, legal name of the representative member and of each member: *[insert full name of each member in the JV and specify the representative member]*
Bidder's actual or intended country of registration: *[insert country of registration]*
Bidder's actual or intended year of incorporation: *[insert year of incorporation]*
Bidder's legal address in country of registration: *[insert street/ number/ town or city/ country]*
Bidder's authorized representative information Name: *[insert full name]* Address: *[inset street/ number/ town or city/ country]* Telephone/Fax numbers: *[insert telephone/fax numbers, including country and city codes]* E-mail address: *[insert E-mail address]*
1. Attached are copies of original documents of ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or documents of registration of the legal entity named above, in accordance with ITB 4.3. ☐ In case of JV, letter of intent to form JV or JV agreement, in accordance with ITB 4.1. 2. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

Form ELI-2: Bidder's Party Information Form

Date: *[insert day, month, year]*

Page *[insert page number]* of *[insert total number]* pages

[The following form is additional to Form ELI-1, and shall be completed to provide information relating to each JV member (in case the Bidder is a JV) as well as any specialist subcontractor proposed to be used by the Bidder for any part of the Contract resulting from this process.]

Bidder's legal name: *[insert full name]*
Bidder's Party legal name: *[insert full name of Bidder's party]*
Bidder's Party country of registration: *[insert country of registration]*
Bidder's Party year of incorporation: *[insert year of incorporation]*
Bidder's Party legal address in country of registration: *[insert street/ number/ town or city/ country]*
Bidder's Party authorized representative information Name:*[insert full name]* Address: *[insert street/ number/ town or city/ country]* Telephone/Fax numbers: *[insert telephone/fax numbers, including country and city codes]* E-mail address:*[insert E-mail address]*
1. Attached are copies of original documents of ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or registration documents of the legal entity named above, in accordance with other Clauses. 2. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

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11.Form LoE – List of Equipments

[insert day, month, year]
Bidder's Legal Name: *[insert full name]*
Joint Venture Party Legal Name:*[insert full name]*
Page *[insert page number]* of *[insert total number]* page

[The Bidder shall provide adequate information to demonstrate clearly that it has the capability to meet the requirements for the key equipment listed in various Sections of Evaluation and Qualification Criteria. A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder.]

Item of equipment		
Equipment information	**Name of manufacturer**	**Model and power rating**
	Capacity	**Year of manufacture**
Current status	**Current location**	
	Details of current commitments	
Source	**Indicate source of the equipment** ☐ **Owned** ☐ **Rented** ☐ **Leased** ☐ **Specially manufactured**	

Omit the following information for equipment owned by the Bidder.

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

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12. Form PER - Resume of Proposed Personnel

[insert day, month, year]

Bidder's Legal Name: *[insert full name]*

Joint Venture Party Legal Name:*[insert full name]*

Page *[insert page number]* of *[insert total number]* page

[The Bidder shall provide the data on the experience of the personnel indicated in Form PER-1, in the form below:]

Name of Bidder

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

[Summarize professional experience over the last 20 years, in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.]

From	To	Company / Project / Position / Relevant technical and management experience

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13. Form PPR - Proposed Personnel

[insert day, month, year]

Bidder's Legal Name: *[insert full name]*

Page *[insert page number]* of *[insert total number]* page

[The Bidder shall provide the names of suitably qualified personnel to meet the specified requirements stated in various Sections of Evaluation and Qualification Criteria]

1.	**Title of position***
	Name
2.	**Title of position***
	Name
3.	**Title of position***
	Name
4.	**Title of position***
	Name

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14. Form NPC: Historical Contract Non-Performance

Date: *[insert day, month, year]*
Bidder's Legal Name: *[insert full name]*
Bidder's Party Legal Name:*[insert full name]*
Page *[insert page number]* of *[insert total number]* pages

[The following table shall be filled in for the Bidder and for each member of a JV]

1. History of Non-Performing Contracts

Non-Performing Contracts			
☐ Contract non-performance did not occur since 1st January *[insert year*], as appropriate. ☐ Contract(s) not performed since 1st January *[insert year]*, as appropriate, is(are) indicated below:			
Year	**Non- performed portion of contract**	**Contract Identification**	**Total Contract Amount (current value, currency, exchange rate and USD equivalent)**
[insert year]	*[insert amount and percentage]*	Contract Identification: *[insert complete contract name, number, and any other identification]* Name of Employer: *[insert full name]* Address of Employer: *[insert street/city/country]* Reason(s) for non-performance: *[indicate main reason(s)]*	*[insert amount]*

2. Pending Litigation

Pending Litigation				
☐ No pending litigation as appropriate. ☐ Pending litigation as appropriate, is indicated below:				
Year of dispute	**Amount in dispute (currency)**	**Outcome as Percentage of Net Worth**	**Contract Identification**	**Total Contract Amount (current value, currency, exchange rate and USD equivalent)**
[insert year]	*[insert amount]*	*[insert percentage]*	Contract Identification: *[indicate complete contract name, number, and any other identification]* Name of Employer: *[insert full name]* Address of Employer: *[insert street/city/country]* Matter in dispute: *[indicate main issues in dispute]* Status of dispute: *[Indicate if it is being treated by the Adjudicator, under Arbitration or being dealt with by the Judiciary]*	*[insert amount]*

3. Litigation History

Litigation History		
☐ No court/arbitral award decisions against the Bidder since 1st January *[insert year],* as appropriate. ☐ Court/ arbitral award decisions against the Bidder since 1st January *[insert year],* as appropriate, are indicated below:		
Year of Award	**Contract Identification**	**Total Contract Amount (current value, currency, exchange rate and USD equivalent)**
[insert year]	Contract Identification: *[indicate complete contract name, number, and any other identification]* Name of Employer: *[insert full name]* Address of Employer: *[insert street/city/country]* Matter in dispute: *[indicate main issues in dispute]* Party who initiated the dispute: *[indicate "Employer" or "Contractor"]* Status of dispute: *[Indicate if it is being treated by the Adjudicator, under Arbitration or being dealt with by the Judiciary]*	*[insert amount]*

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15. Form BS: Bid Security

(Bank Guarantee)

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: *[Employer to insert its name and address]*

Date: *[Insert date of issue]*

BID GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that *[insert name of the Bidder, which in the case of a joint venture shall be the name of the joint venture (whether legally constituted or prospective) or the names of all members thereof]* (hereinafter called "the Applicant") has submitted or will submit to the Beneficiary its Bid (hereinafter called "the Bid") for the execution of *[insert description of contract]* under the Loan Agreement No. *[insert Loan Agreement Number]*.

Furthermore, we understand that, according to the Beneficiary's conditions, Bids must be supported by a bid guarantee.

At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert amount in words]*(*[insert amount in figures]*) upon receipt by us of the Beneficiary's complying demand, supported by the Beneficiary's statement, whether in the demand itself or a separate signed document accompanying or identifying the demand, stating that either the Applicant:

(a) Has withdrawn its Bid during the period of bid validity set forth in the Applicant's Letter of Bid ("the Bid Validity Period"), or any extension thereto provided by the Applicant; or

(b) Having been notified of the acceptance of its Bid by the Beneficiary during the Bid Validity Period or any extension thereto provided by the Applicant, (i) has failed to execute the contract agreement, or (ii) has failed to furnish the Performance Security, in accordance with the Instructions to Bidders of the Beneficiary's bidding documents.

This guarantee will expire and shall be returned: (a) if the Applicant is the successful Bidder, upon our receipt of copies of the contract agreement signed by the Applicant and the Performance Security issued to the Beneficiary in relation to such contract agreement; or (b) if the Applicant is not the successful Bidder, upon the earlier of (i) our receipt of a copy of the Beneficiary's notification to the Applicant of the results of the bidding process; or (ii)twenty-eight days after the end of the Bid Validity Period.

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

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010

Revision, ICC Publication No. 758.

_____

[signature(s)]

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

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16. Form CBD – Contractor's Bid Capacity

The bidder shall have a bid capacity more than the value of this bid. Bidding capacity of contractor for completion of work will be decided by following formula.

BIDDING CAPACITY = 2 N (A – B)

Where

A = Maximum value of audited turnover executed by the contractor in any one year, during the last three years, upgraded to the present year (i.e. tender accepted year) by the formula given below

(WPI Present= WPI Max. value years)	Maximum Value of Audited Turnover executed in a year
1 + WPI Max. value years	

Where: WPI Present: Wholesale price index of the month and year in which tender is invited.

WPI: Max. value years: Average wholesale price index of the year in which the max. value of audited turnover executed.

N: Number of years prescribed for completion of the work for which present bid is invited.

B: Value of existing commitment of ongoing work (i.e. Work in hand)

Sr. No	Name of Works	Name of Division /MC	Accepted Tender Cost.	Amount of Work Completed			Amount of Balance Work	Remark
				2016-17	2017-18	2018-19		
1	2	3	4	5	6	7	8	9

Details of audited turnover executed by the contractor in last three years and existing commitment of ongoing work:

(Rs. In Crore)

Abstract for BID capacity Calculation:

Year	Max. value of audited turn over in the year	Maximum value of audited turnover executed by the contractor in any one year, during the last three years	Remarks

		Value	**Year**	
1	**2**	**3**	**4**	**5**
2013-14		**(Note: Write the max value here)**	**(Note: Write concerned year here)**	
2014-15				
2015-16				

Details of existing commitment: (Rs. In Crore)

Year	**Value of existing commitment of ongoing work to be completed during next N years**	**Total value of existing commitment of ongoing work to be completed during next N years. (B)**
1	**2**	**3**
2016-17		
2017-18		
2018-19		
2019-20….		

Maximum value of audited turnover executed in any one year during last Three years upgraded to present year (i.e. Tender acceptance year) by increasing the cost as per rise in whole sale price index between the year of maximum value and year of tender acceptance

(A) = No. of year prescribed for completion of work for which present tender are invited (N) = Total value of existing commitment of ongoing work to be completed during next N years

(B) = Bid Capacity = 2 N (A – B)

Note:

- Since all the data is pertaining to the contractors own performance, the contractors are requested to provide its bidding capacity for this work by furnishing the calculations and supporting documents duly certified by Chartered Accountant to prove its contentions along with the application for issue of tender form
- Details of audited turnover with name of work, year wise expenditure etc. shall be provided. It should be certified by the Chartered Accountant
- The statement showing the value of existing commitments of ongoing works during next three years for each of works in the list should be counter signed by Chartered

Accountant

- Submission of false information results in blacklisting of the contracting agency
- If support documents are not found uploaded, bid capacity will not be taken into account which will result in disqualification for this tender

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17. ***Form CHL&S – Checklist & summary for Bidders***

Sr. No.	Item	Contract Data
1.	Employer's Name and Contact Information	[*Insert name of Head of Local Body*], [*Insert name of Local Body*], [*Insert Address*], [*Insert Pincode*] Maharashtra Tel: _____ e-mail: _____
2.	Contractor's Name and Address	[*To be inserted by the intending bidder*]
3.	Engineer's Name and Address	
4.	Time for Issue of the Notice to Commence	[Insert Days]
5.	Time for Completion of Works	1. "Works Contract" - ____ Months (____ months of construction work and 6 months of trial run and commissioning) 2. "O&M Contract" - One Year Defect Liability Period and 5 years of O&M Period (from taking over of Section A).
6.	Defect Liability Period	One (5) Year – O&M during this period shall be done by the contractor and Local Body shall make the payment as per contract conditions.
7.	Sections	1. - Design, Supply, Construction, Commissioning, Tests on Completion of the Works. 2. – Operation and Maintenance of the Works
8.	Electronic transmission systems	E-mail will be an acceptable form of electronic transmission system, provided a signed hard copy of the entire contents of the E-mail, including any attachments, is received within seven (7) days of the transmission of the e-mail.
9.	Governing Law	Law of the Republic of India
10.	Ruling Language	English
11.	Language of Communications	English
12.	Submission of Construction Documents	28 Days
13.	Confidential Details	[Bidder to list details that they will not be required to disclose]
14.	Time for access to the Site	14 Days
15.	Time for Submission of Performance Security	1. – within 15 days of issue of Letter of Acceptance 2. – within 30 days after the successful completion of Defect Liability Period.

Sr. No.	Item	Contract Data
16.	Amount of Performance Security	1. - Five (5) percent of Works Contract Price 2. - Five (5) percent of O&M Contract Price
17.	Return of Performance Security	1. – The Performance Security shall be released to the Contractor after the issuance of Works Contract Completion Certificate or 30 (Thirty) days after the successful completion of Defect Liability Period, whichever is later. 2. – Performance Security shall be reduced annually after adjusting the cost of accepted O&M Contract Price for previous year.
18.	Period for notifying unforeseen errors, faults and defects in the Employer's requirements	28 Days
19.	Normal Working Hours	1. – Normal hours during which work will be permitted to be carried out at the Site shall be between 08:00hrs to 18:00hrs, Monday to Saturday, excluding gazetted and national holidays. The Contractor shall be responsible to obtain the written consent of the Employer's Representative if he desires to work outside these times during the execution of work till wet run test. 2. - Operation and Maintenance shall be carried out 24 hours a day, 7 days a week, for all days of the year including national holidays.
20.	Time for Submission of Program	28 Days
21.	Delay Damages for Works	2.0% of accepted Works Contract Price applicable to Section A, for each month of delay to be computed on per day basis, in the same currency / currencies in which the Works Contract Price is payable.
22.	Maximum amount of Delay Damages for Works	10% of accepted Works Contract Price applicable to construction work (CIVIL & E & M)
23.	Maximum total liability of the Contractor to the Employer	Equal to accepted Works Contract Price
24.	Periods of submission of insurance: a) evidence of insurance b) relevant policies	 Not later than the Commencement Date 14 Days after the Commencement Date
25.	Amount of Insurance for Works and Contractors equipment	Total of 15% of the Accepted Works Contract Price applicable to Section "Works Contract".

Sr. No.	Item	Contract Data
26.	Period of Submission of Evidence of Insurance	The Contractor shall provide the Employer with evidence that the insurances required have not been affected not later than the Commencement Date.
27.	Minimum amount of Third Party Insurance	The Contractor shall take out and maintain, for the duration of the Contract Period, third party liability insurance in an amount of not less that INR 2,500,000.00 only per occurrence or event with coverage for not less than 4 (four) occurrences or events. Each time any event occurs or a claim is made under such insurance policy, the Contractor shall immediately extend the coverage by adding an additional event so that the minimum coverage of four events is maintained in force at all times.
28.	Total amount of compensation payable by the Contractor to the Employer	Equal to accepted O&M Contract Price

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18. Form DoSV – Declaration of Site Visit

[*Insert NAME OF THE LOCAL AUTHORITY*]

Name of Works – Wastewater Management Project for _____
Technology: [*insert name of technology*]
[Insert Taluka]
[Insert District]

DECLARATION

I/We hereby declare that I/We have visited the site of work and made myself/ourselves thoroughly conversant with local conditions regarding all materials such as stones, Murum, sand, bio media, availability of water etc. and labour, on which I / We have based my / our rates for this work. The specifications and requirements of lead for this work have been carefully studied and understood by me / us before submitting the tender. I undertake to use only the best materials, to be approved by the Executive Engineer in charge of the work or his duly authorized representative, before starting the work and also to abide by his decision.

I hereby undertake to pay the labours engaged on the work as per Minimum Wages Act, 1984 applicable to the zone concerned.

Contractor's Signature

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1.0 Process Description

1.1 Screen Chamber

The raw sewage will be passed through the bar screen chamber wherein the free, floating, coarse suspended solids having particle size greater than 10-20mm will be trapped and removed. The chamber has to be designed for Peak flow as per considerations of CPHEOO manual

1.1.1 Screens

Mechanical Screens are proposed that shall be fitted with 20mm bar spacing followed by 10mm bar spacing. For flows >1MLD, alternate arrangement of manual screens shall also be done in the same screen chamber. The system shall also be augmented with screened material collection & disposal system.

1.2 Collection cum Equalization Tank

The sewage from screen chamber shall be collected in a collection tank. Effective residence time shall be given for the effluents to reside and achieve stable pH conditions whatever possible to minimize fluctuations in the overall treatment as well as to minimize or avoid the use of chemicals for neutralization. This tank shall also be used as flow regulation chamber in case if the influent is connected from pumping stations. However, for conventional systems such as ASP, MBR, MBBR, SAFF, FAB, SBR & others effective aeration shall be provided to avoid aseptic required in collection tank. Cleaning mechanisms shall also be provided

1.3 Sewage Pumping System

The scope of connecting and conveying sewage to the inlet chamber shall be done by the Local Body and battery limits of contractor starts from Screening Process unless it is specified so in tender documents / scope of works. To regulate flow into the system as a constant rate as per design of the STP, submersible pumps with alternate standby arrangements (2W +1S) has to be done

1.4 Flow Measurement

Preferably Electromagnetic flow meters for flows up to 5MLD whereas Ultrasonic flow measurement system for >5MLD flow shall be considered at the pumping system

1.5 Grit Chamber

For flows >1MLD, wastewater from collection tank is pumped into Grit chamber. Grit Chamber is long narrow tank that are designed to slow down the flow so that solids such as sand, grit and other such material will settle down at the bottom which is further collected and sent to Sludge / solids handling system for disposal. Grit causes excessive wear and tear on pumps and other plant equipment. Its removal is particularly important in sources with combined sewer systems, which carry a good quantity of silt, sand, and gravel that wash off streets or land during a storm.

1.6 Solids Removal & Handling System

1.6.1 Conventional Systems

A] Primary Solids Settling

There is no primary solids removal system in case of conventional STP's such as ASP, MBBR, MBR, SBR & others. The flow is directly connected to the aeration / biological reactor tank

B] Secondary Solids Settling

Secondary biological solids from biological reactor i.e. aeration tank shall be settled and removed regularly from conventional STP's. For flow up to 5MLD it is appropriate to use tube settlers whereas for flows >5MLD clarifier mechanisms are more suitable in light of ease of mechanism, shelf life and space requirements. Tube Settlers offer an inexpensive method in sedimentation basins to improve performance. Tube settlers use multiple tubular channels sloped at an angle of 60° and adjacent to each other, which combine to form an increased effective settling area. This provides for a particle settling depth that is significantly less than the settling depth of a conventional clarifier, reducing settling times. The settled sludge is removed from the bottom of the settler and transferred to sludge drying beds for disposal

1.6.2 For Natural Technologies

A] Primary Solids Settling

Being a natural system and gravitational flow method, solids have to be removed from entering into the biological systems such as Phytorid/SBT/DRDO wetland/DEWATS & others. In fact, the Primary solids have to removed efficiently in order to avoid choking of the bed of wetlands or soil systems used in natural technologies to the maximum extent. The same can be achieved using Tube Settlers for flows up to 5MLD whereas Clarifier for flows >5MLD

B] Secondary Solids Settling

There shall be usually no requirement of secondary solids from biological system. This is the added advantage of using natural system wherein no secondary sludge is formed

1.6.3 Sludge Dewatering Systems

Usually, in case of use of mechanical dewatering system, a sludge holding tank shall also be required.

For Primary solids for flows >1MLD, Decanter / Centrifuge system is most suitable. For flows <1MLD, use of filter press or sludge drying beds can be a suitable mechanism.

For secondary sludge for flows >1MLD, Decanter / Centrifuge system is most suitable. For flows <1MLD, use of filter press or sludge drying beds can be a suitable mechanism. However, recent advances in biogas technology can also be utilized for sludge handling from secondary processes for flows >5MLD usually. This shall definitely result in reduction of sludge volume and ease handling of the sludge. Leachate collection shall also be considered usually collected back into the collection cum equalization tank by gravity or pumping as the case may be.

1.7 Secondary Biological System

1.7.1 Conventional Systems

Most of the processes that are proposed to be deployed for STP's are forced aeration based system wherein bacteria utilize dissolved oxygen to break the organically bio degradable components in sewage and convert them into simple inorganic matter thereby reducing the organic load in sewage. In the event of such process, the biota multiples and needs to be constantly removed & recirculate in order to maintain the live biota for effective process efficiency.

A] This can be in form as suspended growth bacterial culture such as those in Activated Sludge Process or Sequential Batch Process

B] It can be attached growth bacterial culture process such as those in SAFF, RBC or Bio towers

C] It can be fluidized attached growth bacterial culture as in case of MBBR / MBR

The system shall be using twin lobe air blowers along with retrievable fine bubble diffusers arrangement to provide aeration to the bacteria

1.7.2 NON- Conventional Systems

In case of Non Conventional natural processes, usually biota of different forms other than bacteria are also used.

A] In case of constructed wetlands mainly Phytorid, plants along with bacteria supported by plant roots are used with horizontal and vertical movement of sewage in subsurface arrangement

B] In case of SBT, soil microflora is used with vertical movement of sewage and plants are used as indicator of health of the system

C] In case of DEWATS, anaerobic bacteria are used in sequence of tanks that resembles anaerobic digesters

D] In case of DRDO Design, attached growth bacterial system is used followed by polishing wetland like system along with

1.8 Intermediate Collection Tank

The treated effluent from biological system shall be collected in to this tank in order to maintain balance feed to any further polishing treatment if recommended in design which is based on end use of it can be avoided if the secondary treated sewage can be utilized directly. This tank is essential especially in case of flows <1MLD wherein it is preferred to use a tertiary treatment such as Pressure Sand & Activated Carbon Filters

1.9 Tertiary Polishing System

For flows <1MLD and for processes such as single tank MBBR, tertiary treatment using pressure Sand Filter followed by Activated Carbon Filter shall be used. For flows >1MLD and requiring effective treatment for reuse in human/animal contact purposes water it is preferable to have UF and/or ozonation as polishing system. PSF & ACF shall require pumping

1.10 Disinfection System

Removal of microbial contamination, pathogenic microorganism & bacteria etc are essential part of any STP and thereby use a thorough disinfection system needs to be part of the process. Use of Hypochorite for <1MLD is preferred whereas for higher flows of >1MLD it is appropriate to use any of the process including and not limited to Chlorination (Cl_2 gas), UF, UV, O_3, Nano filtration or others as applicable and necessary.

Note: All necessary unit connections of MEP shall also form part of the scope except mains

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20. Form GSSTP - GENERAL SPECIFICATIONS OF WWTP

GSSTP-1 Specifications of Work The work shall be carried out as per practice and procedures laid down in National Building Code of Practice and relevant I.S.S. updated for respective items and Public Health Engineering Manual on sewerage published by Government of India and as directed by the Engineer in charge.

GSSTP-2 General Descriptions and Location of Site The proposed Wastewater treatment plant is to be constructed at [insert location], [insert Full Address]

General contoured layout plan of the proposed sites are attached.

GSSTP-3 Detailed Structural and Hydraulic Design Calculations, Layout, Flow Diagram and

Detailed Working Drawing and Record Drawings

i) The contractor shall prepare and submit structural, RCC detailed working drawing showing plan, elevation, section etc for each unit of the waste water treatment plant /sump and pump house / wet well with overhead pump house and reinforcement at every junction for RCC work in three copy to the Officer In-Charge within 15 days from the date of getting approval to the layout plan and flow diagram from consulting Technology Provider (NEERI /IIT /DRDO/any other) / PMC / Ex. Engg / Third Party appointed therein.

ii) The design shall be based on standard recognized reference books and shall be as per standard Engineering Code of Practice and as per current I.S.S. and it shall indicate the reference of the standard reference books adopted , giving page number, etc. for method of design adopted and formulae that are followed , for easy and quick checking of the design. The said reference books shall also be made available for reference and checking whenever called for. The design calculations shall elaborate and step-by-step without any omissions and with illustrative dimensional wherever required for clarification and easy checking. The contractor should get structural designs and drawings approved from any Government Engineering collage This approved designs and drawings should submit in 4(four) copies to Officer In-Charge.

iii) Any modifications, alterations in levels, design calculations and detailed drawings to be carried out as a result of compliance of scrutiny remarks of component authority shall be carried out and submitted afresh by the Contractor, if called upon by the concerned authorities in the manner indicated in para (ii) above without claiming any extra cost.

iv) The actual execution of work shall be started by the Contractor only after of approval to the design calculations and detailed working drawing from the competent authority.

v) If any provisions in the design and instructions are found inadequate or faulty, necessary modifications shall have to be carried out at any stage up to the period of refund of security deposit without claiming any extra cost.

vi) After completion of the work in all respects , the Contractor shall submit three sets of complete record drawings of all the works as constructed with the stamps \

vii) RECORD DRAWINGS" before clearance of the final bill without claiming any extra cost, failing which the final bill shall not be paid. Similarly the duplicate photocopy of the tracing film of all record drawings shall be submitted to the Executive Engineer for record.

GSSTP-4 Hydraulic Test, Deposit

i) For water retaining component of civil structure, 10% of civil cost will be paid after satisfactory hydraulic testing

ii) a) Only 85% of the probable reasonable cost of the mechanical and electrical equipment as assessed by the Officer-In-Charge will be payable on the receipt of the same on site of work as per approved design & drawing with workshop painting and accepted by the Officer In-Charge.

b) Further 5% shall be released on erection, trial run and site painting.

c) Balance 10% will be released on the satisfactory performance as accepted by the Executive engineer specified elsewhere.

GSSTP-5 Desired Performance of the Waste Water Treatment Plant The treated water shall confirm to MPCB's following requirements

1) BOD less than 10mg/l
2) COD less than 50mg/l
3) SS less than 10mg/l
4) TDS less then 2100mg/l
5) pH in between 6.5-8.0
6) TKN less than 0.6mg/l

GSSTP-6 Water Tightness Test for Structures All the hydraulic structures (Sump, Screen cum Scum Chamber, Wet well, WWTP based on both the technologies) will have to be

tested for water tightness by filling them with water up to their designed full supply level. Earthen, Masonry or R.C.C. structures will be considered as water tight only when the reduction in the water level from FSL is not more than 6mm in 48 hours. The sides of underground structures should not be refilled till the satisfactory hydraulic test is given. In case of structures above the ground, the outside surfaces of the structures must be bone-dry with water.

GSSTP-7 Performance Period (Operation & Maintenance Period) The performance period shall be 60 months i.e. including period of O&M. During this period the contractor shall supervise the operation & maintenance work by deputing one supervisor from the contractor. During this period, the plant will be run by contractor & sample testing / electrical energy & other consumable charges shall be reimbursed to the contractor on production of proof of payments. The special security deposit of 1% of contract amount shall be recovered through R.A. Bills towards performance & same will be refunded after expiry of performance period.

GSSTP-8 Defect Liability Period The contractor shall stand guarantee for the successful operation and maintenance of the whole plant for a period of 5 years towards defect liability which includes performance period, period of commissioning & DLP from the date of starting of the performance period, during which time any defects and shortcomings noticed due to defective construction will have to be made good to the entire satisfaction of the Local body without claiming any extra cost. During the guarantee period the local Body will bear the cost of chemicals and energy. 10% of security deposit will be released after end of defect liability period.

GSSTP 9 Maintaining WWTP for 5 years

1. On completion of WWTP, the Contractor should commission the scheme to its rated capacity, including cost of all labour items, attending execution defects noticed, including cost of material and labour for the period of two years

2. The Contractor should employ necessary staff. It should be the responsibility of the Contractor to see the regular Functioning of WWTP is maintained and the Village Panchayat is made aware of day-to-day maintenance. The running charges exclude the cost of electrical bills. The defects noticed during this period, arising out of defective workmanship should be attended by the Contractor, without any extra cost.

3. The Contractor should maintain necessary log book of pumping and waste water sampling Reports etc. up-to-date.

The O & M shall be done in consultation with technology provider

GSSTP 10 General Plant and Process Requirements

10.1 Design Criteria

Parameters	Existing effluent Characteristics	Final Treated effluent	Unit
pH	5.5 – 9.0	6.5 to 8.5	--
Suspended Solids	500 – 600	<10	**mg/l**
Chemical Oxygen Demand	350 – 450	< 50	**mg/l**
Biochemical Oxygen Demand	200 - 250	< 10	**mg/l**
Oil & Grease	25 – 30	< 10	**mg/l**
Total Dissolved Solids	1000 – 1100	<2100	**mg/l**

10.2 Design Requirements

Contractor's design shall fully comply with the following requirements, regardless of whether or not such requirements or any related components are shown in any drawings included in the Tender Document:

The Contractor shall perform a complete Hazardous Area Classification analysis as per IS 5572 for all facilities and components in this contract and shall submit a complete report of such analysis as well as Hazardous Area Classification Drawings that delineate boundaries of all classified areas and indicate the classification of each area. All electrical or other powered equipment, instrumentation, or components shall fully comply with all requirements of IS 5571.

Where necessary, equipment shall be provided with acoustic, sound-dampening enclosures to limit ambient noise during normal operation. All equipment shall be arranged and buildings and structures designed to permit safe and easy access to and removal of all equipment.

All structures, whether liquid-holding or not, shall be designed such that they can be fully and completely drained and will not float or move when empty, because of groundwater buoyancy or any other reason. The structures shall be designed to counteract any possible floatation without the use of any type of groundwater pressure relief valves.

The floors of all liquid-holding structures (including but not limited to channels, tanks, basins, reactors, clarifiers, etc.) shall be appropriately sloped and trenches and drain sumps shall be provided at the bottoms of such slopes to facilitate complete drainage of liquid. Appropriate drain pipes and valves connected to the drain sump(s) shall be provided for all structures.

Where the drain pipe connects to the structure, the top-of-pipe elevation shall be at least 150 mm lower than the lowest floor elevation for the structure. Non-liquid-holding areas, structures, or buildings where leakage or other wet activities can occur, whether in normal use or during maintenance, shall be provided with covered drainage channels which shall direct the spillage and any washings shall be suitably drained to the sump of Filtrate pump house.

10.2.1 All interconnecting channels shall be designed for peak flows

Inlets into tanks, reactors, or other structures via pipes, channels, valves, or gates shall be designed such that the incoming flow does not cause any damage or excessive wear whatsoever to the structure or any equipment in the vicinity under any hydraulic condition, including but not limited to the condition when the structure is empty.

All piping shall be fully and adequately supported and braced to comply with all applicable codes and standards. Pipe supporting hardware shall also be of corrosion-resistant material. The design of pipe supports and anchors shall fully account for static and dynamic vertical, lateral, longitudinal, and seismic loads, fluid flow, and thermal expansion. Seismic bracing, thrust restraints and/or thrust blocks, and appropriate expansion joints or loops shall be provided as needed. Pipe lengths and joints shall be assembled and arranged for ease of removal in such a way that individual runs can be changed without dismantling adjacent pipes, by providing dismantling joints at regular intervals.

For liquids and sludge, the minimum velocity of flow in open channels or partial flow in pipes or conduits shall not be less than 0.6 m/s and the maximum shall be no more than 1.5 m/s. All underflow sludge service pipes shall be provided with appropriate means for safe and easy drainage of the pipes when not in service. All pipes shall be colour banded and suitably labelled with the stream designation and direction of flow at suitable minimum 5m intervals throughout their run, as per site requirement. All piping shall be arranged without clutter and shall be functional and neat in appearance. Where piping is installed in ducts, it shall be supported not less than 150 mm above the floor. All piping routed under any type of structure or equipment shall be fully and completely encased in cement concrete, with the encasement thickness beyond the outer diameter of the pipe being at least 200 mm on all sides. The encasement shall extend along the pipe length for a minimum horizontal distance of 1500 mm in each direction beyond the footprint of the overlying structure or equipment.

10.2.2 Plant Layout and Hydraulic Profile

A representative plot plan layout is included in this Tender Document. [*Insert Drawings, if applicable*]

These drawings shall be considered representative only. In the event of any conflicts between information, Contractor shall provide independent detailed and optimized layout and hydraulic design, which shall fully comply with the requirements and constraints specified herein.

Basic information about inlet and outlet hydraulic conditions, interfaces, and constraints is provided in the tender document. In addition, the Contractor's layout and hydraulic design shall comply with the following specific constraints and all other requirements described in the Tender Document:

Available topographical survey information, benchmarks, contour maps, geotechnical/soil investigations, and effluent receiving water body/structure maximum or high flood level (HFL) elevations are to be prepared and/or collected by Bidder and/or gathered from Employer on request if available. However, Employer makes no guarantees or representations regarding this information whatsoever. Tenderers use of this information shall be at their own risk. Tenderers shall independently obtain any and all site information they deem necessary for proper preparation of the bids and for the planning, design, testing, commissioning, operation, and maintenance of all components in the contract.

All new plant components shall be fully contained within the designated site boundaries and shall be placed so as to easily and logically accomplish all specified interfaces with existing components. Contractor's proposed site layout shall clearly show the space allocated for all plant components, including those components and/or unit processes that may be designated for future construction or installation. Setbacks and clearances from the site boundary shall be provided as appropriate and as required by law. All existing utilities (including but not limited to water, sewer, and power, whether overhead or underground and whether physically located on the site or not) that must be relocated to accommodate the Contractor's proposed and approved site layout shall be relocated by the Contractor. Contractor shall be fully responsible for all applicable permits, approvals, public notifications and processes, and any other paperwork or procedures required, and shall fully coordinate the entire process with the Employer as well as all other agencies, entities, and stakeholders that may be involved.

10.2.3 The Plant Layout shall fully comply with the following

Minimum clear distance provided to permit safe and convenient access for operation and maintenance shall be 5m between adjacent treatment units or fixed structures and 500mm between individual equipment units.

The design shall further ensure that all such units receive equal flow or loading at all times when in operation.

The design shall ensure that multiple modules of various unit processes are fully integrated and can operate as a single plant and a single process stream – multiple parallel plants will not be allowed. Such integration shall be accomplished by means of common collection and distribution channels, boxes, or header pipes in between unit processes that combine the flow from multiple modules of the upstream unit process and redistribute it to multiple modules of the downstream unit process. Designs where each module operates independently of other modules will not be permitted.

10.2.4 Sewage Treatment Process Layout and Facilities Description

This section provides general descriptions and design / sizing criteria and other requirement of the major processes and facilities that the Contractor shall be required to design, construct, and operate under this contract. The Contractor shall use these description together with other information provided elsewhere in this Tender Document, including but not limited to this section. The Contractor may propose alternate implementation details such as layouts and elevations of specific components. However, the Contractor shall strictly comply with the specified treatment concept, major unit processes, flow configuration (connectivity between unit processes and facilities), performance requirements (such as effluent and sludge quality), and design criteria (such as design operating conditions, various process loading rates and/or detention times, volumes, and dimensions where specified).

10.2.5 Civil Scope

A] Utility Buildings

METER ROOM / ELECTRIC ROOM CUM TOILET BLOCK, if applicable

It will be constructed as per item of BOQ and payment will be made for the composite item consisting of at least following item with specification. Nothing etc. will be paid beyond the relevant items of BOQ for the successful completion, structural stability, water proofing and sound engineering practice all other items are to be executive for proper functioning of this unit.

Description of item
1.Earth work in excavation by mechanical means (Hydraulic excavator) All kinds of soil

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level : 1:3:6 (1 Cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)
Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work. All works upto plinth level & all works above plinth level upto fifth floor
Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo-mechanically Treated bars
Centering and shuttering including strutting, propping etc. and removal of form for: Foundations, footings, bases of columns, etc. for mass concrete, Suspended floors, roofs, landings, balconies and access platform, Lintels, beams, plinth beams, girders, bressumers and cantilevers, Columns, Pillars, Piers, Abutments, Posts and Struts
Brick work with clay flyash F.P.S. (non-modular) brick of class designation 7.5 in superstructure above plinth level up to floor five level in: Cement mortar 1:4 (1 cement : 4 coarse sand)
12 mm cement plaster finished with a floating coat of neat cement of mix : 1:4 (1 cement: 4 coarse sand)
12 mm cement plaster of mix : 1:4 (1 cement: 4 coarse sand)
6 mm cement plaster of mix : 1:3 (1 cement : 3 fine sand)
18 mm cement plaster in two coats under layer 12 mm thick cement plaster 1:5 (1 cement: 5 coarse sand) and a top layer 6 mm thick cement plaster 1:3 (1 cement : 3 coarse sand) finished rough with sponge.
Distempering with oil bound washable distemper of approved brand and manufacture to give an even shade : New work (two or more coats) over and including water thinnable priming coat with cement primer

Finishing walls with water proofing cement paint of required shade : New Work (Two or more coats applied @ 3.84 kg/sqm)
Providing and fixing T-iron frames for doors, windows and ventilators of mild steel Tee-sections, joints mitred and welded, including fixing of necessary butt hinges and screws and applying a priming coat of approved steel primer. Fixing with 15x3 mm lugs 10 cm long embedded in cement concrete block 15x10x10 cm of C.C. 1:3:6 (1 Cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)
Providing & fixing glass panes with putty and glazing clips in steel doors, windows, clerestory windows, all complete with : 4 mm thick glass panes
Providing and fixing 1mm thick M.S. sheet door with frame of 40x40x6 mm angle iron and 3 mm M.S. gusset plates at the junctions and corners, all necessary fittings complete, including applying a priming coat of approved steel primer. Using M.S. angles 40x40x6 mm for diagonal braces
Providing and fixing factory made ISI marked steel glazed doors, windows and ventilators, side /top /centre hung, with beading and all members such as F7D, F4B, K11 B and K12 B etc. complete of standard rolled steel sections, joints mitred and flash butt welded and sash bars tenoned and riveted, including providing and fixing of hinges, pivots, including priming coat of approved steel primer, but excluding the cost of other fittings, complete all as per approved design, Fixing with 15x3 mm lugs 10 cm long embedded in cement concrete block 15x10x10 cm of C.C. 1:3:6 (1 Cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)
Providing and fixing oxidised M.S. casement stays (straight peg type) with necessary screws etc. complete. 250 mm weighing not less than 150 gms
Providing and fixing ISI marked oxidised M.S. handles conforming to IS:4992 with necessary screws etc. complete : 125 mm

Painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade: Painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade : Two or more coats on new work over an under coat of suitable shade with ordinary paint of approved brand and manufacture
Cement concrete flooring 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate) finished with a floating coat of neat cement, including cement slurry, but excluding the cost of nosing of steps etc. complete. 40 mm thick with 20 mm nominal size stone aggregate
Cement plaster skirting up to 30 cm height, with cement mortar 1:3 (1 cement : 3 coarse sand), finished with a floating coat of neat cement. 18 mm thick
Providing and placing on terrace (at all floor levels) polyethylene water storage tank ISI : 12701 marked with cover and suitable locking arrangement and making necessary holes for inlet, outlet and overflow pipes but without fittings and the base support for tank.
Providing and fixing G.I. pipes complete with G.I. fittings and clamps, including cutting and making good the walls etc. Internal work – Exposed on wall. 15 mm dia. nominal bore
Providing and fixing G.I. pipes complete with G.I. fittings including trenching and refilling etc. (external work): 25 mm dia nominal bore
Providing and fixing G.I. Pipes complete with G.I. fittings and clamps, i/c making good the walls etc. concealed pipe including painting with anti corrosive bitumastic paint, cutting chases and making good the wall. 15mm dia nominal bore `
Providing and fixing ball valve (brass) of approved quality, High or low pressure, with plastic floats complete : 15 mm nominal bore

Providing and fixing G.I. Union in G.I. Pipe including cutting and threading the pipe and making long screws etc. complete (New work). 15 mm nominal bore
Providing and fixing brass bib cock of approved quality : 15 mm nominal bore
Providing and fixing brass stop cock of approved quality : 15 mm nominal bore
Providing and fixing P.V.C. waste pipe for sink or wash basin including P.V.C. waste fittings complete. Flexible pipe 40 mm dia water proofing of terrace, disposal of rain water and waste water, providing water services, storm water drain, plinth protection, DPC and other miscellaneous item required for successful completion and functioning of the building.
Making connection of G.I. distribution branch with G.I. main of following sizes by providing and fixing tee, including cutting and threading the pipe etc. complete. 15 to 50 mm nominal bore
Constructing Masonry Chamber 30x30x50 cm, inside with 75 class designation brick work in cement mortar 1:4 (1 cement :4 coarse sand) for stop cock, with C. I. surface box 100x100 x75 mm (inside) with hinged cover fixed in cement concrete slab 1:2:4 mix (1 cement :2 coarse sand : 4 graded stone aggregate 20 mm nominal size) necessary excavation foundation concrete 1:5:10 (1 cement :5 fine sand:10 graded stone aggregate 40mm nominal size) and inside plastering with cement mortar 1:3 (1 cement :3 coarse sand) 12mm thick finished with a floating coat of neat cement complete as per standard design : With common burnt clay F.P.S.(non modular) bricks of class designation 7.5

Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete : 150 mm dia. R.C.C. pipe 300 mm dia. R.C.C. pipe
Making connection of drain or sewer line with existing manhole including breaking into and making good the walls, floors with cement concrete 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) cement plastered on both sides with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement and making necessary channels for the drain etc. complete: For pipes 100 to 230 mm diameter
Providing and fixing square-mouth S.W. gully trap grade `A' complete with C.I. grating, brick masonry chamber with water tight C.I. cover with frame of 300x300 mm size (inside), the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70 kg per standard design. 100x100 mm Size P type With F.P.S. Bricks class 75
Providing and fixing white vitreous china pedestal type water closet (European type W.C. pan) with seat and lid, 10 litre low level white P.V.C. flushing cistern, including flush pipe, with manually controlled device (handle lever), conforming to IS : 7231, with all fittings and fixtures complete, including cutting and making good the walls and floors wherever required : W.C. pan with ISI marked black solid plastic seat and lid
Providing and fixing white vitreous china flat back or wall corner type lipped front urinal basin of 430x260x350 mm or 340x410x265 mm sizes respectively.
Providing and fixing P.V.C. waste pipe for sink or wash basin including P.V.C. waste fittings complete. Semi rigid pipe 32 mm dia

Providing and fixing 600x450 mm beveled edge mirror of superior glass (of approved quality) complete with 6 mm thick hard board ground fixed to wooden cleats with C.P. brass screws and washers complete.
Providing and fixing PTMT liquid soap container 109 mm wide, 125 mm high and 112 mm distance from wall of standard shape with bracket of the same materials with snap fittings of approved quality and colour, weighing not less than 105 gms.
Providing and fixing PTMT Waste Coupling for wash basin and sink, of approved quality and colour.
Waste coupling 31mm dia of 79mm length and 62mm breadth weighing not less than 45gms
Providing and fixing PTMT 15mm Urinal spreader size 95x69x100 mm with 1/2" BSP thread and shapes, weighing not less than 60gms.
Providing and fixing PTMT urinal cock of approved quality and colour
15 mm nominal bore, 80mm long, 42mm high and 30mm wide with BSP female threads weighing not less than 48 gms
Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete :
100 mm dia. R.C.C. pipe
Constructing brick masonry manhole in cement mortar 1:4 (1 cement : 4 coarse sand) with R.C.C. top slab with 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) finished with a floating coat of neat cement complete as per standard design :
Inside size 90x80 cm and 45 cm deep including C.I. cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover and frame to be not less than 38 kg (weight of cover 23 kg and weight offrame 15 kg) :
With common burnt clay F.P.S. (non modular) bricks of class designation 7.5
Providing and fixing PTMT, push cock of approved quality and colour.
15 mm nominal bore, 80 mm long, weighing not less than 46 gms

Providing and fixing unplasticised PVC connection pipe with brass unions :
30 cm length
15 mm nominal bore
Providing and fixing G.I. Union in G.I. pipe including cutting and threading the pipe and making long screws etc. complete (New work) :
15 mm nominal bore
Providing and fixing PTMT grating of approved quality and colour.
Rectangular type with openable circular lid
150 mm nominal size square 100 mm diameter of the inner hinged round grating
Providing and fixing wash basin with C.I. brackets, 15 mm C.P. brass pillar taps, 32 mm C.P. brass waste of standard pattern, including painting of fittings and brackets, cutting and making good the walls wherever require :
White Vitreous China Flat back wash basin size 550x400 mm with single 15 mm C.P. brass pillar tap
Providing and fixing Ist quality ceramic glazed wall tiles conforming to IS:15622 (thickness to be specified by the manufacturer), of approved make,in all colours, shades except burgundy, bottle green, black of any size as approved by Engineer-in-Charge, in skirting, risers of steps and dados, over 12mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand)and jointing with grey cement slurry @ 3.3kg per sqm, including pointing in white cement mixed with pigment of matching shade complete.
Providing and laying Ceramic glazed floor tiles of size 300x300 mm (thickness to be specified by the manufacturer) of 1st quality conforming to IS : 15622 of approved make in colours such as White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick cement mortar 1:4 (1 Cement : 4 Coarse sand), including pointing the joints with white cement and matching pigment etc., complete.
Steel work welded in built up sections/ framed work, including cutting, nhoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.
In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works

Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.

The ground floor shall have Laboratory if stated in BoQ separately, rooms and toilets, one each for men and women of appropriate size. Each of these toilets shall have one WC, wash basin, towel rail, mirror, soap dispenser and other features of required specifications as directed by the Engineer. Men's toilet shall have 2 urinals also. Two Nos. of Triple layered polyethylene water storage tanks of size 1 KL each shall be provided at the top of the building and nothing extra is payable.

10.2.6 The laboratory shall be provided with the following, if applicable

A platform projecting 750 mm from the wall one at about 150 mm height from floor l Level and the other at sill level. The upper platform shall be of RCC. The platforms shall be covered with Granite stone on top surface.

Ceramic tiles on the walls all along the RCC platforms upto the 750 mm.

Two laboratory sinks on the RCC platform and one wash basin along the opposite wall. The sinks and wash basin shall have direct water supply connection and not from the service tank.

The space below the platform shall have cabinet/ cupboards for keeping laboratory materials.

A septic tank and soak pit shall be provided for the collection of sewerage from the toilet

Before commencing the construction of the office, the Contractor shall submit to the engineer for his approval a drawing of the proposed building showing all architectural and finishing details. After approval of these details, contractor shall submit structural designs and drawings.

The Contractor shall furnish the rooms as the engineer directs and the equipment, furniture, furnishings and fittings to be supplied shall be new items and also of approved make.

All the operating expenses, water, lights and other charges shall be regarded as an inclusive cost of the Contractor's operating costs and part of the contract price and nothing extra is payable.

10.2.7 Architectural Concepts and Designs

An Architectural Design Basis Report will be submitted to the engineer including proposals for the following scheme components: shape, form, colour, and basic materials for interior and exterior architecture along with an appropriate landscaping scheme. All schemes will be supported by architectural statement explaining the factors considered in the design.

Architecture work shall include walls, roof, flooring and floor finish, roof water proofing, down water pipes, windows, ventilators, doors, glazing, equipment access doors, painting and other ornamental works. The contractor shall get all Architectural, Structural and RCC drawings and design calculations, etc approved by engineer prior to construction of works at site.

10.2.8 Structural Designs

The Contractor shall on its own carryout Soil investigation i.e. Geo technical investigation and prepare Structural drawings vetted by Government College or Institute

10.2.8.1 Design Submissions

The design considerations described hereunder establish the minimum basic requirements of plain and reinforced concrete structures, masonry structures and structural steel works. However, any particular structure shall be designed for the satisfactory performance of the functions for which the same is being constructed. The Contractor shall also take care to check the stability of partly completed or existing structures associated with the proposed WWTP.

Complete detailed design calculations of foundations and superstructure together with general arrangement drawings and explanatory sketches shall be submitted to the Engineer. Separate calculations for foundations or superstructures submitted independent of each other shall be deemed to be incomplete and will not be accepted by the Engineer. The contractor shall be responsible for the safety of structures, structural strength, stability, soundness, water tightness and accuracy, adequacy of design, workability and performance even after the approval of the same by the Engineer. During the job execution, if any deficiency or alteration is required, firm shall attend to the same within the contractual provisions and nothing extra shall be claimed/paid to the firm.

Approval conveyed to the firm will neither relieve the firm of its contractual obligations and its responsibility for the correctness of the dimensions, material, of the construction, weights, quantities, design perimeters, dimensions, assembly its, performance, particulars, conformity of the supplies with Indian statuary laws as may applicable nor will it limit the local body's rights under the contract.

10.2.8.2 Design Loadings

All buildings and structures shall be designed to resist the worst combination of the loads/stresses during testing and under working conditions and shall be as per IS:875. The loads considered shall include dead load, live load, wind load, seismic load, stresses due to temperature changes, shrinkage and creep in materials, dynamic loads and uplift pressure.

A] Dead Load

This shall comprise all permanent construction including foundations, walls, floors, columns, roofs, partitions, stairways, fixed service equipments and other items of machinery. In estimating the loads of process equipment all fixtures and attached piping shall be included. The following minimum loads shall be considered in design of structures:

(i)	Weight of water	:	10.00 kN/m3
(ii)	Weight of saturated soil (irrespective of strata available at site and type of soil used for filling etc). However, for checking stability against uplift, actual weight of soil as determined by field test shall be considered.	:	20.00 kN/m3
(iii)	Weight of plain concrete	:	24.00 kN/m3
(iv)	Weight of reinforced concrete	:	25.00 kN/m3
(v)	Weight of brickwork (exclusive of plaster)	:	22.00 N/m2 per mm thickness of brickwork
(vi)	Weight of plaster to masonry surface	:	18.00 N/m2 per mm thickness
(vii)	Weight of granolithic terrazo finish or rendering screed, etc.	:	24.00 N/m2 per mm thickness
(viii)	Weight of sand (filter media)	:	26.0 kN/m3

B] Live Load

The following minimum loads shall be considered in the design of structures:

(i)	Live Load on Roofs	:	1.50 kN/m2
(ii)	Live Load on Dome	:	2.50 kN/m2
(iii)	Live Load on floors supporting equipment such as pumps, blowers, compressors, valves etc	:	10.00 kN/m2

(iv)	Live load on all other floors walkways, stairways and platforms	:	5.00 kN/m2
(v)	Toilet	:	2.00 kN/m2

In the absence of any suitable provisions for live loads in I.S. Codes or as given above for any particular type of floor or structure, assumptions made must receive the approval of the Engineer prior to starting of the design work. Apart from the specified live loads or any other load due to material stored, any other equipment load or possible overloading during maintenance or erection/construction shall be considered and shall be partial or full whichever causes the most critical condition. Any such loading condition must be incorporated in design calculations with supporting documentation for approval.

C] Wind Load

Wind loads shall be conforming to I.S. 875.

D] Earthquake Load

Earthquake loads shall be conforming to I.S. 1893 considering seismic (Zone IV). Importance factor shall be taken as per Table 6 of IS 1893 (Part 1). The soil foundation coefficient shall be considered as 1.2.

E] Dynamic Load

Dynamic loads due to working of plant items such as pumps, blowers, compressors, switch gears, travelling cranes, etc. shall be considered in the design of structures.

F] Vehicular Load

IRC Class AA (wheeled vehicle) loading shall be considered for design of structures under or by the side of roads.

G] Joints

Movement joints such as expansion joints, complete / partial contraction joints and sliding joints shall be designed to suit the structure requirements. Position and design of construction joints should be predetermined keeping in view the convenience in construction. All joints should be tested for water tightness and must be leak proof. The material used in the joints like joint filers, water bars, sealing compounds and other such materials should be resistant to chemical and biological action and require approval of Engineer and nothing extra is payable.

H] Water stops

Water stops shall be of PVC/Neoprene as applicable (material shall be suitable for sewage/acidic liquid storage). To be supplied from approved manufacture. Samples and the test certificate shall be got approved by the Engineer –in – charge before procurement for incorporation in the works. Water stops shall be either of the bar type, serrated with centre bulb and end gips for use within the concrete elements or of the surface (kicker)type for external use. nothing extra is payable.

I] Completely / Partly Underground Liquid Retaining Structures

All underground or partly underground liquid retaining structures shall be designed for the following conditions:

Structure filled with liquid: Liquid depth up to full height of wall, irrespective of the actual height of liquid in the structure: no relief due to soil pressure from outside to be considered;

Structure empty: full earth pressure and surcharge pressure, as applicable, to be considered;
Partition wall between dry sump and wet sump: to be designed for full liquid depth up to full height of wall including free board;

Partition wall between two compartments: to be designed as one compartment empty and other full; Structures shall be designed for uplift in empty conditions with the water table indicated by the Contractor's own investigation or approved by Engineer prior to design, whichever is maximum. No reduction Factor for the uplift forces shall be considered.
The dead weight of the empty structure should provide a safety factor of not less than 1.2 against uplift pressures during construction and in service;

Walls shall be designed under operating conditions to resist earthquake forces from earth pressure mobilization and dynamic water loads;

Underground or partially underground structures shall also be checked against stresses developed due to any combination of full and empty compartments with appropriate ground/uplift pressures from below to base slab.

J] Foundations

The minimum depth of foundations for all structures, equipment, buildings and frame foundations and load bearing walls shall be conforming to IS 1904. All foundations shall extend to a depth below virgin ground level as per the Geotechnical Report. The foundations shall be placed on virgin soil and not on backfilled soil. The earth fill above virgin ground level till formation level shall be taken as a surcharge load and shall be added in the loads

coming on foundations appropriately.

Maximum safe bearing capacity of soil strata shall be taken as indicated in geotechnical reports by contractor's. For the foundation depths and types of footings other than those mentioned in the geotechnical reports, the maximum safe bearing capacity shall be appropriately computed from the parameters given in the geotechnical reports and got reviewed and approved by the Engineer.

Care shall be taken to avoid the foundations of adjacent buildings or structure foundations, either existing or not within the scope of this Contract. Suitable adjustments in depth, location and sizes may have to be made depending on site conditions.

Plinth level of all structures shall be at least 500 mm above formation level. If pile foundations are used, the bidder shall conduct the initial routine test as per IS 2911 at his own cost, to determine the safe load bearing capacity of piles.

10.2.8.3 Design Requirements

The Civil & Structural design shall be carried out in accordance with BIS:456, and BIS:3370 and other relevant Indian Standard Codes. For the seismic forces, the structure should be designed as per IS: 1893 and all the factors as applicable for Zone V.

A] The following are the design requirements for all reinforced or plain concrete structures:

- All blinding and leveling concrete shall be minimum 100 mm thick in concrete grade M15, unless otherwise specified.
- All structural reinforced concrete shall be with a maximum 20 mm stone aggregate size.
- The minimum grade of concrete shall be M-25 for RCC structures other than liquid retaining structures, for which minimum grade of concrete shall be M 30.
- The minimum reinforcements in walls, floors and roofs of liquid retaining structures in each of two directions at right angles shall be 0.3% HYSD bars.
- Minimum reinforcement and cover to the reinforcement shall be provided as per relevant IS standards.

B] Minimum Thicknesses of Reinforced Concrete Members

The following minimum thicknesses shall be used for different reinforced concrete members, irrespective of design thicknesses:

Walls for liquid retaining structures (except for Launders, Channels)	:	150 mm
Bottom slabs for liquid retaining structures	:	150 mm
Wall foundation (at junction of base slab & wall)	:	250 mm
Roof slabs for liquid retaining structures	:	150 mm
Launders & Channels – Base Slab & Wall	:	150 mm
Floor slabs including roof slabs, walkways, canopy slabs	:	100 mm
Walls of cables / pipe trenches	:	75mm
Precast trench cover	:	75 mm

10.2.9 Additional Appointment of Third Party

The Local Body as and when feels can appoint Third Party as PMC or otherwise to Supervise, Monitor & Verify Performance and/or conduct of Contractor as well as to verify test records, drawings, schedule, QA/QC, treatment process efficiency, etc at extra cost as & when required.

10.3 Design Calculations & Drawings Submissions

The Contractor at his own cost shall carryout contour survey & prepare design calculations for the technology, process flow diagram, P&ID, Section drawings, working civil & MEP drawings, Layout on Contour also superimposed on google maps, architectural & structural design calculations & drawings, line diagram, hydraulic drawings, etc. Additionally, contractor shall submit cut sheets & test certificates of MEP, etc.

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21. Form GSC - GENERAL SPECIFICATIONS for Civil Works

GS 1 Sand and Metal

Sand and coarse aggregate (metal) shall be stored separately on site on hard ground so as to keep them free from foreign materials such as soils, clay, glass etc. In case of machined crushed metal separate depot shall be prepared for different sizes of metal and suitable proportion to form dense mix as directed by the Officer In-Charge shall be taken from these different sizes of metal.

GS 2 Form Work

2.1 A The wooden shuttering planks shall be not less than 40 mm thick or such other thickness as may be allowed by the Executive Engineer for a particular job. The entire form work, whether of steel, plywood or wooden planks, shall be very strongly proposed and braced with sufficiently strong vertical and horizontal members and the entire Servicing structure shall be of sufficiently horizontal members and sufficiently strong to take up the load of concrete and all stresses it may be subjected to, without any deflection. The Contractor shall be wholly and fully responsible for any defects in the entire form work and its Servicing structure.

2.2 The form work shall be very smooth and entirely free from any dust particles direct and its inner surface shall be oiled for the easy facility of form removal and shall be watertight.

GS 3 Reinforcement

3.1 The Contractor has to procure it from open Market at his cost. The bars shall be scrapped thoroughly for removing any scales, rust, etc. before use in work. Bars that may be found defective in any way shall not be allowed to be used. The reinforcement is to be fabricated and placed in position as per the Officer In-Charge or contractors design to be intimated to the Contractor during execution from time to time. The hooks, laps, anchors, cover, etc. shall be as per IS code. The Contractor has to place in position the reinforcement as directed and to secure it by binding wire to be provided at Contractors cost. Any additional reinforcement provided by contractor in addition to approved design and direction shall not be measured and paid for.

3.2 To ensure that the minimum cover require for slabs, beams, etc. is provided. Separators of precast or cast in situ CC block with wires embedded shall be used and shall be tied to the reinforcement with wires. Between 2 or more layers of reinforcement, separators, of 200 mm or 25 mm size bars as directed shall be used duly tied. The

separators of M.S. bar piece shall not be admissible for payment. The GI binding wire shall not be admissible for payment.

3.3 When Contractor has to bring steel then it shall be only tested one and Contractor shall produce the manufacturers rolling mills test certificate without which it shall not be accepted. Further the Contractor shall arrange to get tested any samples from steel brought at site in a laboratory at his cost, and result should be submitted to Officer In-Charge. Defective steel shall be rejected.

GS 4 Mixing

4.1 Good clean water shall only be used for mixing. Arrangements for bringing such water shall be done by the Contractor at his cost. The amount of water to be used shall be as directed by the Engineer-in-charge. On the bases of correct water cement ratio. The water measuring apparatus shall be provided by the Contractor at his cost.

4.2 For R.C.C. reservoirs and for other works which in the opinion of the Executive Engineer are important the concrete shall be only machine mixed. The mixing shall be continued for at least 8 minutes after all materials and water are placed in the drum which shall revolve for 14 to 18 revolutions or as specified by the manufacturers. The mixer for this purpose shall be brought by Contractor at his cost and the Officer In-Charge does not take any responsibility for supply of mixer if as a result of breakdown of mixer during concreting, hand mixing has to be resorted to temporarily. Only such work which is considered absolute essential by the Executive Engineer shall be allowed to be done by hand mixing and the entire operation of hand mixing and precaution thereof shall be taken as directed by the Engineer-in-charge. For hand mixture mixing shall be done for sufficient time till it is of uniform colour. The required quantity of aggregate shall then be added and the mixture again turned over for at least 14 to 18 times. The required quantity of water shall then be added gradually through rose pieces attached to the can until process of turning is in progress and till is of uniform consistency where such hand mixing is allowed as a result of area requirement and no extra payment for this excess cement shall be admissible.

4.3 For works other than mentioned in above para, hand mixing will be allowed and in such cases, cement to be used shall be as per standard requirement only.

4.4 Normally the standard cement consumption will be as under: for one cum of concrete 1:2:4 (M-150) 1:1.1/2:3 (M-200) 1:3:6 (M-100) 5.90 bags 6.90 bags 4.42 bags For any other mix the cement consumption shall be as decided by the Executive Engineer. The consumption as mentioned above shall be for the gross RCC column actually cast.

GS 5 Concrete Laying

5.1 The forms shall first be lightly moistened before laying concrete. The concrete shall be placed in position within 20 minutes after adding water to the mix and shall be slowly deposited in its place and not thrown or dumped from a height shall be placed in uniform layers. For vertical walls or water retaining structure, water stoppers shall be provided.

5.2 For columns the concrete shall be laid in maximum 1.2 M height at a time. For vertical walls of reservoir it shall be laid in maximum 0.6 M height only at a time.

GS 6 Tamping, Ramming and Consolidating

6.1 For all RCC structures and other works which are considered by the Executive Engineer to be important mechanical vibrators shall invariably be used by the Contractor at his cost. The Contractor shall provide at least 2 vibrators in good working condition, so as to have one as a standby and to prevent interruption in work. The concrete being laid shall be vigorously vibrated laying and also loaded by bars where vibrator cannot reach so that dense and complete filling is assured. The Contractor shall make his own arrangements for procuring vibrators at his cost and the OFFICER IN-CHARGE does not guarantee that they will be supplied on hire.

6.2 For all other works consolidation and tamping shall be manual labour by rodding vigorously by M.S. bars, throughout for a sufficient time and in such manner as directed by the Engineer-in-charge. Adequate number of labourers shall be set apart specifically for tamping and ramming with relievers.

6.3 The efficiency of tamping and consolidation shall be judged by absence of any air pockets and absence of honey combing any defective consolidation and tamping shall be entirely on Contractor's risk and costing will have to be entirely pulled down if so directed and redone properly entirely at the cost of the Contractor.

GS 7 Curing

7.1 All RCC work will be watered and kept constantly wet for 28 days after initial set casting by means of wet gunny bags and pounding as directed by the Engineer-in-charge. This operation shall start immediately after initial set of the concrete. Should the Contractor fail to water the concrete - continuously, it will be done immediately at Contractor's cost.

7.2 **Removal of Form** It shall be generally as under, subject to the written approval and modification by the Engineer-in-charge. Column and Beam Sides 3 Days Vertical Walls 6 Days Bottom of Slab and Domes 10 Days Bottom of Beams 14 Days Bottom of Beams of

Span 4.5 M and above 21 Days

GS 8 Inspection

The work of each category of operation i.e. completion of form work placing reinforcement, concreting, removal of form, etc. must be got inspected by the Junior Engineer before commencing and succeeding operation in case of RCC works and major RCC jobs. In all cases, however, before the concrete is laid it must be got inspected and approved by the Deputy Engineer to concreting shall be commenced with approval of the Deputy Engineer. In case of RCC structures and other major works concreting must be done in presence of Deputy Engineer himself. In other case, it shall be done in presence of Junior Engineer. In case of failure to comply with above specifications, the work is liable to be pulled down if directed for any work which is done contrary to specification and no payment thereof shall be admissible.

GS 9 Finish and Quality of Concrete

9.1 The RCC work cast shall be of dense mix, homogenous without any honey combing true in size alignment and shape. Any defective work shall not be entitled for full tendered rates for payment and if the defects are major no measurements and payment are admissible and Contractor shall have to pull down such defective work and redo at his cost. The decision of the Executive Engineer regarding such defective work and the decision, viz. pulling it down or reducing rates as may be necessary shall be final and binding on the contractor.

9.2 All RCC work shall be finished as directed by the Executive Engineer. It should be clearly under stood that the finishing is not meant to cover the casting defects but only to give a smooth appearance. In case of RCC reservoirs and other major RCC works Contractor shall not commence finishing unless and until Engineer-in-charge has inspected the casting of concrete after removal of form and has satisfied about its quality failing which it shall be regarded that casting was defective and action deemed fit as per clause (11) 1 above will be taken since finishing has to commence immediately after removal of forms. The forms removal in RCC reservoirs and other major work shall be done in presence of Deputy Engineer. 28 days test : 1:2:4 1:1.1/2:3 1:1.5:1 150 Kg/cm^2 200 Kg/cm^2 300 Kg/cm^2 Cube casting acceptance of concrete will be as specified in IS 456 - 1964 and relevant ISS. Unacceptable quality concrete shall be demolished and redone without any extra cost by the contractor. The Executive Engineer at his discretion consider substandard work at a suitable reduced rate, provided such weak concrete is restricted to such members and in such quantities, which in the opinion of the Executive Engineer will not endanger the safety of the

structures. Executive Engineer's decision in such cases shall be final and binding on the contractor.

9.3 Surfaces not in contact with form work and not subject to any plaster shall be finished by a float to present a smooth and uniform appearance. Surfaces which are in contract of form work but for which no plastering is provided as per plan and estimate shall also be finished smooth, and sand faced as directed. Surfaces for which plastering is to be done, as per separate provision of plastering plans and estimates, shall immediately on removal of forms, be roughened for bond by a pointed tamping tool.

9.4 In case, whether would be specified in the tender item or not the finish shall be such as to match with the rest of the structure to present a harmonious appearance. It shall consist of 3 coats of cement, rendering, plastering float finished faced, etc. as per to the requirement at site and as directed by the Executive Engineer and Contractor shall have to do it at his own cost. Failure to do proper finishing as directed shall result in payment at reduced rates only to the Contractor and the decision of the Executive Engineer in this respect shall be final and binding on the Contractor.

GS 10 Testing

10.1 All structure meant to hold water shall be tested for water tightness test at Contractor's cost, by filling them to their desired level. The water tightness test shall be considered satisfactory when the fall in water level after the container is filled to the FSL is not more than 6mm in 48 hours and there is no sweating from outside or bottom whatsoever.

10.2 Contractor has to make his own arrangements for water for testing at his cost and these arrangements shall be such that immediately after initial setting of plaster, the containers are filled with water. After the satisfactory water tightness test the container shall be kept constantly filled with water at Contractor's cost till the completion of work.

10.3 Till satisfactory water tightness test is given by the Contractor, at his cost, to the satisfaction of the Officer In-Charge. Only 90% tendered rates shall be admissible for payment for RCC concrete items.

10.4 In case of major RCC works from batches or concrete mix actually being laid, testing cubes shall be cast periodically as directed by the Officer In-Charge, in presence of the Deputy Engineer-in-charge and these cubes shall be got tested after they have attained their full strength, from a suitable testing laboratory. The Officer In-Charge's representative shall arrange for taking test cubes, sending them to laboratory and obtaining test results, at full cost of Contractor. The charges of this viz. moulds, labour for casting, materials, conveyance

charges to and from the laboratory including TA of staff members and laboratory test charges, etc. are included in the tender rates and they shall be recovered from Contractor's bills. The ultimate compressive stress as revealed from these tests shall not be less than 28 days test : 1:2:4 1:1.1/2:3 150 Kg/cm2 200 Kg/cm2 Cube casting acceptance of concrete will be as specified in IS 456-1964 and relevant ISS. Unacceptable quality concrete shall be demolished and redone without any extra cost by the Contractor. The Executive Engineer at his discretion consider substandard work at a suitable reduced rate, provided such weak concrete is restricted to such members and in such quantities, which in the opinion of the Executive Engineer will not endanger the safety of the structure. Executive Engineer's decision in such cases shall be final and binding on the Contractor.

GS 11 Measurements

11.1 The Measurements shall be the unit as mentioned in the Schedule 'B' and break - up schedule.

11.2 Mode of measurements shall be:- a) Columns: Height from top of footing to bottom of beams shall be measured as columns. b) Braces for columns shall be measured as net between column faces. c) For straight beams, duly ribs between column top and slab bottom surface shall be measured to beams and rest in slabs. d) For ring beams the full section of beams from bottom to top shall be measured in beams and quantities laying outside the full beam section in beams. Slant walls, slabs, etc. as the case may be shall be measured in the respective slant wall vertical wall, flat slab, etc. as the case may be. e) Vertical walls shall be measured for net quantity outside columns, beams, slabs. f) No deduction shall be made for reinforcement in RCC work. 11.3 The measurement under RCC works for net dimensions cast as directed without any allowance for rendering, finishing, etc.

GS 12 Specification for Masonry viz. UCR/CR, Brick Masonry Khandki Facing, etc.

12.1 The masonry shall be either UCR/CR Khandki facing, BB Masonry, etc. as specified in the respective tender items.

12.2 For stone masonry either UCR/CR or Khandki facing, with 1:5 proportion cement mortar, which has to retain, the percentage of mortar shall be between 40% to 45% of the gross built-up masonry and in no case less than 40%. The cement to be used in masonry shall be on the basis of this percentage. If the masonry is constructed with less percentage of the mortar than specified above and if in the opinion of Executive Engineer it is not suitable retain water pressure, it shall have to be dismantled and redone at Contractor's cost with correct percentage of mortar.

12.3 For all other masonries viz. UCR/CR/BB, etc. the percentage of mortar shall be as per P.W.D. Hand Book Specifications and cement to be used shall be based on these percentage.

12.4 For CR Masonry, khandki facing masonry etc all courses shall be of equal height, to be specified by the Engineer-in-charge and only one row of khandkies shall be allowed in one course.

12.5 Tender rates of masonry item, unless otherwise mentioned specifically in the tender items, shall include scaffolding, watering, curing and cement pointing in CM 1:2 to the exposed faces, where necessary and as directed.

12.6 For masonries meant for retaining structures, the Contractor shall give a satisfactory water tightness test at his cost to the satisfaction of OFFICER IN-CHARGE Till such a satisfactory water tightness test is given, only part rates (90%), as directed by the Executive Engineer shall be admissible for payment and the decision for such part regarding reduced rates, shall be final and binding on the Contractor. It shall be Contractor's responsibility to give the water tightness test and he may use standard waterproofing compounds at his cost in the mortar.

12.7 In all other items viz. materials like sand, stones, joints, headers, khandkies, etc. the PWD Hand Book Specification (latest edition) and specifications given in standard specification Book (Red Book) shall apply.

12.8 The wall of masonry should be truly vertical on both faces or should be truly as specified grade.

12.9 The height of masonry should not be raised at more than 1 M per day.

GS 13 Doors, Windows CCTW Doors, Windows, Cupboards, etc.

13.1 Sizes shown on drawing are clear opening in masonry and not the shutter's size. these sizes shown on drawings are, therefore, inclusive of required frame sizes and doors, windows, etc. and shall be manufactured, accordingly. If sizes bigger than shown in drawing are manufactured, as instructed specifically in writing they shall be measured and paid for accordingly.

13.2 The work shall be executed as per the size of frame thickness of shutter type viz. plain planked paneled, glazed, etc. and fixture, etc. as described in tender item. Iron bars for windows ventilators are to be provided if specifically mentioned in the tender item at Contractor's cost. Specifications in PW standard specifications shall be applicable.

13.3 The design shutters and quality of wood shall be got approved from the Engineer-in-charge before manufacture. The CCTW to be used for wood work shall be uniform in substance straight, free from large deed knots, flows flanks. The work shall be done as per specification of P.W.D. hand books latest edition. The joints shall be perfect. The work be done as per specification Book (Red Book) published by B&C Department.

13.4 Parts of wood embedded in masonry shall be painted with the tar. The frames of doors, windows, ventilators, etc. shall have proper holdfasts embedded in masonry.

13.5 Whenever iron bar is to be provided as per tender item the rate thereof is included in tender item. The painting shall be done as prescribed in tender item. No painting, however, shall be permitted till the wood work is approved by the Engineer-in-charge.

13.6 Any substandard work not confirming to the specifications shall be paid at reduced rates only and also liable to the outright rejected and Executive Engineer's decision in such cases shall be final and binding on the Contractor**.**

13.7 The mode of measurement shall be on area units as mentioned in Schedule 'B'.

GS 14 Steel doors, windows and ventilators

14.1 General The specification lays down the requirements of providing the steel doors, windows and ventilators shall confirm to I.S. 1038 - 1975 its latest revision.

14.2 Material's Rolled Steel Sections: They shall be manufactured from steel confirming to I.S. 1977-1962 specifications its latest revision for structural steel. They shall be free from rolling defects and shall be suitable for punching and welding. Coupling Sections for Non-modular Opening: They shall be manufactured from mild steel plate 1.6 mm in thickness confirming to the dimensions as given in figure 84 or IS 1038 -1975 its latest revision as specified in the Item 1 Glass Panels: Glass panels shall weigh at least 7.5 kg/sqm. and shall be free from flaws, specks and bubbles. All glass panels shall have properly squared corners and straight edges. The size of glass panels shall be as specified in the item. Workmanship: The doors windows and ventilators shall be fixed in true line and level, to the entire satisfaction of the Engineer-in-charge. The damaged works shall be made good to the level of original works. Screws: Screws threads of machine screws used in manufacture of steel doors, windows and ventilators shall conform to the requirements of I.S. 7362-1962.

14.3 Mode of measurement The item shall include – a) Providing and fixing of steel frames and shutters to line and level. b) Fixing of required fixtures and fastenings of approved

quality. c) Glazing or paneling with specified materials such as glass or steel sheets etc. in workman like manner. d) Painting the steel sections and portion of the doors windows and ventilators with three coats of synthetic enamel paint of approved quality and shade.

GS 15 Plastering

15.1 12 mm, 20 mm and 25 mm cement either plain or waterproof. The plastering items shall be executed in thickness and cement mortar of proportions as detailed in respective tender items. Similarly, the plastering shall be either ordinary or waterproof as specified in tender item.

15.2 In case of waterproof plaster, standard and approved waterproofing compounding shall be mixed in cement mortar in required percentage as directed and then the plaster is applied. Unless and until the water tightness test is given by the Contractor to the satisfaction of the Officer In-Charge only part rates shall be paid.

15.3 The finishing shall be either smooth or rough cast as may be directed by the Officer In-Charge unless otherwise specifically mentioned in the tender item.

15.4 Neeru finish wherever directed by the Officer In-Charge shall be done from inside at no extra cost.

15.5 Specification given for this item in Standard Specifications Book (Red Book) published by B and C Department shall be followed

15.6 Curing and watering shall be done as directed and plaster shall be in alignment and level. Any substandard work is liable to be rejected and shall have to be redone at Contractor's cost. Sand to be used shall be of approved quality only.

15.7 Cost of all scaffolding is including in the tender rate.

GS 16 Flooring - IPS Flooring

1.1/2" thick cement concrete 1:2:4 shall be provided for IPS flooring. The size of metal shall not be more than 1/2" and it shall be properly graded. A thin coat of very fine plaster shall be provided on top to give it a smooth finish. The marking of false grooves to surfaces as directed includes the cost of labour.

GS 17 Shahabad Stone Flooring

17.1 Stone shall be specified in tender item. The Shahabad stones shall be square with suitable dimensions and of approved quality only. All stones shall be of the same size. They

shall be either rough Shahabad or polished Shahabad as mentioned in tender item. If there is no such mention, they shall be rough shahabad only. These shall be set in 1:2:4 CC and joints properly finished in CM 1:1 pointing. The CC bedding below 10 cm thickness (M-100) is included in the item.

17.2 All other specifications of P.W.D. Hand Book latest edition and specifications given in Standard Specification Book (Red Book) published by B and C Department shall apply to the above flooring items.

GS 18 Painting

The work shall be carried out as per the description of the tender item and as directed by Engineer-in-charge. It shall be whitewashing, distempering and / or snowcem painting. Shade and make shall be as directed by the Officer In-Charge and for decorative purpose, Officer In-Charge may ask for different shades to be provided for different components or different parts of the same component which the Contractor shall have to do within his tendered rate only at no extra cost to the Officer In-Charge Cost of priming coat as directed, scaffolding, etc. is included in the tender item. The work shall be executed as per the specifications of P.W.D. Hand Book latest edition and specification for painting in Standard Specification Book (Red Book) published by B and C Department.

GS 19 Providing and Fixing M.S. Ladder

Ladder shall be manufactured as per the details provided in the tender item. All the materials and labour required for executing the item are to be provided by the Contractor at his cost. The Ladder shall be properly fixed at site as directed and the bottom and top shall be properly embedded in 1:2:4 CC block as directed at Contractor's cost. In order to have stiffness to the ladder, cross Services or stiffeners at suitable intervals as directed, shall be provided of suitable M.S. flats duly embedded in walls or welded to the ladder. The specifications for this item as given in the Standard Specification Book (Red Book) published by B and C Department shall be followed.

GS 20 GI Hand Railing

The item shall be executed as specified in the tender item and as shown on drawing. The vertical SERVICES shall be properly fixed at base either in masonry or concrete by nuts and bolts duly embedded in the form, right anchorage holes in the vertical Services to pass GI piping in it or welding to fix the GI pipes to Services together with MS cleats, etc. are included in this item. The GI piping shall be provided along with required specials, fixtures, fastenings, etc. and GI collars or welded as per necessity. The diameter of GI piping,

number of rows, size and type to vertical posts together with its center to center distance height, etc. shall be as specified in the tender item in absence thereof as per the Officer In-Charge's type design in force. The rate shall also include 2 coats of approved shade oil paint. Cost of all the materials which shall be procured by the Contractor, labour involved for executing this item is including in tender item. The measurements and the payment shall be on the basis of lengths in running meters occupied by the completed railing assembly in plan.

GS 21 Providing, Fixing RSJ and Other Structural Steel Works

21.1 This item covers fixing MS/RS girders, MS angle, channel, flats base plates, gusset plates, clear, bracket, etc. and other accessories as per requirement and as directed and fabricating the assembly by cutting, drilling holes, etc. and erecting and fixing item at site with necessary riveted or welded joints, fixtures with nuts and bolts, etc. wherever necessary as directed. Structural steel works materials shall be procured by the Contractor from open market at his cost. The item includes 3 coats of oil paint of shade as directed to all structural work.

21.2 All above operations including cost of material and labour thereof are included in the tender item. The measurement and payment shall be on the weight basis in the unit as mentioned in Schedule 'B', actually erected at site as directed shall be admissible for payment. RSJ channels, angles, flats, gusset plates, brackets, base cleats, packing pieces actually used as directed shall be admissible for payment but not the rivets, nuts and bolts, etc. The riveted or welded joints or fixing with nuts are included in the tendered rates. The specification for this item given in Standard Specification (Red Book) published by B and C Department will be followed.

GS 22 Murum filling, Bedding etc.

22.1 When tender item provides that murum available from excavation is to be used free of cost, whatever murum that is available and suitable from excavated stuff shall be used by the contractor shall be used by the contractor free of cost.

22.2 The murum filling or bedding is to be done in 15 cm to 20 cm thick layers, watered and duly consolidated by hand rammers as directed.

GS 23 Rubble Filling - Providing and Packing Rubble Filling, etc.

23.1 The rubble shall be properly hand packed with murum bindage in 20 cm thick layers as directed. Unless otherwise specifically mentioned in the tender item of the cost of rubble is included in this item, and if rubble is available from excavation, the same shall be used by

the contractor after getting approved the quality of rubble selected from the excavated stuff by the Engineer-in-charge. This rubble is considered to be issued free of cost for use on the work only.

23.2 This shall be as per specification of P.W.D. (Hand Book) and as directed by Engineer-in-charge. Only trap stone shall be used other than the specification for this item in Standard Specification Book.

GS 24 Specifications for Embankment

24.1 Scope of work: The item shall include deposition and spreading the available material from excavation in final position and consolidation as specified

24.2 Clearance of site: Before commencing the work on the embankment, the site should be cleared of stones and vegetation without any charges. The soil available from excavation and to be used for embankment work should be free from any deleterious materials and the same shall be carried out by the contractor without any charges.

24.3 Material used: All the material to be used shall be free from organic material and shall contain coarse-grained material whose suitability being confirmed by laboratory tests. The material shall not contain stones larger than 3/4th thickness of compacted layer Surplus rubble available at site can be used as casing material as directed by the Engineer-in-charge.

24.4 Compaction including watering: All the materials placed in the embankment shall be compacted to attain a dry density which shall not be less than 95% of the modified proctor density of the material under consideration. The required amount of water to be sprinkled for a specific quantity of soil shall be first calculated when water is proposed to be added at the dam. This water should be thoroughly mixed with the soil and then rolling should be started. Rolling should be done by wheeled power rollers of 10 Tonne capacity. For the portions where compaction is permitted by the Executive Engineer to be done by non-mechanical means, the compaction shall be done by stone or iron rollers of such a size and weight that they will give a pressure of 15 Tonne per metre length of the roller. There should be at least 2 field density tests per day for ascertaining the dry density of the soil. Also the field tests shall be done forever 300 cum of embankment compacted.

24.5 Tamping. In those part of the structure in accessible to the specified rolling equipment's, around and in contact with the structure and in proximity to structures where the rolling equipment will not be permitted to operate, compaction shall be either accomplished either with hand or mechanical tampers of approved type. Rollers will not be

permitted to operate within one meter of structures and this distance shall be tamped by mechanical tamper. All materials to be tamped shall be exercised to obtain a good contact and bond with surface of structures.

GS25 Specifications for Stone Pitching Scope of Work

The slopes of the embankment to receive the pitching shall be first prepared and the pitching laid upon the bank work

25.1 Material: Stones should be large and placed vertically so as to interlock with each other and the chips used for filling the interstices and wedging may be in pieces. The stone should be large enough so as not to be disturbed by wave action. Also the flat surface of the pitching should face the embankment. The remaining interstices being filled in with chips, spauls properly hammered in so that the entire mass becomes firm and cannot be disturbed by hand

25.2 Laying of Pitching: The stones used for pitching shall be perfectly sound and as regular as possible.60% of the stones shall not weigh less than 40Kg each. The stones should be interlocked and keyed together with minimum voids. High irregular points shall be knocked off and the finished pitching shall present a neat and reasonably smooth and uniform surface free of loose stones.

GS 26 Providing H.D.P.E. Pipes

This Indian Standard lays down requirements for high density polyethylene pipes from 16mm to 1000mm nominal diameter of pressure rating from 0.25 MPa to 1.6 MPa in material grades of PE63, PE 80, PE 100, for use for buried water, sewerage mains and services confirming to IS 4984/14151/12786/13488 latest version 1.1

References: *The Indian Standards listed below are necessary adjuncts to this standard*

IS No.	Title
2530 : 1963	Methods of test for polyethylene moulding materials and polyethylene compounds.
4905 : 1968	Methods for random sampling.
7328 : 1991	High density polyethylene materials for moulding and extrusion (First revision).
9845 : 1968	Method of analysis for the determination of constituents of plastics materials and articles intended to come into contact with foodstuffs (First revision)
10141 : 1982	Positive list of constituents of polyethylene in contact with foodstuffs, pharmaceuticals and drinking water.
10146 : 1982	Polyethylene for its safe use in contact with foodstuff, pharmaceuticals and drinking water.

26.1 Designation

26.1.1 Pipes shall be designated according to the grade of material followed by pressure rating and nominal diameter for example, PE 63, PN 10, DN,200 indicates a pipe pertaining to material grade 63, pressure rating 1.0 MPs and outside nominal diameter 200 mm. in blue colour. These stripes shall be executed during pipe manufacturing and shall not be more than 0.2 mm in depth. The material of the strips shall be of the same type of resin, as used in the base compound for the pipe.

26.1.2 Material

The material used for the manufacture of pipes should not constitute toxic hazard, should not services microbial growth and should not give rise to unpleasant taste or odour, cloudiness or discoloration of water. Pipe manufacturers shall obtain a certificate to this effect from the manufacturers of raw material.

26.1.3 High Density Polyethylene. High density polyethylene (HDPE) used for the manufacture of pipes shall conform to designation PEEWA-45-T-006 of IS 7328:1991. HDPE confirming to designation PEEWA-45-T-012 of IS 7328 m: 1992 may also be used with the exception that melt flow rating (MFR) shall not exceed 1.10 Kg / 10 minutes. In addition the material shall also conform 5.6.2 of IS 7328:1992 (See A-1) 1.6.3 The specified base density shall be between 9405 Kg / m3 and 946.4 kg / m3 (both inclusive) when determined at 27^0C according to procedure prescribed in Annex A of IS 7328: 1992. The value of the density shall also not differ from the nominal value by more than 3 Kg / m3 as per 5.2.1.1 of IS 7328:1992. 1.6.4 The MFr of the material shall be between 0.41 and 1.10 (both inclusive) when tested at 1900 with nominal load of 5 Kgf as determined by method prescribed in 7 of IS 2530:1993. The MFR of the material shall also be within – 20 percent of the value declared by the manufacturer.

26.1.4 The Resin shall be compounded with carbon black. The carbon black content in the material shall be within 2.5 = 0.5 % and the dispersion of carbon black shall be satisfactory when tested according to the procedure described in IS 2530:1963.

26.1.5 Anti-oxidant The percentage of anti-oxidant used shall not be more than 0.3 percent by mass of finished resin. The anti-oxidant used shall be physiologically harmless and shall be selected from the list given in IS 10141: 1982.

26.1.6 Reworked Material The addition of not more than 10 percent of the manufacturer's own rework material resulting from the manufacture of pipes is permissible. No other reworked or recycled material shall be used.

26.2 Dimensions of Pipes

26.2.1 Wall Thickness: The minimum and maximum wall thickness of pipes for the three grades of materials, namely, PE 63, PE 80, and PE 100 shall be as PW IS 4984 / 1995. 1.6.2

26.2.2 Method of Measurement: The outside diameter of the pipe shall be taken as the average of two measurements taken at right angles for pipes up to 110 mm diameter. Alternatively and for high sizes, the diameter shall be measured preferably by using a flexible pit tape or micrometer, having an accuracy of not less than 0.1 mm. The wall thickness shall be measured by a dia. vernier or ball ended micrometer. The resulting dimension shall be expressed to the nearest 0.1 mm.

Notes:

1. The outside diameter shall be measured at a distance of at least 300 mm from the end of the pipe.
2. In the case of dispute, the dimension of pipes shall be increased after conditioning at room temperature for 4 hours.

26.2.3 Length of Straight Pipe: The length of straight pipe shall not be less than 6.0 m.

26.2.4 Coiling: The pipes supplied in coils shall be coiled on drums of minimum diameter of 25 times the nominal diameter of the pipe ensuring that kinking of pipe is prevented.

26.3 Visual Appearance: The internal and external surfaces of the pipes shall be smooth, clean and free from grooving and other longitudinal grooves or irregularities in the wall thickness shall be permissible provided that the wall thickness remains within he permissible limits.

26.4 Performance Requirements.

26.4.1 Hydraulic Characteristics. Then subjected to internal pressure creep rupture test in accordance with procedure given in Annexure of IS 4985 / 1995 the pipes under test shall show no signs of localized swelling, leakage or weeping, and shall not burst during the prescribed test duration. The temperatures, duration of test and induced stresses for the test shall conform to those specified in Table as below.

Sr. No.	**Test**	**Test Temp ^{0}C**	**Test Duration (Minimum Holding Time)**	**Induced Stress, or in MPa for**		
				PE 63	PE 80	PE 100
1	2	3	4	5	6	7
i)	Type Test	80	165	3.5	4.6	5.5

ii)	Acceptanc e test.	48	48	3.8	4.9	5.7

26.4.2 Reversion Test. When tested according to the procedure given at Annex C, IS of 4985 / 1995 the value of the longitudinal reversion shall not be greater than 3 percent.

26.4.3 Overall Migration Test. When tested from a composite sample of minimum 3 pipes as per IS 9845: 1986, the overall migration of constituents shall be within the limits stipulated in IS 10146: 1987.

26.4.4 Density. When tested from a composite sample of minimum three pipes as per Annex A of IS 7328: 199, it shall meet the requirement as given in 5.2. 1 of IS 4985 / 1995.

26.4.5 Melt Flow Rate (MFR). When tested from a composite sample of minimum three pipes as per IS 2530: 1963 at 1900 C with nominal load of 5 kg, MFR shall be between 0.4 to 1.1 kg / 10 minutes and also shall not differ by more than 30% of the MFR of the material used in manufacturing pipes.

26.4.6 Carbon Black Content and Dispersion. When tested from a composite sample of minimum three pipes, in accordance with IS 2530:1963, the carbon black content shall be within 2.5 = 0.5 percent and the dispersion of carbon black shall be satisfactory.

26.5 Sampling, Frequency of tests and Criteria for conformity.

26.5.1 Type Test. The tests are intended to prove the suitability and performance of a new composition, a new technique or a new size of a pipe. Such tests, therefore, need be applied only when a change is made in polyer composition or method of manufacture, or when a new size of pipe is to be introduced. Even if no change is envisaged type test shall be done at least once in two years on each pressure rating and grade of pipe of the highest size manufactured during the period.

26.5.2 Acceptance Tests. Acceptance tests are carried out on samples selected from a lot for the purpose of a acceptance of the lot.

26.5.3 Lot. All pipes of the same size, same pressure rating and same grade and also manufactured essentially under similar conditions of manufacture, shall constitute a lot. For ascertaining conformity of the lot to the requirements of this specification, samples shall select in accordance with the provisions.

GS 27 Precautions during Execution

(i) The Contractor shall comply with instructions issued by the Employer in respect of road

maintenance and inter utility code of conduct for excavating trenches across and along various roads and other places, in all respects. In case of non-compliance the contractor shall be liable to pay liquidated damages for various lapses as indicated below:

a) Non-installation of boards on either ends of trenches: Rs. 500/- per day till implementation
b) Non shoring of walls of trenches to prevent collapse of the excavated portion (beyond 1.5 m) and where proper stopping not proved: Rs. 1000/- per day till the shoring is fixed.
c) Digging of trenches beyond a stretch of 500 meter for Electrical Authority and Employer and otherwise 1000 meter in case of telephone: Rs. 500/- per day till the damage is restored.
d) Non barricading of trenches of more than 1.5 meter: Rs. 500/- per day till completed.
e) Excavation of trenches across and along roads during day time (at 8 AM to 8PM) without permission: Rs. 500/- per day.
f) Non removal of excess earth and other stones etc. which are causing inconvenience to the road users: Rs. 1000/- per day till completed.
g) Non consolidation of earth while back filling of trenches to the original level: Rs. 500/- per day till completed.
h) Non adherence to prescribed methodology for reinstatement of trenches: Rs. 500/- per day.
i) Road cutting without written or oral permission: Rs. 1250/- per day.
j) Non stacking of materials pipes etc. in an orderly manner during execution causing 98
k) in convenience to the road users: Rs. 1000/- per day.

(ii) The contractor shall have to provide MS sheet barricading or as provided in BOQ up to a minimum height of 2m above ground level all around the Site of excavation and trenches as per direction of Engineer-in-Charge. Such barricading must be provided before taking up the excavation work and must remain in position till complete filling back of excavated trenches and resurfacing work, if any. The sheets must be painted in red & White stripes with fluorescent paint.

(iii) Proper supporting of all underground services such as water mains, sewers, cables, drains, and water and sewer connections shall be provided by the contractor without any additional cost. If the services/connections are damaged the contractor will be responsible for the restoration of the same to original specifications at his own cost.

(iv) Imposition of liquidated damages by Employer shall not absolve Contractor from any other civil/ criminal liabilities.

(v) Contractor should maintain first aid box, electric shock recovery devices, safety equipment such as breathing apparatus, safety personal protective equipment and/ or other safety equipment as per NHRC guidelines and/ or factory act. The Engineer-in-Charge shall decide to impose suitable damages

GS 28 Action in Case work Not Done as per Specifications

28.1 All work under or in course of execution or executed in pursuance of the Contract shall at all times be open and accessible to the inspection and supervision of the Engineer-in-Charge, his representatives and assistants in charge of the Works and all senior officers, officer of the quality control division of the Employer, third party hired by Employer, and of the chief technical examiner's office. The Contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of such officers has been given to the Contractor, either himself be present to receive orders and instructions or have his responsible agent, present for that purpose.

28.2 In the event it appears to the Engineer-in-Charge or his representative in charge of the Works or any nominated officer (as described above in this clause), that any work has been executed with unsound, imperfect, or unskillful workmanship, or is against Good Engineering Practice or with material or articles of a quality inferior to that contracted or otherwise not in accordance with the Contract, the Contractor shall, on demand in writing which shall be made during construction and upto six months after completion of the Works by the Engineer-in-Charge specifying the work, materials or articles complained (notwithstanding that the same may have been passed, certified and paid for forthwith) rectify, or remove and reconstruct the Works so specified in whole or in part, as the case may require, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost. In the event of failing to do so within a period specified by the Engineer-in- Charge in his demand aforesaid, the Contractor shall be liable to pay compensation at the same rate specified earlier in the Contract (for non-completion of the Works in time) for this default.

28.3 Provided that in such an event the Engineer-in-Charge may not accept the item of Works at the rates applicable under the Contract but may accept such items at reduced rates as the Employer may consider reasonable during the preparation of on-account bills or final bill if the item is so acceptable without detriment to the safety and utility of the item and the structure or he may reject the Works outright without any payment and/or get it and other

connected and incidental items rectified, or removed and re-executed at the risk and cost of the Contractor. Decision of the Engineer-in-Charge to be conveyed in writing in respect of the same shall be final and binding on the Contractor.

GS 29 Action where there are no Specifications

In the case of any class of work for which there is no such specifications as referred in tender conditions, such work shall be carried out in accordance with the CPWD/ Bureau of Indian Standards Specifications or any other applicable standards specific to the Works. Provided that where there is no such specification in CPWD/ Bureau of Indian Standards, the Works shall be carried out as per manufacturers' specifications. Provided further that where there are no such specifications as required above, the Works shall be carried out in all respects in accordance with Good Engineering Practice and Site requirements under the instructions and requirements as communicated by the Engineer-in-Charge.

GS 30 Contractor to Supply Tools & Plants etc.

The Contractor shall provide at his own cost all materials (except such special materials If any, as may in accordance with the Contract be supplied from the Employer) stores, plants, tools, appliances, implements, ladders, cordage, tackle, scaffolding and temporary work required for the proper execution of the work, whether original, altered or substituted and whether included in the specification or other documents forming part of the Contract or referred to in these conditions or not, or which may be necessary for the purpose of satisfying or complying with the requirements of the Engineer-in-Charge. The Contractor shall also supply without charge the requisite number of persons with the means and materials, necessary for the purpose of setting out Works, and counting, weighing and assisting the measurement for examination at any time of the Works or materials. In the event the Contractor fails to supply such requisite number of persons with the means and materials the same may be provided by the Engineer-in-Charge at the expense of the Contractor and the expenses may be deducted, from any money due to the Contractor, under this Contract or otherwise and/or from his security deposit or the proceeds of sale thereof, or of a sufficient portions thereof.

30.1 Hire of Plant and Machinery

(i) The Contractor shall arrange at his own expense all tools, plant, machinery or equipment (hereinafter referred to as T&P) required for execution of the Works except for the Plant & Machinery listed in Special Conditions of Contract and stipulated for issue to the Contractor. If the Contractor requires any item of T&P on hire from the T&P available with the Employer over and above the T&P stipulated for issue, the Employer will, if such item is available, hire

it to the Contractor at rates to be agreed upon between him and the Engineer-in-Charge. In such a case all the conditions hereunder for issue of T&P shall also be applicable to such T&P as is agreed to be issued.

(ii) Plant and Machinery when supplied on hire charges as shown in Special Conditions of Contract shall be taken from the departmental equipment yard/shed and the Contractor shall bear the cost of carriage from the place of issue to the Site and back. The Contractor shall be responsible to return the plant and machinery in the condition in which it was handed over to him, and shall be responsible for all damage caused to the said plant and machinery at the Site or elsewhere during operation and otherwise during transit including damage to or loss of plant and for all losses due to his failure to return the same, soon after the completion of the Works for which it was issued. The Engineer-in-Charge shall be the sole judge to determine the liability of the Contractor and its extent in this regard and his decision shall be final and binding on the Contractor

(iii) The plant and machinery as stipulated above shall be issued as and when available and if required by the Contractor. The Contractor shall arrange his work program schedule according to the availability of the plant and machinery and no claim whatsoever will be entertained from him for any delay in supply by the Employer. If such re-arrangement results in delay in completion of work, and such delay, in the opinion of Engineer-in-Charge are unavoidable, the contractor shall be entitled to shall be eligible for extension of time.

(iv) The hire charges shall be recovered at the prescribed rates from and inclusive of the date the plant and machinery made over up to and inclusive of the date of the return in good order even though the same may not have been working for any cause except major breakdown due to no fault of the Contractor or faulty use requiring more than three working days continuously (excluding intervening, holidays and Sundays) for bringing the plant in order. The Contractor shall immediately intimate in writing to the Engineer-in- Charge when any plant or machinery gets out of order requiring major repairs as aforesaid. The Engineer-in-Charge shall record the date and time of receipt of such intimation in the log sheet of the plant or machinery. Based on this if the breakdown occurs before lunch period or major breakdown will be computed considering half a day's breakdown on the day of complaint. If the breakdown occurs in the post lunch period of major breakdown will be computed starting from the next working day. In case of any dispute under this clause the decision of the Engineer-in-Charge shall be final and binding on the Contractor.

(v) The hire charges shown above are for each day of 8 hours (inclusive of the one hour lunch break) or part thereof.

(vi) Hire charges shall include service of operating staff as required and also supply of Lubricating oil and stores for cleaning purposes. Power fuel of approved type, firewood, kerosene oil etc. for running the plant and machinery' and also the full time chowkidar for guarding the plant and machinery against any loss or damage shall be arranged by the Contractor who shall be fully responsible for the safeguard and security of plant and machinery. The Contractor shall on or before the supply of plant and machinery sign an agreement indemnifying the Employer against any loss or damage caused to the plant and machinery either during transit or at Site.

(vii) Ordinarily, no plant and machinery shall work for more than 8 hours a day inclusive of one hour lunch break. In case of an urgent work however, the Engineer-in-Charge may, at his discretion, allow the plant and machinery to be worked for more than normal period of 8 hours a day. In that case the hourly hire charges for overtime to be borne by the Contractor shall be 50% more than the normal proportionate hourly charges (1/8th of the daily charges) subject to a minimum of half day's normal charges on any particular day. For working out hire charges for overtime a period of half an hour and above will be charged as one hour and a period of less than half an hour will be ignored.

(viii) The Contractor shall release the plant and machinery every 7 (seventh) day for periodical servicing and/or wash out which may take about three to four hours or more. Hire charges for full day shall be recovered from the Contractor for the day of servicing/ wash out irrespective of the period employed in servicing

(ix) The plant and machinery once issued to the Contractor shall not be returned by him on account of lack of arrangements of labour and materials, etc. on his part, the same will be returned only when they are required for major repairs or when in the opinion of the Engineer-in- Charge the Works or a portion of Works for which the same was issued is completed.

(x) Log Book for recording the hours of daily work for each of the plant and machinery supplied to the Contractor shall be maintained by the Employer and shall be countersigned by the Contractor or his responsible agent daily. In case the Contractor contests the correctness of the entries and/or fails to sign the Log Book, the decision of the Engineer-in-Charge shall be final and binding on him. Hire charges shall be calculated according to the entries in the Log Book and will be binding on the Contractor. Recovery on account of hire charges for road rollers shall be made for the minimum number of days worked out on the assumption that a roller can consolidate per day and maximum quantity of materials or area surfacing, the data for which shall be provided by Employer later on request. Local Body

may use GPS tracking devices for on-line monitoring of movements and recording of log book.

(xi) In the case of concrete mixers, the Contractors shall arrange to get the hopper cleaned and the drum washed at the close of the work each day or each occasion. In case rollers for consolidation are employed by the Contractor himself, log book for such rollers shall be maintained in the same manner as is done in case of departmental rollers, maximum quantity of any items to be consolidated for each roller-day shall also be same as in data

(x) For less use of rollers recovery for the less roller days shall be made at the stipulated issue rate.

(xii) The Contractor shall be responsible to return the plant and machinery in the condition in which it was handed over to him and he shall be responsible for all damage caused to the said plant and machinery at the Site or elsewhere in operation or otherwise or during transit including damage to or loss of parts, and for all losses due to his failure to return the same soon after the completion of the Works for which it was issued. The Engineer-in-Charge shall be the sole judge to determine the liability of the Contractor and its extent in this regard and his decision shall be final and binding on the Contractor.

(xiii) The Contractor shall be exempted from levy of any hire charges for the number of days he is called upon in writing by the Engineer-in-Charge to suspend execution of the work, provided Employer plant and machinery in question have, in fact, remained idle with the Contractor because of the suspension.

(xiv) In the event of the Contractor not requiring any item of plant and machinery issued by Employer though not stipulated for issue in Contract any time after taking delivery at the place of issue, he may return if after 2 (two) days written notice or at any time without notice it he agrees to pay hire charges for 2 (two) additional days without, in any way, affecting the right of the Engineer-in-Charge to use the said plant and machinery during the said period of 2 (two) days as he likes including hiring out to a third party.

GS 31 General Measurement & Payments

31.1 Measurement of work done

31.1.1 The Engineer-in-Charge shall, except as otherwise provided, ascertain and determine, by measurement, the value of Works done in accordance with the Contract. Measurement of all items having financial value shall be entered in measurement book and/or level field book so that a complete record is obtained of all Works performed under

the Contract. All measurements and levels shall be taken jointly by the Engineer-in-Charge or his authorized representative and by the Contractor or his responsible agent from time to time during the progress of the Works and such measurements shall be signed and dated by the Engineer-in-Charge and the Contractor or their representatives as token of their acceptance. If the Contractor objects to any of the measurements recorded, a note shall be made to that effect with reason and signed by both the parties.

31.1.2 If for any reason the Contractor or his responsible agent is not available and the work of recording measurements is suspended by the Engineer-in-Charge or his representative, the Engineer-in-Charge and the Employer shall not entertain any claim from Contractor for any loss or damages on this account. If the Contractor or his responsible agent does not remain present at the time of such measurements after the Contractor or his responsible agent has been given a notice in writing three (3) days in advance or fails to countersign or to record objection within a week from the date of the measurement, then such measurements recorded in his absence by the Engineer-in- Charge or his representative shall be deemed to have been accepted by the Contractor.

31.1.3 The Contractor shall, without extra charge, provide all assistance with every instrument, labour and other things necessary for measurements and recording levels.

31.1.4 Except where any general or detailed description of the Works expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the technical specifications notwithstanding any provision in the relevant standard method of measurement or any general or local custom. In the case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the Bureau of Indian Standards and if for any item no such standard is available then a mutually agreed method shall be followed.

31.1.5 If any part of Works shall be covered up or placed beyond the reach of measurements without notice been given to the Engineer-in-Charge or without his consent being obtained in writing, the Works shall be uncovered at Contractor's expense, or in default thereof no payment or allowance shall be made for such Works or the materials with which the same was executed.

31.1.6 Engineer-in-Charge or his authorized representative may cause either themselves or another officer of the Employer to check the measurements recorded jointly or otherwise as aforesaid and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.

31.1.7 It is also a term of this Contract that recording of measurements of any item of Works in the measurement book and/or its payment in the interim, on-account or final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the Contractor from liabilities from any other measurements or defects noticed till completion of the defects liability period.

31.2 Payments of Running Bills

31.2.1 The payment of the monthly running bill for the Works shall be released in 90 days from the date of recording of pay order. No excuse for delay in completion of work/prolongation of the Contract shall however be entertained on account of the reason of delay in payment. The bidder therefore, must take into consideration of its financial capability to carry out and to continue the work without any hindrances.

31.2.2 In the event of the failure of Employer to release payment as per clause 8.2.1, the Employer shall be liable to pay interest @ 10% per annum on net payable amount computed for period beyond 90 days. Provided always, that no interest shall be payable on any amount disallowed or disputed by the Engineer-in-Charge or the Employer, even if such amount is later on determined to be payable to the Contractor, as a result of any process resorted to for the settlement of the dispute as per Contract.

31.2.3 It shall be the contractual obligations on the part of the Contractor to submit with each running bill photocopies of the:-

(i) Challans for the main items purchased for the Works like CI/DI/MS/RCC/PSC Pipes, E&M equipment, manhole frame and covers, footrests, sluice valves, fire hydrants and other fixtures and accessories used in the Works;

(ii) Guarantee/ warranty certificates, wherever applicable;
(iii) Manufacturer's test reports of cement, steel, MS plates, sluice valves etc.
(iv) GIS maps of pipelines and other related key components (to be submitted only with the final bill)

Note: Contractor shall solely be responsible for the authenticity of the challans and other documents submitted along with each running and final bills.

31.2.4 The original challans shall be produced before the Engineer-in-Charge for verification, as and when desired by him.

31.3 Currency of Payment

Unless specifically provided for in the Contract, all payments shall be in Indian rupees only. Unless specified otherwise, payment, if any, in foreign currencies, shall be made only to the extent and in the manner laid down in the Contract. In case of items of Works requiring payments in foreign exchange, the Contractor shall furnish the details in the Bill of Quantities. For such items, payments will be arranged in Foreign Currency.

31.4 Payment of Contractor's bills to Banks

Payments due to the Contractor shall be made to his bank instead of direct to him. The Contractor shall submit to the Engineer-in-Charge:

(1) an authorization in form of a legally valid document such as a power of attorney conferring authority on the bank to receive payments and

(2) his own acceptance of the correctness of the amount made out as being due to him by Employer or his signature on the bill or other claim preferred against Employer before settlement by the Engineer-in-Charge of the account or claim by payment to the bank, registered financial, cooperative or thrift societies or recognized financial institutions. While the receipt given by such bank; registered financial, cooperative or thrift societies or recognized financial institutions shall constitute a full and sufficient discharge for the payment, the Contractor shall whenever possible present his bills duly receipted and discharged through his bank, registered financial, cooperative or thrift societies or recognized financial institutions. Nothing herein contained shall operate to create any rights or equities vis-à-vis Employer in favor of the bank.

31.5 Payment of Final Bill

The final bill shall be submitted by the Contractor within three months of Completion Date or within one month of the date of issue of Completion Certificate furnished by the Engineer-in-Charge whichever is earlier. In case commissioning is delayed beyond a period of one year from the Physical Completion of the Works, the final bill shall be settled upon completion of the Defect Liability Period, as per various clause or upon successful commissioning whichever is earlier. No further claims shall be made by the Contractor after submission of the final bill and these shall be deemed to have been waived and extinguished. Payments of those items of the bill in respect of which there is no dispute and of items in dispute, for quantities and rates as approved by Engineer-in Charge, will, as far as possible be made within the period specified herein under, the period being reckoned from the date of receipt of the bill by the Engineer-in-Charge or his representative, complete with account of materials issued by the Employer and dismantled materials.

31.6 Lump sum Provisions in a Composite Tender

When the Contract Price is lump sum in respect of parts of the Works, the Contractor shall be entitled to payment in respect of the items of Works involved or the part of the Works in question at the same rates as are payable under this Contract for such items, or if the part of the Works in question is not in the opinion of the Engineer-in-Charge payable of measurement, the Engineer-in- Charge may at his discretion pay the lump-sum amount entered in the estimate, and the certificate in writing of the Engineer-In-Charge shall be final and conclusive against the Contractor with regard to any sum or sums payable to him under the provisions of the clause.

31.7 Withholding and lien in respect of sums due from Contractor

(i) Whenever any claim or claims for payment of a sum of money arises out of or under the Contract against the Contractor, the Engineer-in-Charge or the Employer shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from any sum or sums found payable or which may at any time thereafter become payable to the Contractor under the Contract. In the event of the payment from such sums being insufficient to cover the claimed amount, the Employer shall be entitled to withhold and have a lien to retain to the extent of such claimed amount from the security deposit, if any. Further, for the purpose of this clause, the Employer shall be entitled to withhold and also have a lien to retain to the extent of the claimed amount or amounts, from any sum or sums found payable or which may at any time thereafter become payable to the Contractor under any other Contract with the Engineer- in-Charge or the Employer pending finalization of adjudication of any such claim.

(ii) The sum of money or moneys so withheld or retained under the lien referred to above by the Engineer-in- Charge or Employer will be kept withheld or retained as such by the Engineer-in- Charge or Employer till the claim arising out of or under the Contract is determined by the arbitrator (if the Contract is governed by the arbitration clause) or by the competent ‘court, as the case may be and that the Contractor will have no claim for interest or damages whatsoever on any account in respect of such withholding or retention under the lien referred to above and duly notified as such to the Contractor. For the purpose of this clause, where the Contractor is a partnership firm or a limited company, the Engineer-in-Charge or the Employer shall be entitled to withhold and also have a lien to retain towards such claimed amount or amounts in whole or in part from any sum found payable to any partner/limited company as the case may be, whether in his Individual capacity or otherwise.

(iii) The Employer shall have the right to cause an audit and technical examination of the Works and the final bills of the Contractor including all supporting vouchers, abstract, etc., to be made after payment of the final bill. If as a result of such audit and technical examination

any sum is found to have been overpaid in respect of any work done by the Contractor under the Contract or any work claimed to have been done by him under the Contract is found not to have been executed, the Contractor shall be liable to refund the amount of over-payment and it shall be lawful for Employer to recover the same from him in the manner prescribed in sub-clause (i) of this clause or in any other manner legally permissible; and if it is found that the Contractor was paid less than what was due to him under the Contract in respect if any work executed by him under it, the amount of such under payment shall be duly paid by Employer to the Contractor, without any interest thereon. Provided that the Employer shall not be entitled to recover any sum overpaid, nor the Contractor shall be entitled to payment of any sum paid short where such payment has been agreed upon between the Engineer-in-Charge on the one hand and the Contractor on the other under any term of the Contract permitting payment for Works after assessment by the Engineer-in-Charge.

31.8 Rates

31.8.1 The tendered rate (%age rate tender/item rate tender) for all items of the Works shall be considered inclusive of all leads and lifts, unless otherwise specified by BOQ, skilled or unskilled labour & material required for working at all heights and depths, making any shape of the masonry as per the drawings, royalty fee, terminal taxes, octroi , entry tax etc. etc. besides other taxes payable by the Contractor such as Value Added Tax (VAT) on work contract and the VAT applicable on the goods/material. Nothing extra shall be paid unless otherwise given in the description of item and no extra claim shall be entertained due to any reasons whatsoever on this account.

31.8.2 Nothing extra shall be paid unless otherwise specified on account of cutting of grass, bushes, leveling of undulation in the ground, existence of drain and temporary structures etc. requiring removal and difficulty due to space constraints.

31.8.3 Nothing extra shall be paid for working in foul conditions unless otherwise specified. The tendered rates shall not be subject to any revisions for want of any information.

31.8.4 Nothing extra shall be paid for Works required as per Good Engineering Practice, BIS, manufacturer recommendation even if it is not specifically provided in the Contract.

31.9 Levy / Taxes payable by Contractor

All taxes, duties, levies, cess, etc. in respect of this Contract shall be payable by the Contractor and the Employer shall not entertain any claim whatsoever in this respect.

(i) The Contractor shall deposit royalty and obtain necessary permit for supply of the red

bajri, stone, kankar, etc. from local authorities.

(ii) Where pursuant to or under any law, notification or order any royalty, cess or the like becomes payable by the Employer and does not any time become payable by the Contractor to the State Government or Local authorities in respect of any material used by the Contractor in the Works, then in such a case, it shall be lawful to the Employer and it will have the right and be entitled to recover the amount paid in the circumstances as aforesaid from dues of the Contractor.

31.10 Taxes

31.10.1 Unless otherwise specified in Special Conditions of Contract, the Contract Price shall be inclusive of all the taxes, duties, cess/GST or any other taxes on the materials.

31.10.2 Service Tax: - Deleted

For item rate and percentage rate tenders, the quantity of various materials and supplies/equipments shall be worked out as per the Bill of Quantities (BOQ) prepared for working out the estimates of the project. For DBO projects, the quantity of various materials and supplies/ equipment to be consumed shall be worked out based on the design & drawing submitted by the Contractor after award of work and that is subsequently released by Employer for execution of work. Such release of design and drawing by Employer shall be periodic and commensurate with the work progress. The BOQ and the price break-up shall then be prepared by the Contractor for DBO projects and got approved by Employer. In case of any extra/ substitute item, necessary adjustment would be accordingly made to BOQ. Although Employer shall recognize the delivery challan for material and supplies/ equipments involved in execution of the work (supplied in course of inter-state trade) at the time of their receipt at the Site, the responsibility of their watch and ward shall continue to vest with Contractor, until the project is handed over to Employer. Also, the payment to Contractor shall be governed by the payment schedule as laid down in the tender document. To facilitate the Contractor account for the transactions, Employer shall with each payment issue a certificate specifying the quantity of material and supplies/ equipment consumed in achievement of a project milestone against which payment is released, based on the quantities worked out as mentioned above.

Note: *Recognition of delivery challan against the material and supplies at the time of their receipt at the project site should not be understood in any case, that the contractor can procure any quantity of material which is way beyond the quantity to be consumed (estimated using the common business prudence) and the shelf life of the material expires before it being used. Accordingly, material and supplies should be procured based on the progressive use of material and supplies/ equipments and the same shall correspond with*

the approved/ released design & drawing, and BOQ. Further, Employer shall not be responsible in any manner to recognize the billing for any excess consumption of material and supplies/ equipments by the Contractor beyond the quantities worked out as per para 2 above, subject to permissible variation allowed under clause 9.3. [Clause to be inserted in Pure Supply and E&M Contracts]

31.10.6 Works Contract TDS: The Contractor shall produce before the Employer a copy of his registration certificate under the GST Act/s and the lower TDS rate certificate (if any) issued in terms of the provisions made under the GST Act / Rules, hereof, failing which the Employer will deduct tax at source (TDS) on full value of the Contract at the standard rate prescribed under the GST Act.

GS 32 Alterations, Additions & Omissions

32.1 Deviations / Variation Extent and Pricing

32.1.1 The Engineer-in-Charge shall have power:

(i) to make alteration , omissions , additions , or substitutions in the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work, and

(ii) to omit a part of the Works in case of non-availability of a portion of the Site or for any Other reasons.

The Contractor shall be bound to carry out the Works in accordance with any instructions given to him in writing signed by the Engineer-in-Charge and such alterations, omissions, additions or substitutions shall form part of the Contract as if originally provided therein. Any altered, additional or substituted Works which the Contractor may be directed to do in the manner specified above as part of the Works, shall be carried out by the Contractor on the same conditions in all respects including price on which he agreed to do the Works except as hereafter provided. Instructions for any variations shall be communicated to the Contractor by the Engineer-in-Charge in writing with a copy to the Employer.

32.1.2 The time for completion of the Works shall, in the event of any deviations resulting in additional cost over the Contract Price be extended, if requested by the Contractor, as follows:

(i) In the proportion which the additional cost of the altered, additional or substituted work, bears to the original Contract Price and

(ii) Upto 25% of the time calculated in (i) above or as may be considered reasonable by the Engineer-in-Charge.

32.1.3 If any extra item of material and/ or labour is involved during execution of work, the Contractor shall have to execute the same as per the direction of Engineer-in-Charge and the payment shall be made as per applicable DSR plus/ minus Contractor's enhancement as applicable. In case, the extra item of material and/ or labour is not available in the schedule of rate, the Contractor will be paid analyzed rates based on either DSR with Contractor's enhancement (+/-) or prevailing market rates plus 15% Contractor's profit but without Contractor's enhancement.

32.1.4 In case of reduction of scope due to action under clause 9.1.1, the reduction in payments shall be calculated based on schedule of rates for the Contract.

32.2 Foreclosure of Contract due to abandonment or reductions in scope of work

32.2.1 If at any time after issuance of Work Order, the Employer decides to abandon or reduce the scope of the Works for any reason whatsoever and hence not require the whole or any part of the Works to be carried out, the Engineer-in-Charge shall give notice in writing to that effect to the Contractor and the Contractor shall act accordingly in the matter. The Contractor shall have no claim to any payment of compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the Works in full but which he did not derive in consequence of the fore closure of the whole or part of the Works.

32.2.2 The Contractor shall be paid at Contract rates full amount for Works executed at Site and, in addition, a reasonable amount as certified by the Engineer-in-Charge for the items hereunder mentioned which could not be utilized on the Works to the full extent in view of the foreclosure:

(i) Any expenditure incurred on preliminary site work, e.g. temporary access roads, temporary labour huts, staff quarters and site office, storage accommodation and water storage tanks.

(ii) Employer shall not take over Contractor's materials or any part thereof either brought to Site or of which the Contractor is legally bound to accept delivery from suppliers (for incorporation in or incidental to the work). However, the Engineer-in- Charge/ Employer may consider providing cost for such materials as deemed reasonable. The cost shall, however, take into account purchase price, salvage value, cost of transportation and deterioration or damage which may have been caused to materials whilst in the custody of the Contractor.

(iii) If any materials supplied by Employer are rendered surplus, the same except normal wastage shall be returned by the Contractor to Employer at rates not exceeding those at which these were originally issued less allowance for any deterioration or damage which may have been caused whilst the materials were in the custody of the Contractor. In addition, cost of transporting such materials from Site to Employer's stores, if so required by Employer, shall be paid by the Employer.

(iv) Reasonable compensation for repatriation of Contractors site staff and imported labour to the extent necessary. The Contractor shall, if required by the Engineer- in-Charge furnish to him books of account, wage books, time sheets and other relevant documents and evidence as may be necessary to enable him to certify the reasonable amount payable under this condition. The reasonable amount of items on (i)and (iv) above shall not be in excess of 2% of the cost of the Works remaining incomplete on the date of closure, i.e., total stipulated cost of the Works as per accepted tender less the cost of Works actually executed under the Contract. Provided always that against any payments due to the Contractor on this account or otherwise, the Engineer-in-Charge shall be entitled to recover or be credited with any outstanding balances due from the Contractor for advance paid in respect of any tool, plants and materials and any other sums which at the date of termination were recoverable by the Employer from the Contractor under the terms of the Contract.

32.3 Permissible Variation in Cement & Steel

After completion of the Works, the theoretical quantity of cement/ steel to be used in Works shall be calculated on the basis of statement showing quantity of cement/ steel to be used in different items of Works as provided in Schedule of Rates. In case any item is executed for which the standard coefficient for the consumption of cement/ steel are not available in the above mentioned statement or cannot be derived, the same shall be calculated on the basis of analysis by the Engineer-in-Charge. Over this theoretical quantity of cement, a variation up to 2% (two percent) and for steel, a variation up to 3% (three percent) plus/minus for Works shall be allowed. In the event of it being discovered that the quantity of cement/ steel used is less than the quantity required (allowing variation on the minus side as stipulated above), the portion of Works executed will be rejected and the same shall be demolished and reconstructed by the Contractor at his own cost. The decision of concerned Engineer-in-Charge, in this regard, shall be final and binding on the Contractor. Provided that, cement/ steel used in excess over permissible variation shall not be payable.

GS 33 Changes in Contract Price- Not applicable

33.1 Payments due to variation in prices of material, POL and labour after receipt of tender for Item Rate/ Percentage Contract (Would apply for EPC/ DB/ DBO contracts also when

exact quantity of material consumed is measured) If during the operative period of the Contract, there shall be any variation in the prices of material (not being the material supplied by Employer as and/ or services rendered at fixed prices and the material for which the price variation is being calculated for actual quantities used and/ or in the wages of labour required for execution of Works and/ or in POL (fuel, oil and lubricant), the Contract Price shall be adjusted as per the provisions detailed below.

For working out the percentages of the values of material, labour and POL components in the work, the total of these three components should be taken as 100. Standard labour, material & POL components as indicated in Works related to WWTP and/or SWM.

GS 34 Indemnity by Contractor

34.1 Indemnity against All Actions of Contractor

The Contractor shall hold and save harmless and indemnify the Employer, from and against all actions, suits, proceedings, loss, costs, damages, charges, claims and demands of every nature and description brought or recovered against the Employer, by reason of any act or omissions of the Contractor, his representative or his employees, in the execution of the Works or in the guarding of the same. All sums payable by way of compensation under any of these conditions, shall be considered as reasonable compensation payable to the Employer by Contractor, without reference to the actual loss or damage sustained, and whether or not any damage shall have been sustained.

34.2 Indemnity against All Claims of Patent Rights and Royalties

The Contractor shall hold and save harmless and indemnify the Employer, its agents and employees from and against all claims and proceedings, for or on account of infringement by the Contractor of copyright, any patent rights, design trademark or name, secret process, patented or unpatented invention, articles or appliances manufactured or used for or in connection with the Works and from and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto. Except where otherwise stated, the Contractor shall pay all royalties, rent and other payments or compensation, if any, for getting stone, sand, gravel, clay or other materials required for the Works.

GS 35 Employment of Technical Staff and Employees

The Contractor shall employ a qualified engineer(s) for supervision of the Works as under:-

- For Works costing above Rs.50 lakhs - qualified graduate engineer(s) for the required domain

- For Works upto 50 lakhs - A recognized diploma holder engineer(s) for the required domain

Where the Contractor fails to employ the qualified engineer as aforesaid he shall be liable to pay a sum of Rs.20,000/- (Rupees twenty thousand only) per week of default in the case of graduate engineer's and Rs.10, 000/- (Rupees ten thousand only) per week of default in the case of diploma holder. The technical staff of the contractor should be available at Site on full time basis, to take instructions. The Contractor shall provide all necessary superintendence during execution of the Works and for as long thereafter as may be necessary for proper fulfilling of the obligations under the Contract.

The Contractor shall immediately after receiving Letter of Acceptance of the tender and before commencement of the work, intimate in writing to the Engineer-in-Charge the name, qualifications, experience, age, address and other particulars along with certificates, of the principal technical representative to be in charge of the work. Such qualifications and experience shall not be lower than specified in Special Conditions of Contract. The Engineer-in-Charge shall within 15 days of receipt of such communication intimate in writing his approval or otherwise of such a representative to the Contractor. Any such approval may at any time be withdrawn and in case of such withdrawal the Contractor shall appoint another such representative according to the provisions of this clause. Decision of the Employer shall be final and binding on the Contractor in this respect. Such a principal technical representative shall be appointed by the Contractor soon after receipt of the approval from Engineer-in-Charge and shall be available at Site within fifteen days of start of work.

Where the Contractor (or any partner in case of firm/company) himself has such qualifications, it will not be necessary for the said Contractor to appoint such a principal technical representative but the Contractor shall designate and appoint a responsible agent to represent him and to be present at the Works whenever the Contractor is not in a position to be so present. All the provisions applicable to the principal technical representative under the clause will also be applicable in such a case to Contractor or his responsible agent. The principal technical representative and/or the Contractor shall on receiving reasonable notice from the Engineer-in-Charge or his designated representative(s) in charge of the Works in writing or in person or otherwise, present himself to the Engineer-in- Charge and/or at the Site, as required, to take instructions. Instructions given to the principal technical representative or the responsible agent shall be deemed to have the same force as if these have been given to the Contractor. The principal technical representative and/or the Contractor or his responsible authorized agent shall be available at Site at least two working

days every week. These days shall be determined in consultation with the Engineer-in-Charge. The principal technical representative and/or the Contractor or his responsible authorized agent shall be present daily during important stages of execution of work, during recording of measurement of work and whenever so required by the Engineer-in-Charge by a notice as aforesaid and shall also note down instructions conveyed by the Engineer-in-Charge or his designated representative in the site order book and shall affix his signature in token of noting down the instructions and in token of acceptance of measurements. There shall be no objection if the representative/agent looks after more than one Works and not more than three works provided these details are disclosed to the Engineer-in-Charge and he shall be satisfied that the provisions and the purpose of this clause are fulfilled satisfactorily. Where the Engineer-in-Charge, whose decision in this respect is final and binding on the Contractor, is convinced that no such technical representative or agent is effectively appointed or is effectively attending or fulfilling the provision of this clause, a recovery shall be effected from the Contractor as specified in Special Conditions of Contract and the decision of the Engineer-in-Charge as recorded in the site order book and measurement recorded in measurement books shall be final and binding on the Contractor. Provided that if the Contractor fails to appoint a suitable technical representative or responsible agent and if such appointed persons are not effectively present or do not discharge their responsibilities satisfactorily, the Engineer-in-Charge shall have full powers to suspend the execution of the Works until such date as a suitable agent is appointed and the Contractor shall be held responsible for the delay so caused to the work. The Contractor shall submit a certificate of employment of the technical representative/responsible agent along with every account bill/fixed bill and shall produce evidence if at any time so required by the Engineer-in-Charge.

The Contractor shall provide and employ on the site only such technical assistants as are skilled and experienced in their respective fields and such foremen and supervisory staff as are competent to give proper supervision to the work. The Contractor shall provide and employ skilled, semiskilled and unskilled labour as is necessary for proper and timely execution of the work.

GS 36 Force Majeure

As used in this Contract, the expression “Force Majeure” or “Force Majeure Event” shall mean occurrence in India of any or all of Non-Political Event, Indirect Political Event and Political Event, as defined in clauses 36.1, 36.2, and 36.3 respectively, if it affects the performance by the Parties claiming the benefit of Force Majeure (the “Affected Party”) of its obligations under this Contract and which act or event (i) is beyond the reasonable control of the Affected Party, and (ii) the Affected Party could not have prevented or overcome by

exercise of due diligence and following Good Industry Practice, and (iii) has material adverse effect on the Affected Party.

36.1 Non-Political Event

A Non-Political Event shall mean one or more of the following acts or events:
(i) act of God, epidemic, extremely adverse weather conditions, lightning, earthquake, landslide, cyclone, flood, volcanic eruption, chemical or radioactive contamination or ionising radiation, fire or explosion (to the extent of contamination or radiation or fire or explosion originating from a source external to the Site);

(ii) strikes or boycotts (other than those involving the, Contractor, Subcontractors or their respective employees/representatives, or attributable to any act or omission of any of them) interrupting supplies and services to the Site for a continuous period of 24 (twenty four) hours and an aggregate period exceeding 7 (seven) days in an Accounting Year, and not being an Indirect Political Event set forth in clause 6.2;

(iii) any failure or delay of a Sub-contractor/Contractor but only to the extent caused by another Non-Political Event and which does not result in any offsetting compensation being payable to the Employer by or on behalf of such Contractor;

(iv) any judgment or order of any court of competent jurisdiction or statutory authority made against the Contractor in any proceedings for reasons other than (i) failure of the Contractor to comply with any Applicable Law or Applicable Permit, or (ii) on account of breach of any Applicable Law or Applicable Permit or of any contract, or (iii) enforcement of this Contract, or (iv) exercise of any of its rights under this Contract by the Employer; (v) the discovery of geological conditions, toxic contamination or archaeological remains on the Site that could not reasonably have been expected to be discovered through a site inspection; or (vi) any event or circumstances of a nature analogous to any of the foregoing.

36.2 Indirect Political Event

An Indirect Political Event shall mean one or more of the following acts or events:

(i) an act of war (whether declared or undeclared), invasion, armed conflict or act of foreign enemy, blockade, embargo, riot, insurrection, terrorist or military action, civil commotion or politically motivated sabotage;

(ii) industry-wide or State-wide strikes or industrial action for a continuous period of 24 (twenty four) hours and exceeding an aggregate period of 7 (seven) days in an Accounting Year;

(iii) any civil commotion, boycott or political agitation which prevents construction of the Works by the Contractor for an aggregate period exceeding 7 (seven) days in an Accounting Year;

(iv) any failure or delay of a Contractor to the extent caused by any Indirect Political Event and which does not result in any offsetting compensation being payable to the Employer by or on behalf of such Contractor;

(v) any Indirect Political Event that causes a Non-Political Event; or

(vi) any event or circumstances of a nature analogous to any of the foregoing.

36.3 Political Event

A Political Event shall mean one or more of the following acts or events by or on account of Any Government Instrumentality:

(i) Change in Law, only if consequences thereof cannot be dealt with under and in accordance with the provisions of other clauses of contract

(ii) compulsory acquisition in national interest or expropriation of any project assets or rights of the Contractor or of the Sub-Contractors;

(iii) unlawful or unauthorized or without jurisdiction revocation of, or refusal to renew or grant without valid cause, any clearance, license, permit, authorization, no objection certificate, consent, approval or exemption required by the Contractor or any of the Subcontractors to perform their respective obligations under this Contract; provided that such delay, modification, denial, refusal or revocation did not result from the Contractor's or any Sub-contractor's inability or failure to comply with any condition relating to grant, maintenance or renewal of such clearance, license, authorization, no objection certificate, exemption, consent, approval or permit;

(iv) any failure or delay of a Contractor but only to the extent caused by another Political Event and which does not result in any offsetting compensation being payable to the Employer by or on behalf of such Contractor; or

(v) any event or circumstance of a nature analogous to any of the foregoing.

36.4 Effect of Force Majeure

Neither Parties shall be considered to be in default or in breach of his obligations under the Contract to the extent that performance of such obligations is prevented by any

circumstances of Force Majeure which arises after the date of the letter of Acceptance or the date when the Contract becomes effective, whichever is the earlier.

36.5 Notice of Occurrence

If either Parties considers that any circumstances of Force Majeure have occurred which may affect performance of his obligations he shall promptly notify the other Parties and the Engineer-in – Charge.

36.6 Performance to Continue

Upon the occurrence of any circumstance of Force Majeure the Contractor shall endeavor to continue to perform his obligations under the Contract so far as reasonable practicable. The Contractor shall notify the Engineer-in-Charge of the steps he proposes to take including any reasonable alternative means for performance which is not prevented by Force Majeure. The Contractor shall not take any such steps unless directed so to do by the Engineer-in- charge. Provided that if the Contractor incurs additional costs in complying with the Engineer–in-Charge's directions under this clause, the amount thereof shall be certified by the Engineer-in charge and added to the Contract Price.

GS 37 Termination of Contract

37.1 When can Contract be terminated

37.1.1 Subject to other provisions contained in this clause the Engineer-in-Charge may, without prejudice to his any other rights or remedy against the Contractor in respect of any delay, inferior workmanship, any claims for damages and/or any other provisions of this Contract or otherwise, and whether the Completion Date has or has not elapsed, by notice in writing absolutely determine the Contract in any of the following cases, if the Contractor:

(i) persistently neglects to carry out his obligations under the Contract and/or commits default in complying with any of the terms and conditions of the Contract and does not remedy it or take effective steps to remedy it within 7 days after a notice in writing is given to him in that behalf by the Engineer-in-Charge; or

(ii) having been given by the Engineer-in-Charge a notice in writing to rectify, reconstruct or replace any defective work or that the Works is being performed in an inefficient or otherwise improper un-workman like" manner shall omit to comply with the requirement of such notice for a period of seven days thereafter, or

(iii) has without reasonable cause, suspended the progress of the Works or has failed to proceed with the Works with due diligence so that in the opinion of the Engineer-in-Charge

(which shall be final and binding) he will be unable to secure completion of the Works by Completion Date and continues to do so after a notice in writing of seven days from the Engineer-in- Charge' or

(iv) fails to complete the Works within the Completion Date or items of Works with individual date of completion, if any stipulated, on or before such date(s) of completion and does not complete them within the period specified in a notice given in writing in that behalf by the Engineer-in-Charge, or

(v) being an individual, or if a firm, any partner thereof shall at any time be adjudged insolvent or have a receiving order or order for administration of his estate made against him or shall take any proceedings for liquidation or composition (other than a voluntary liquidation for the purpose of amalgamation or reconstruction) under any Insolvency Act for the time being in force or make any conveyance or assignment of his effects or composition or arrangement for the benefit of his creditors or purport so to do, or if any application be made under any Insolvency Act for the time being in force for the sequestration of his estate or if a trust deed be executed by him for benefit of his creditors; or

(vi) being a company shall pass a resolution or the court shall make an order that the company shall be wound up or if a receiver or a manager on behalf of a creditor shall be appointed or if circumstances shall arise which entitle the court or the creditor to appoint a receiver or a manager or which entitle the court to make a winding up order; or

(vii) shall offer or give or agree to give to any person in Government service or to any other person on his behalf any gift or consideration of any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any act in relation to the obtaining or execution of this or any other Contract for Government; or

(viii) shall obtain a Contract with Government as a result of wrong tendering 'or other non-bonafide methods of competitive tendering; or

(ix) shall suffer an execution being levied on his goods and allow it to be continued for a period of 21 days; or

(x) assigns, transfers, sublets (engagement of labour on a piece-work basis or of labour with materials not to be incorporated in the Works, shall not be deemed to be subletting) or otherwise parts with or attempts to assign, transfer sublet or otherwise parts with the entire Works or any portion thereof without the prior written approval of the Employer

(xi) doesn't start the Works within 1/8th of the stipulated time; or

(xii) is found to have a conflict of interest. Conflict of interest is defined in the general eligibility criteria shared with the Contractor during the bidding stage.

37.1.2 When the Contractor has made himself liable for action under any of the cases aforesaid, the Engineer-in-Charge on behalf of Employer shall have powers:-

(i) To determine or rescind the Contract as aforesaid (of which termination or rescission notice in writing to the Contractor under the hand of Engineer-In- Charge shall be conclusive evidence). Upon such determination or rescission, the Earnest Money Deposit, Security Deposit already recovered and performance guarantee under the Contract shall be liable to be forfeited and shall be absolutely at the disposal of the Employer

(ii) "After giving notice to the Contractor to measure up the Works of the Contractor and to take such whole, or the balance or part thereof, as shall be un-executed out of his hands and to give it to another Contractor to complete the Works at risk and cost of the defaulting Contractor. The Contractor, whose Contract is determined or rescinded as above, shall not be allowed to participate in the tendering process for the balance Works besides being subject to appropriate legal action as per the provisions of Contract. In the event of above course(s) being adopted by the Engineer-in-Charge, the Contractor shall have no claim to compensation for any loss sustained by him by reasons of his having purchased or procured any material or entered into any engagements or made any advance on account or with a view to the execution of the Works or the performance of the Contract. And in case action is taken under any of the provision aforesaid the Contractor shall not be entitled to recover or be paid any sum for any work thereof or actually performed under this Contract unless and until the Engineer-in- Charge has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

37.2 Contractor liable to pay compensation even if action not taken under Clause

In any case in which any of the powers conferred upon the Engineer-in-Charge by clause 7.1 thereof, shall have become exercisable and the same are not exercised, the non – exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any future case of default by the Contractor and the liability of the Contractor for 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 preceding clause, he may, if he so desires after giving a notice in writing to the Contractor, take possession of (or at the sole discretion of the Engineer-in-Charge which shall be final and binding on the Contractor) use as on hire (the amount of the hire money being also in

the final determination of the Engineer-in-Charge) all or any tools, plant, materials and stores, in or upon the Works, or the Site thereof belonging to the Contractor, or procured by the Contractor and intended to be used for the execution of the workflow any part thereof, paying or allowing for the same in account at the Contract rates or, in the case of these not being applicable, at current market rates to be certified by the Engineer-in-Charge, whose certificate thereof shall be final, and binding on the Contractor.

37.3 Cancellation of Contract in Full or Part

37.3.1 The Employer may, without prejudice to any other right or remedy which shall have accrued or shall accrue hereafter to Employer, by a notice in writing to cancel the Contract as a whole or only such item of Works in default from the Contractor due to occurrence of any of the events mentioned in clause 37.1 above. The Engineer-in-Charge shall on such cancellation by the Employer have powers to:

(i) Take possession of the Site and any materials, constructional plant, implements stores, etc., thereon; and/or

(ii) Carry out the incomplete work by any means at the risk and cost of the Contractor, On cancellation of the Contract in full or in part, the Engineer-in-Charge shall determine what amount, if any, is recoverable from the Contractor for completion of the Works or part of the Works or in case the Works or part of the Works is not to be completed, the loss of damage suffered by Employer. In determining the amount, credit shall be given to the Contractor for the value of the Works executed by him up to the time of cancellation, the value of Contractor's materials taken over and incorporated in the Works and use of plant and machinery belonging to the Contractor.

37.3.2 Any excess expenditure incurred or to be incurred by Employer in completing the Works or part of the Works or the excess loss or damages suffered or may be suffered by Employer as aforesaid after allowing such credit shall without prejudice to any other right or remedy available to Employer in law be recovered from any money due to the Contractor on any account, and if such moneys are not sufficient the Contractor shall be called upon in writing and shall be liable to pay the same within 30 days.

If the Contractor shall fail to pay the required sum within the aforesaid period of 30 days, the Engineer-in-Charge shall have the right to sell any or all of the Contractors' unused materials, constructional plant, implements, temporary buildings, etc. and apply the proceeds of sale thereof towards the satisfaction of any sums due from the Contractor under the Contract and if thereafter there be any balance outstanding from the Contractor, it shall be

recovered in accordance with the provisions of the Contract.

37.3.3 Any sums in excess of the amounts due to Employer and unsold materials, constructional plant, etc., shall be returned to the Contractor, provided always that if cost or anticipated cost of completion by Employer of the Works or part of the Works is less than the amount which the Contractor would have been paid had he completed the Works or part of the Works, such benefit shall not accrue to the Contractor.

37.4 Termination of Contract on death of Contractor/ Partner

If the Contractor is an individual or a sole proprietary concern, and the individual or the sole proprietor dies, or if the Contractor is a partnership concern and one of the partners dies, in that case unless the Employer is satisfied that the legal representative of the individual Contractor or of the sole proprietor, as the case may be, or in the case of a partnership firm, all surviving partners, are capable of carrying out and completing the Contract, the Employer shall be entitled to terminate the Contract as to its incomplete part. In that event, the Employer shall not be liable to pay any compensation to the legal heirs of the deceased Contractor and / or to the surviving partners of the Contractor's firm, on account of such cancellation of Contract. Local Body's decision, as to whether the legal representatives of the deceased Contractor or surviving partners of the Contractor firm can or cannot carry out and complete the Contract, shall be final and binding on the parties. Any liability incurred by the deceased Contractor, or by the deceased partner of the contracting firm, before his death, shall be recovered from the legal representatives of the deceased Contractor or from the surviving partners of the said contracting firm as the case may be.

37.5 Termination due to Force Majeure Event

37.5.1 If a Force Majeure Event, as specified under clause 10.5, subsists for a period of 60 days or more within a continuous period of 120 days, either Parties may in its discretion terminate this Contract by issuing a termination notice to the other Parties without being liable in any manner whatsoever, save as provided in provisions of clause 7.1. Upon issue of such termination notice, this Contract shall, notwithstanding anything to the contrary contained herein, stand terminated forthwith; Provided that before issuing such termination notice, the Parties intending to issue the termination notice shall inform the other Parties of such intention and grant 15 (fifteen) days' time to make a representation, and may after the expiry of such 15 (fifteen) days period, whether or not it is in receipt of such representation, in its sole discretion issue the termination notice.

37.5.2 In the event of the Contract being terminated under clause 11.5.1 on account of Force Majeure Event, the Engineer-in-Charge shall issue a payment certificate which shall include:

(i) An amount equal to the value of the construction work less payments already made, less advance payments outstanding against the Contractor up to the date of issue of termination notice, less other recoveries due in terms of the Contract, less taxes due to be deducted at source in accordance with applicable Law

(ii) the cost of plants and materials ordered for the Works which have been delivered to the Contractor. Provided that such Plants and Materials shall become property of Employer when paid for by the Employer and the Contractor shall place the same at the Employer's disposal

(iii) and the Contractor's cost of protecting and securing the Works.

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22. Form QAP - Quality Assurance Plan

The implementation of the Quality System shall be through the establishment of a comprehensive Quality Assurance Plan issued to and approved by the Engineer. The instituted Quality Assurance system should ensure the quality and quantity continuously through properly designed monitoring systems / proformas for Test on materials, form work checkup, Bar bending schedule, pour card, post concreting checkups, daily progress report, labor / manpower deployed, quantity executed on periodic basis, observations thereof etc.

Quality Assurance plan shall include, but shall not be restricted to as noted herein.
Management procedures adopted for placing the Quality Control plan in action during design, manufacturing, testing, procurement & supply, construction, fabrication, erection, trial run, O&M, etc.

Procedures to control transmission of information across all interfaces both internally (that is, within the Contractor's Quality System) and externally. Those of the latter shall include all Statutory Bodies, Authorities and the Engineer.

All material, plant and equipment intended to be used in the project and workmanship comply with specifications. Provide samples of materials to be tested in required quantities at locations where testing is to be performed. When it is discovered on inspection that work is proceeding with incorrect materials or methods, ensure the corrections are immediately made and that improperly complete work is replaced on the Contractor’s cost.

The Quality Assurance program, as approved by the engineer, shall provide inspection and testing of products during fabrication and installation as engineer may deem necessary to ensure that work is performed in compliance with the Contract. The contractor shall engage, at no extra cost to the employer, third party independent professionals or firms or testing laboratories for inspection if required as per the applicable codes or specifications. All such engagements shall require prior approval of the engineer. Provision of inspection and testing instruments and devices and facilities required to ensure proper performance of Quality Assurance at the job site. Certification by producer / manufacturer that specified products meet requirements of reference standards as specified in applicable codes / specification.

Calibrate measuring and testing devices periodically against certified standard equipments. Calibration shall be verified by inspection firm.

Maintain continuity of Quality Assurance surveillance throughout fabrication of products and execution of work.

Submit details of Quality Assurance tests and methods inclusive of the specification.

Perform inspection on a continuing basis as each part of the works commences and on a regular basis to ensure constant compliance with the requirements.

Provide samples of materials to be tested in required quantities at locations where testing is performed.

Contractor's Quality Assurance representative at the site shall be responsible on receipt of items at the site for noting damage suffered by them during transit and for directing that they be rectified or replaced.

When it is discovered on inspection that work is proceeding with incorrect materials or methods, ensure that corrections are immediately made and that improperly complete work is replaced.

The Contractor shall impose Quality Assurance methods at the location of manufacture, fabrication and assembly of items to be incorporated in the works to ensure that they conform to requirements of the Contract Documents. This Quality Assurance shall not apply to proprietary catalog production products except as may be deemed necessary by the Contractor or as directed by the engineer.

Contractor shall provide notice to the engineer in writing at least 4 weeks in advance of packing of every batch of product components or assemblies so that the Employer or Employer's Consultants and their designated representatives may have opportunity at his / their choice of inspecting any such product components or assemblies prior to transportation at the cost of the bidder. The Contractor's Quality Assurance representative off-site shall be responsible for the release of items for transit to the job site.

The Contractor shall be responsible for protecting and maintaining items on the site. No damage to equipments and other materials shall take place during storage, erection, installation and maintenance.

All the field and site laboratory tests shall be carried out as per CPWD specifications. Minimum 10% of these field tests shall be got done from approved laboratory and all testing charges shall be borne by the contractor.

Each delivery / lot of cement and steel shall be accompanied by manufacturer / producer test

certificate conforming that the supplied cement and steel conforms to relevant specifications. These certificates shall be endorsed to the Engineer for his record.

From each lot of Cement and steel samples shall be taken for carrying out mandatory test in accordance with latest CPWD / State PWD specifications. These tests shall be got done from approved laboratory.

Water used in construction shall be tested in Government Approved or Reputed Third Party laboratory or as suggested by Engineer-In-Charge Laboratory and cost towards testing shall be borne by the contractor.

The Contractor shall furnish manufacturer's test certificates and technical literature for any admixture proposed for use. If directed, the admixture shall be tested at an approved laboratory.

Quality Assurance Reports and Feedback

All Quality Control tests and inspections carried during the execution of contract shall be documented and submitted in the form of report in triplicate to the engineer.

The report shall state the purpose of tests performed, description of methods used, test results and observations made and personnel involved. Similarly, the inspection report shall certify that which item are defective, nature of defect and what corrective methods have been adopted.

If inspection and testing is carried out by an approved inspection and testing firm, certified copies of test reports obtained by the firm shall be annexed with the Quality Assurance report.

The system shall include for the reporting back, recording and incorporation into the system of deficiencies and remedial measures to correct them noted during the control of the project.

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23. Form LoTB - Letter of Technical Bid

Date: *[insert date of Bid submission]*

To:
[*Insert name of Head of Local Body*],
[*Insert name of Local Body*],
[*Insert Address*],
[*Insert Pincode*]
Maharashtra
Tel: _____
e-mail: _____

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Documents, including addenda issued in accordance with Instructions to Bidders (ITB 8). *[Insert the number and issuing date of each addendum]*;

(b) We, including subcontractors meet the eligibility requirements in accordance with ITB 4 and ITB 5;

(c) We, including subcontractors have no conflict of interest in accordance with ITB 4;

(d) We offer to execute in conformity with the Bidding Documents the following Works: Construction of _____MLD Wastewater Treatment Plant for [*Insert Name of Project & Location*] using [*Insert name of Technology*]

(e) Our Bid shall be valid for a period of *180* days from the date fixed for the Bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(f) We are not participating, as a Bidder or as a subcontractor, in more than one Bid in this bidding process in accordance with ITB 4.2(c), other than alternative Bids submitted in accordance with ITB 13; and

(g) We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in any type of fraud and corruption.

Name of the Bidder***** *[insert complete name of person signing the Bid]*

Name of the person duly authorized to sign the Bid on behalf of the Bidder**** *[insert complete name of person duly authorized to sign the Bid]*

Title of the person signing the Bid *[insert complete title of the person signing the Bid]*

Signature of the person named above *[insert signature of person whose name and capacity are shown above]*

Date signed *[insert date of signing]* day of*[insert month], [insert year]*

*****: In the case of the Bid submitted by joint venture specify the name of the Joint Venture as Bidder

**: Person signing the Bid shall have the power of attorney given by the Bidder to be attached with the Bid.

----------x----------x----------

24. *Form LoPB - Letter of Price Bid*

Date: *[insert date of Bid submission]*

To:
[*Insert name of Head of Local Body*],
[*Insert name of Local Body*],
[*Insert Address*],
[*Insert Pincode*]
Maharashtra
Tel: _____
e-mail: _____

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Documents, including addenda issued in accordance with Instructions to Bidders (ITB 8).*[Insert the number and issuing date of each addendum]*;

(b) We offer to execute in conformity with the Bidding Documents and Technical Bid the following Works:[*insert a brief description of the Works*];

(c) The total price of our Bid, excluding any discounts offered in item (d) below is:
In case of only one lot, total price of the Bid *[insert the total price of the Bid in words and figures, indicating the various amounts and the respective currencies]*

Total: _____

(d) The discounts offered and the methodology for their application are:

The exact method of calculations to determine the net price after application of discounts is shown below: *[specify in detail the method that shall be used to apply for the discounts.]*

(e) Our Bid shall be valid for a period of *180* days from the date fixed for the Bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(f) If our Bid is accepted, we commit to obtain a Performance Security in accordance with

the Bidding Documents;

(g) We understand that this Bid, together with your written acceptance thereof included in your Letter of Acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed; and

(h) We understand that you are not bound to accept the lowest evaluated Bid or any other Bid that you may receive.

Name of the Bidder****** *[insert complete name of person signing the Bid]*
Name of the person duly authorized to sign the Bid on behalf of the Bidder******* *[insert complete name of person duly authorized to sign the Bid]*

Title of the person signing the Bid *[insert complete title of the person signing the Bid]*

Signature of the person named above *[insert signature of person whose name and capacity are shown above]*

Date signed *[insert date of signing]* day of*[insert month], [insert year]*

*******: This form is to be attached with Financial Proposal only.*
********: In the case of the Bid submitted by joint venture specify the name of the Joint Venture as Bidder*
****: Person signing the Bid shall have the power of attorney given by the Bidder to be attached with the Bid.*

----------x----------x----------

22.Form LoA - Letter of Acceptance

[Insert letterhead paper of the Employer]

[Insert date]

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

This is to notify you that your Bid dated *[insert date]* for execution of the *[insert name of the Contract and identification number, as given in the Contract Data]* for the Accepted Contract Amount of the equivalent of *[insert amount in words and figures] [insert name of currency]*, as corrected and modified in accordance with the Instructions to Bidders, is hereby accepted by our Agency.

You are requested to furnish the Performance Security within 15 days of receipt of this Letter of Acceptance in accordance with the Conditions of Contract, using for that purpose one of the Performance Security Forms included in Section IX, Annex to the Particular Conditions - Contract Forms, of the Bidding Documents

Authorized Signature: _____

Name and Title of Signatory: _____

Name of Agency: _____

Attachment: Contract Agreement

----------x----------x----------

23 – Price Schedule

Attached As Annexure II.

24. Form ADS: Advance Security Form

[*Insert NAME OF THE LOCAL AUTHORITY*]

Name of Works – Wastewater management project for _____
Technology: [*insert name of technology*]
[Insert Taluka]
[Insert District]

ANNEXTURE - B

UNDERTAKING FOR GUARANTEE

I/WE GUARANTEE THAT

1. I / We will replace, repair and adjust free of all charges, to the employer any part of work which fails to comply with the specifications or amendment to such specifications as referred to in our specifications attached to tender, fair wear and tear accepted until the completion and a period of 60 months for the date of Acceptance Certificate issued under Articles of General Condition of Contract.

2. All the work will be reliable.

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

4. I / We accept and abide by the clause relating to quality and guarantee of work.

Contractor's Signature

----------x----------x----------

25. *Form AoC - Contract Agreement*

THIS AGREEMENT made the *[insert day]* day of *[insert month]*, *[insert year]*, between*[insert name of the Employer]* (hereinafter "the Employer"), of the one part, and *[insert name of the Contractor]*(hereinafter "the Contractor"), of the other part:

WHEREAS the Employer desires that the Works known as *[name of the Contract]* should be executed by the Contractor, and has accepted a Bid by the Contractor for the execution and completion of these Works and the remedying of any defects therein,

The Employer and the Contractor agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Contract documents referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement. This Agreement shall prevail over all other Contract documents.

(i) the Letter of Acceptance;

(ii) the Employer's Requirements;

(iii) the Letter of Technical Bid ;

(iv) the Letter of Price Bid

(v) Corrigendum & Addendum and Reply to Pre-Bid queries*[insert addenda numbers, if any]* (if any);

(vi) the Particular Conditions of Contract;

(vii) the General Conditions of Contract;

(viii) Contractor's Proposal and post-bid opening correspondence; and

For the purpose of interpretation, the priority of the listed documents shall be in accordance with the above listed order.

3. In consideration of the payments to be made by the Employer to the Contractor as specified in this Agreement, the Contractor hereby covenants with the Employer to execute the Works and to remedy defects therein in conformity in all respects with the provisions of the Contract.

4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of *[insert the laws of the borrowing country]* on the day, month and year specified above.

Signed by _____ Signed by _____

for and on behalf of the Employer	for and on behalf the Contractor
in the presence of	in the presence of
Witness, Name, Signature, Address, Date	Witness, Name, Signature, Address, Date

----------x----------x----------

2.0 Miscellaneous Clauses

1.1 Dispute Resolution

1.1.1 Amicable Resolution

(i) Save where expressly stated to the contrary in this Contract, any dispute, difference or controversy of whatever nature between the Parties, howsoever arising under, out of or in relation to this Contract (the "Dispute") shall in the first instance be attempted to be resolved amicably with the Employer.

(ii) In case of failure to amicably resolve the dispute under clause (i) above either Parties may require such Dispute be referred to a 3-member body consisting of Chief Secretary of the Government of Maharashtra or his representative, as Chairman, the Chief Executive Officer of the Local Body, and a nominee representative of the Contractor for amicable settlement. Upon such reference, both the Parties shall be required by such three member body to meet at the earliest mutual convenience and in any event within 15 (fifteen) days of such reference to discuss and attempt to amicable resolve the Dispute. If the Dispute is not amicably settled within thirty days of such meeting between the Parties, either Party shall have liberty to take further action in accordance with the law.

1.2 If Relation Working in Employer then Contractor Not Allowed to Tender

The Contractor shall not be permitted to tender for Works in the Employer zone (responsible for award and execution of contracts) in which his near relative is posted as Divisional Accountant or as an officer in any capacity between the grades of the junior engineer and Chief engineer (both inclusive). He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any gazetted Officer with Employer. Any breach of this condition by the Contractor would render him liable to be removed from the approved list of Contractors of this Employer.

Note: By the term "near relatives" is meant wife, husband, parents and grandparents, children and grandchildren, brothers and sisters.

1.3 No Gazetted Engineer to work as Contractor/ Consultant within two year of retirement/ resignation

No engineer of gazette rank or other gazette officer employed in engineering or administrative duties in an engineering department of the Government of Maharashtra shall work as a Contractor/ Consultant or employee of a Contractor/ Consultant for a period of two

year after his retirement from government service without the previous permission of Employer in writing. This Contact is liable to be cancelled if either the Contractor/ Consultant or any of his employees is found at any time to be such a person who had not obtained the permission of Government of Maharashtra as aforesaid, before submission of the tender or engagement in the Contractor's/ Consultant's service, as-the case may be.

1.4 Corruption or fraudulent practices

1.4.1 Employer defines, for the purposes of this provision, the terms set forth below as follows:

(i) "corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in Contract execution, and

(ii) "fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Employer, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive them of the benefits of free and open competition;

1.4.2 The Employer will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the Contract.

1.5 Use of Explosives

Subject to the Applicable Laws and the Applicable Permits, the Contractor shall comply with the following:

(i) the use of explosives by the Contractor shall be subject to the prior approval/authorization of the concerned Government Instrumentality;

(ii) the Contractor shall at all times take all such safety measures as may be required for the importation, handling, transportation, storage and use of explosives and shall, at all times when engaged in blasting operations, post sufficient warning flagmen to the full satisfaction of the Engineer-in-Charge.

(iii) the Contractor shall, by a notice in writing, 15 days prior to the blasting operation, notify all parties including Government Instrumentalities, private parties concerned or affected or likely to be concerned or affected by blasting operations for their prior approval; and

(iv) the Contractor shall pay all license fees and charges which may be required for storage of explosives or in respect of any other matter related thereto. All operations in which or for which explosives are employed shall be at the sole risk and responsibility of the Contractor and the Contractor shall indemnify the Employer in respect thereof.

1.6 Confidentiality and Publicity

The Contractor shall treat the details of the Contract as private and confidential save in so far as may be necessary for the purpose thereof, and shall not publish or disclose the same or any particulars thereof in any trade or technical paper or elsewhere without the previous consent in writing of the Employer. Publication of approved articles, photographs or similar materials shall carry acknowledgement to the Employer and state the name of the Engineer–in-Charge. If any dispute arises as to the necessity of any publication or disclosure for the purpose of the Contract the same shall be referred for decision to the Employer, whose decision shall be final. Any advertising mentioning the subject of this Contract must be approved by the Employer prior to publication.

1.7 Individuals not personally Liable

No member or officer of the Employer nor the representative of Engineer-in-Charge nor any one of the respective staffs or the employees of the Employer shall be in any way personally liable for the acts or obligations of the Employer under the Contract or answerable for any default or omission of the Employer in the observance or performance of any of the acts, matters or things which are herein contained.

1.8 Limitation of Liability

1.8.1 Neither Parties shall be liable to the other Parties for loss of profit, loss of any Contract or for any indirect or consequential loss or damage which may be suffered by the other Parties in connection with the Contract, other than under clause under Indemnity by Contractor and Section under Termination of Contract

1.8.2 The total Liability of the Contractor to the Employer, under or in connection with the Contract, other than under clause Indemnity by Contractor, Clause Responsibility of damage to property and injury to persons, clause Electricity for construction of Works and Supply of water shall not exceed the Contract Price.

1.8.3 This clause shall not limit liability in any case of fraud, deliberate default or reckless misconduct by the defaulting Parties. Further, this clause shall not limit any criminal action that may follow from any action.

1.9 Waiver and Consents Clause

1.9.1 Waiver by either Party of any default by other Party in the observance and performance of any provision of or obligations of or under this Contract

(i) shall not operate or be construed as a waiver of any other or subsequent default hereof or of other provisions of or obligations under this Contract;

ii) shall not be effective unless it is in writing and executed by a duly authorized representative of the Party; and

iii) shall not affect the validity or enforceability of this Contract in any manner.

1.9.2 Neither the failure by either Party to insist on any occasion upon the performance of the terms, conditions and provisions of this Contract or any obligation there under nor time or other indulgence granted by a Party to the other Party shall be treated or deemed as waiver of such breach or acceptance of any variation or the relinquishment of any such right hereunder.

1.9.3 Any such waiver or consent may be given subject to any conditions thought fit by the Party giving it and shall be effective only in the instance and for the purpose for which it is given.

----------x----------x----------

27. TSD : Technology Screening Details Annexure I

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1.0. Technology Availability in Indian Scenario

Wastewater depending on its characteristics is subjected to different treatment options. Basic wastewater treatment consists of a combination of physical, chemical, and biological processes and operations to remove solids, organic matter and, sometimes, nutrients from wastewater. General terms used to describe different degrees of treatment, in order of increasing treatment level, are preliminary, primary, secondary, and tertiary and/or advanced wastewater treatment. Design of the actual treatment system for a STP involves selection of alternative processes based on the ability of individual treatment processes to remove specific waste constituents.

In order to reduce substantial expenditure on long distance conveyance of sewage as well as treated water for recycling, decentralized treatment of sewage is advisable. As a good practice, many small sewage treatment plants (STP) should be built rather than a few of very large capacity. The concept of decentralized treatment systems and water/wastewater management is covered in detail in subsequent sections of report.

This section discusses in brief various treatment technologies involved in the process of wastewater treatment. In-depth knowledge of all these technologies and factors regulating the treatment mechanism is important for better management of STPs.[7]

2.1 ASP - Conventional Activated Sludge Process

Activated Sludge Process (ASP) is a suspended growth aerobic process. It is provided with primary clarifier to reduce the organic load in biological reactor (aeration basin). About 40% of organic load is intercepted in primary clarifier in the form of sludge, decreasing the loading in the aeration tank. Detention period in aeration tank is maintained between 4-6h. After aeration tank, the mixed liquor is sent to secondary clarification where sludge and liquid are separated. A major portion of the sludge is re-circulated and excess sludge is sent to a digester. Sludge generated in primary clarifier and excess sludge from secondary clarifier are not matured, digestion of such sludge is essential before disposal. In anaerobic sludge digestion, such sludge produces biogas which can be used for power generation by gas engines. Generated power can be used for operation of plant. A Schematic Diagram of a Conventional Activated Sludge Process is presented in **Figure 1.3.**

[7] Technology availability in India

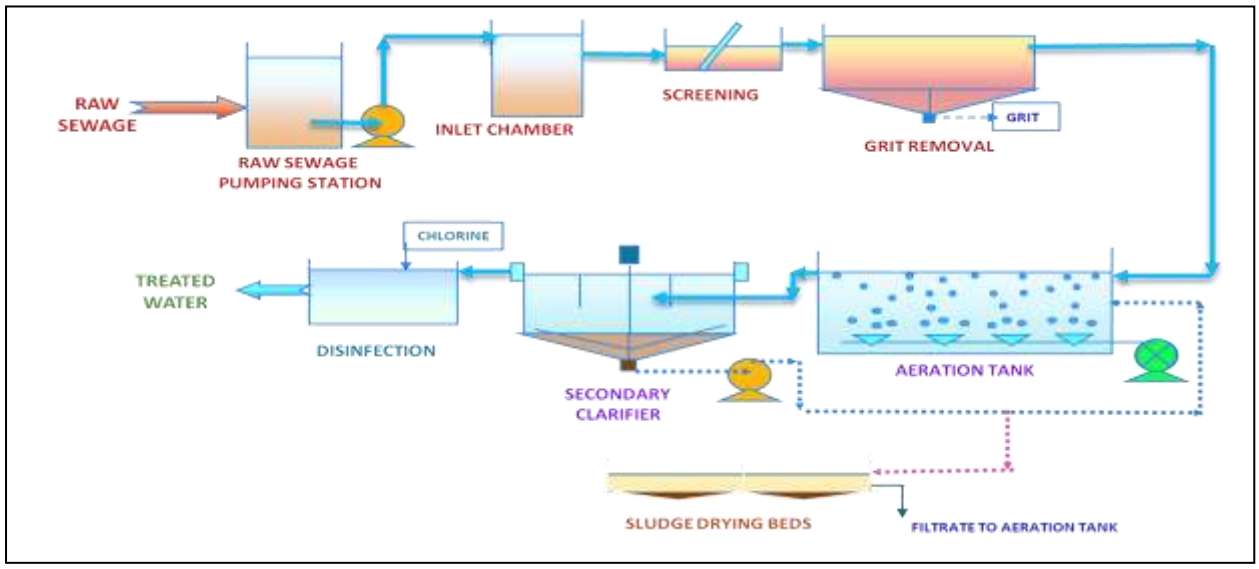

Figure 1.3 Schematic Diagram of a Conventional Activated Sludge Process

Merits and demerits of Conventional Activated Sludge Process are delineated as below;

1.1.1 Merits

- Good process flexibility
- Reliable operation
- Proven track record in all plant sizes
- Less land requirements
- Low odor emission
- Energy production
- Ability to withstand nominal changes in water characteristics

1.1.2 Demerits

- High energy consumption
- Skilled operators needed
- Uninterrupted power supply is required
- Requires sludge digestion and drying
- Less nutrient removal

2.2 MBBR - Moving Bed Bio-film Reactor

Moving Bed Bio-film Reactor is an aerobic attached biological growth process. It does not require primary clarifier and sludge recirculation. Raw sewage, after screening and de-gritting, is fed to the biological reactor. In the reactor, floating plastic media is provided which remains in suspension. Biological mass is generated on the surface of the media. Attached biological mass consumes organic matter for their metabolism. Excess biological mass

leaves the surface of media and it is settled in clarifier. Usually a detention time of 5 to 12 h is provided in the reactors. MBBR were initially used for small sewage flow rates and because of less space requirement. In large plant, media quantity is very high and it requires long shut down period for plant maintenance. In fact, it may not be successful for large capacity plants. Moreover the plastic media is patented and not available in the open market, leading to single supplier conditions which limit or deny price competition. In addition, due to very less detention time and other engineering factors, functional Moving Bed Bio-film Reactor in India do not produce acceptable quality effluent. A Schematic Diagram of a Moving Bed Bio-film Reactor is presented in **Figure 1.4.**

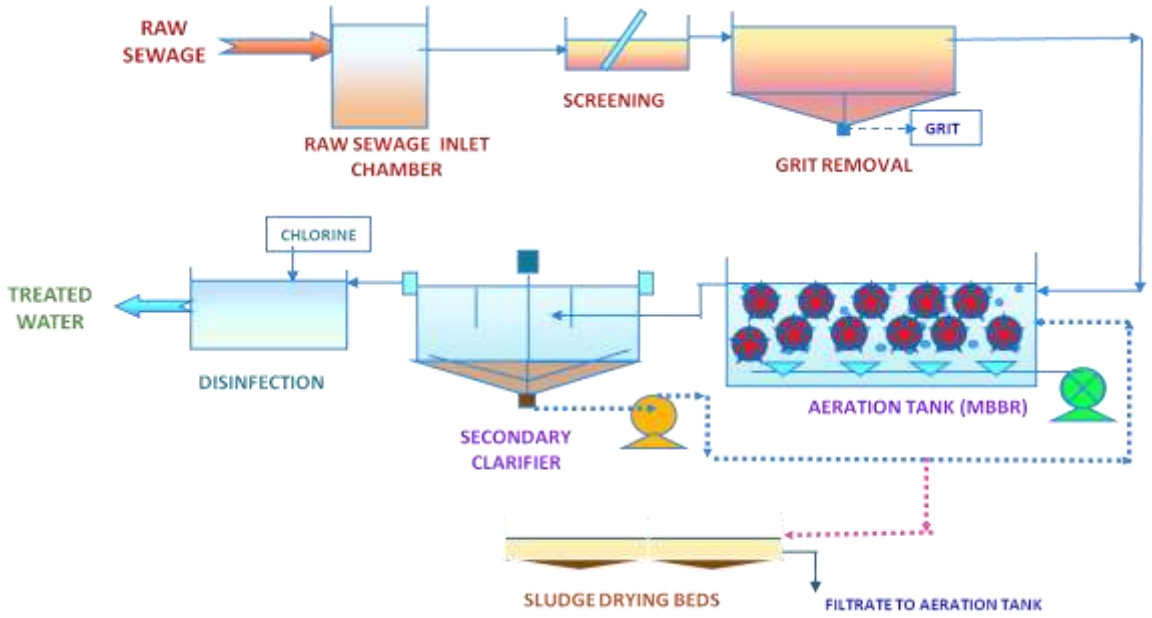

Figure 1.4 A Schematic Diagram of a Moving Bed Bio-film Reactor

Merits and demerits of Moving Bed Bio-film Reactor Process are delineated as below;

2.2.1 Merits

- Moving Bed Bio-film Reactor needs less space since there is no primary clarifier and detention period in reactor is generally 4-5 h.
- Ability to withstand shock load with equalization tank option
- High operator oversight is not required

2.2.2 Demerits

- High operating cost due to large power requirements
- Not much experience available with larger capacity plants (>1.5 MLD)
- Skilled operators needed
- No energy production
- Effluent quality not up to the mark in India
- Much less nutrient removal
- Designed criteria not well established

2.3 SBR - Sequencing Batch Reactor

It is a fill-and-draw batch aerobic suspended growth (Activated Sludge) process incorporating all the features of extended aeration plant. After screening and de-gritting, sewage is fed to the batch reactor. Reactor operation takes place in certain sequence in cyclic order and in each cycle, following operations are involved

- Anoxic Filling tank
- Aeration
- Sedimentation/clarification
- Decantation
- Sludge withdrawal

A number of large-scale plants exist around the world with several years of continuous operation. In India also, there are large scale plants operating efficiently since more than a year. Hundreds of full-scale plants operated on Sequencing Batch Reactor Technology are under successful operation in Japan. Some parts are patented and not available in the open market, leading to single supplier conditions which limit or deny price competition. Schematic Diagram of a Sequencing Batch Reactor (A Continuous Process “In Batch”) is presented in **Figure 1.5.**

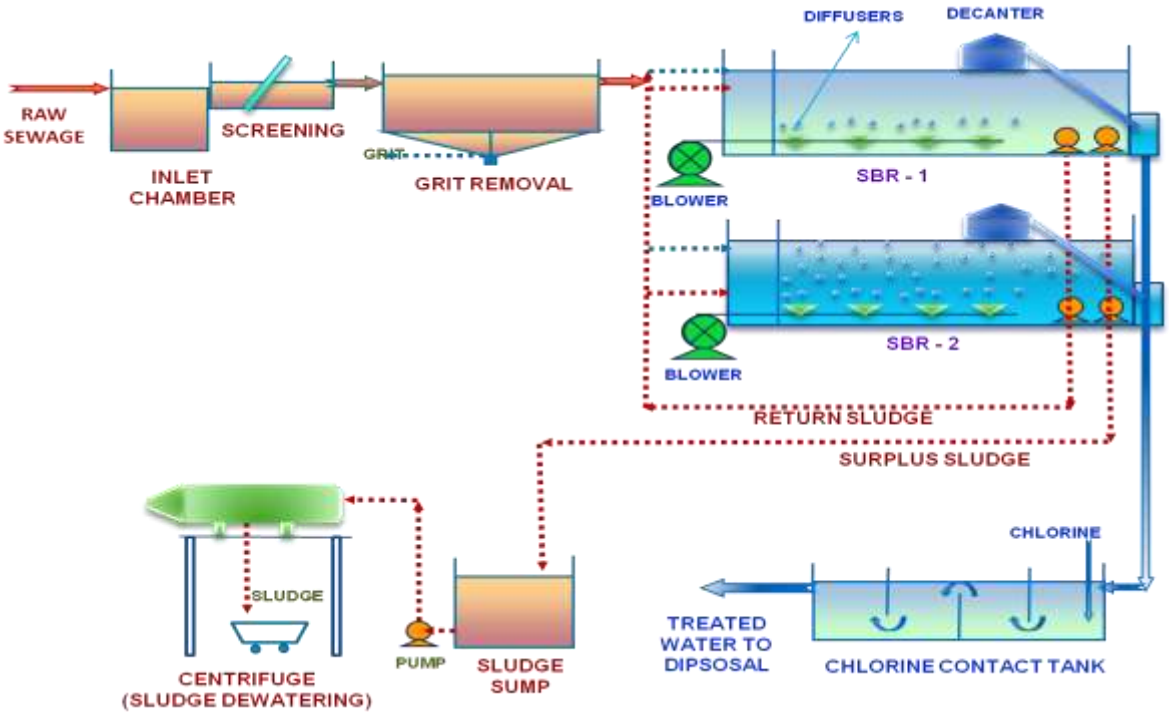

Figure 1.5 Schematic Diagram of a Sequencing Batch Reactor (A Continuous Process "In Batch")

Merits and demerits of Sequencing Batch Reactor (A Continuous Process "In Batch") are delineated as below;

2.3.1 Merits

- Excellent effluent quality
- Smaller footprint because of absence of primary, secondary clarifiers and digester
- Recent track record available in large applications in India also
- Biological nutrient (N&P) removal
- High degree of coliform removal
- Less chlorine dosing required for post disinfection
- Ability to withstand hydraulic and organic shock loads

2.3.2 Demerits

- Comparatively high energy consumption
- To achieve high efficiency, complete automation is required
- Highly skilled operators needed
- No energy production
- Uninterrupted power supply required

2.4 UASB+ASP - Up-flow Anaerobic Sludge Blanket Followed by Activated Sludge Process

It is an anaerobic process in which influent wastewater is distributed at the bottom of the UASB reactor and travels in an up-flow mode through the sludge blanket. Critical components of UASB design are the influent distribution system, the gas-liquid-solid separator (GLSS) and effluent withdrawal design. Compared to other anaerobic processes, UASB allows the use of high hydraulic loading. Schematic Diagram of an Up-flow Anaerobic Sludge Blanket Process followed by ASP is presented in **Figure 1.6.**

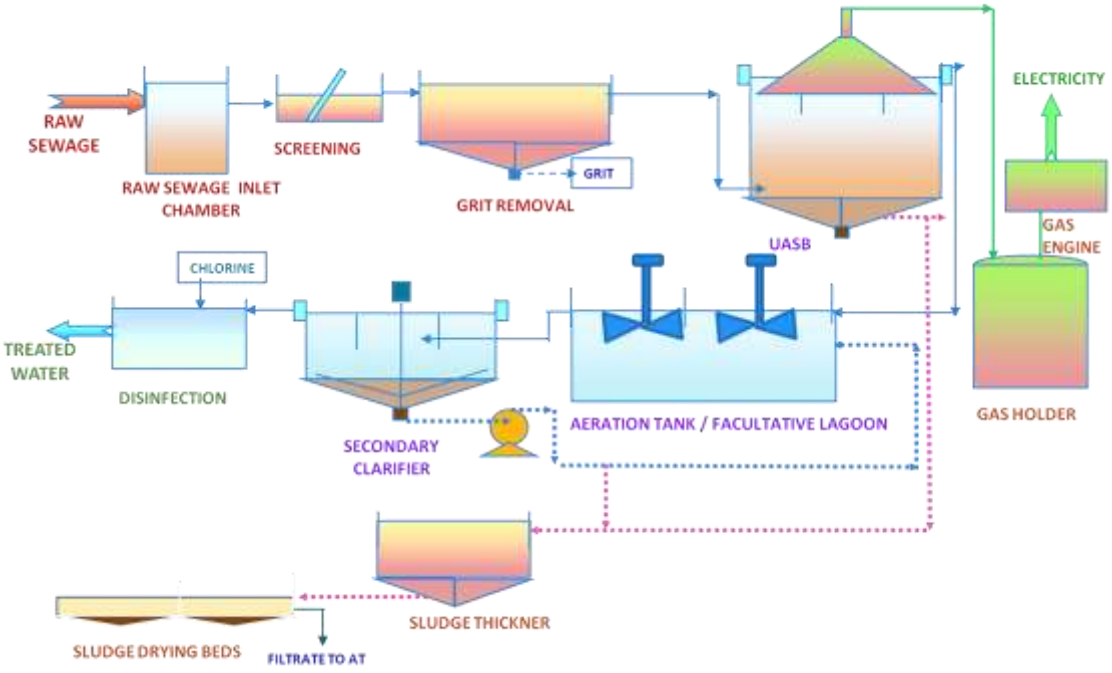

Figure 1.6 Schematic Diagram of an Up-flow Anaerobic Sludge Blanket Process followed by ASP

Merits and demerits of Up-flow Anaerobic Sludge Blanket Process followed by ASP are delineated as below;

2.4.1 Merits

- Relatively simple operation and maintenance
- No external energy requirement and hence less vulnerable to power cuts
- No primary treatment required
- Energy production possible but generally not achieved
- Low sludge production
- No special care or seeding required after interrupted operations
- Can absorb hydraulic and organic shock loading

2.4.2 Demerits

- Post treatment required to meet the effluent standard
- Anoxic effluent exerts high oxygen demand
- Large Land requirement
- More man-power require for O&M
- Effluent quality is not up to the mark and poor fecal and total coliform removal
- Foul smell and corrosion problems around STP area
- High chlorine dosing required for disinfection.
- Less nutrient removal

2.5 MBR - Membrane Bioreactor

It is a biological reactor with a suspended biomass. The solid-liquid separation in membrane bioreactor is achieved by a microfiltration membrane with pore sizes ranging from 0.1 to 0.4 µm. No secondary clarifier is used and has the ability to operate at high MLSS concentrations. Membranes are patented and not available in the open market, leading to single supplier conditions which limit or deny price competition. Schematic Diagram of Membrane Bioreactor is presented in **Figure 1.7.**

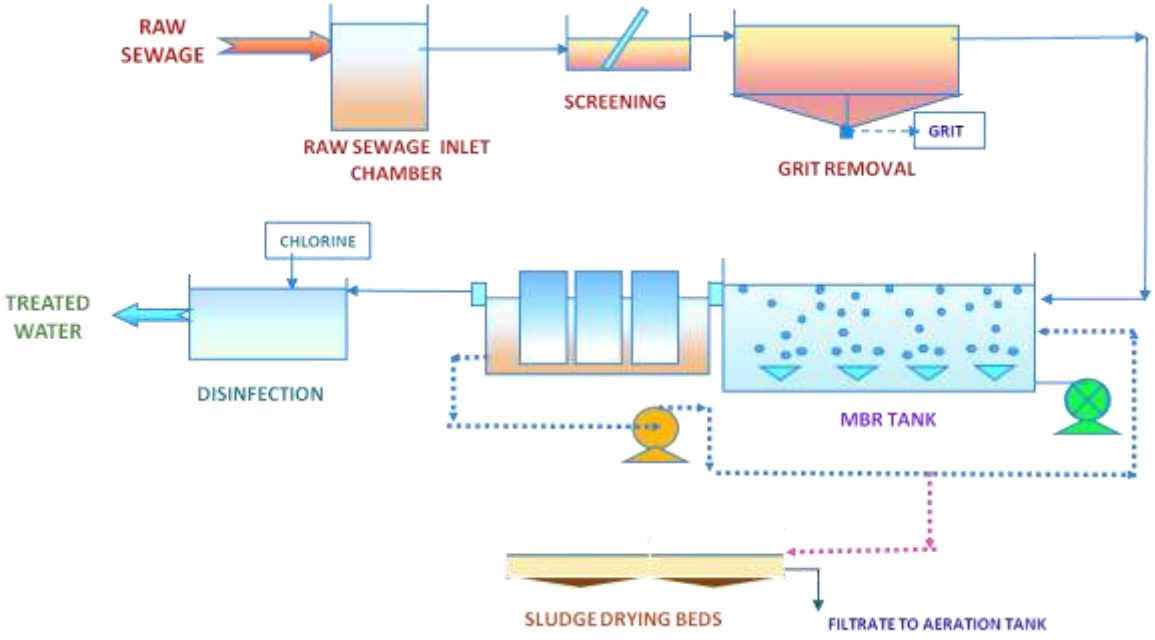

Figure 1.7 Schematic Diagram of Membrane Bioreactor Process followed by ASP

Merits and demerits of Membrane Bioreactor Process are delineated as below;

2.5.1 Merits

- Low hydraulic retention time and hence low foot print (area) requirement
- Less sludge production

- High quality effluent in terms of low turbidity, TSS, BOD and bacteria
- Stabilized sludge
- Ability to absorb shock loads

2.5.2 Demerits

- High construction cost
- Very high operation cost
- Periodic cleaning and replacement of membranes
- High membrane cost
- High automation
- Fouling of membrane
- No energy production

2.6 WSP - Waste Stabilization Pond (Combination of Anaerobic and Aerobic Pond)

Sewage is treated in a series of earthen ponds. Initially after screening and de-gritting it is fed to an anaerobic pond for initial pretreatment; depth of anaerobic pond is usually 3 to 3.5 m; as a result the lower section of pond does not get oxygen and an anaerobic condition is developed. BOD reduction takes place by anaerobic metabolism and gases like ammonia and hydrogen sulphide are produced creating odor problems. After reduction of BOD by 40% it enters the facultative/aerobic pond, which is normally 1 - 1.5 m in depth. Lesser depth allows continuous oxygen diffusion from atmosphere; in addition algae in the pond also produces oxygen. Though BOD at the outlet remains within the range, sometimes the effluent has green color due to presence of algae. The algae growth can contribute to the deterioration of effluent quality (higher total suspended solids) from time to time. Moreover, coliforms removal is also in 1-2 log order. The operating cost of a waste stabilization pond is minimum, mostly related to the cost of cleaning the pond once in two to three years. A waste stabilization pond requires a very large land area and it is normally used for small capacity plant, especially where barren land is available. Schematic Diagram of Waste Stabilization Pond (Combination of Anaerobic and Aerobic Pond) **Figure 1.8.**

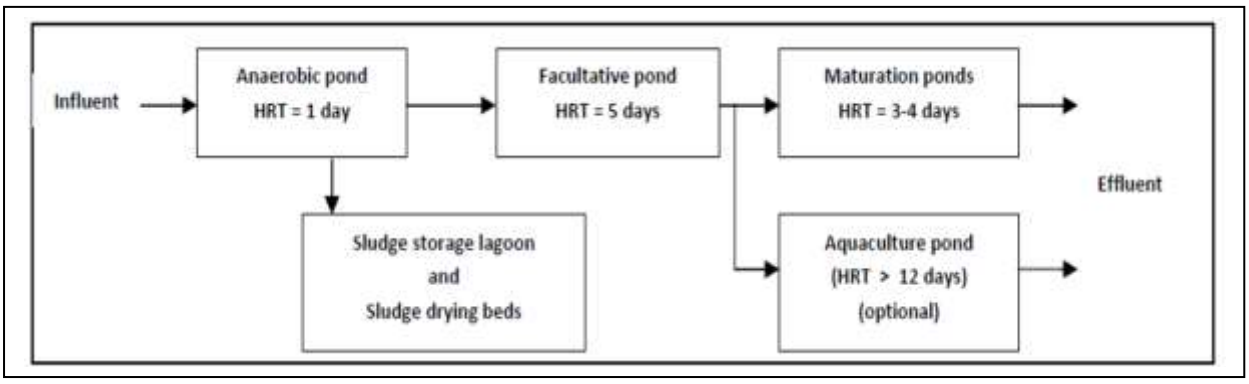

Figure 1.8 Schematic Diagram of Waste Stabilization Pond (Combination of Anaerobic and Aerobic Pond)

Merits and demerits of Waste Stabilization Pond (Combination of Anaerobic and Aerobic Pond) are delineated as below;

2.6.1 Merits

- Simple to construct and operate and maintain
- Low operating and maintenance cost
- Self sufficiency, ecological balance, and economic viability is greater
- Possible recovery of the complete resources
- Good ability to withstand hydraulic and organic load fluctuations

2.6.2 Demerits

- Requires extremely large areas
- Large evaporation loss of water
- If liner is breached, groundwater is impacted
- Effluent quality may vary with seasons
- No energy production
- Comparatively inferior quality of effluent
- Less nutrient removal
- High chlorine dosing for disinfection
- Odor and vector nuisance
- Loss of valuable greenhouse gases to the atmosphere

2.7 Phytorid Technology

Use of wetland plants and combined working of their root system in a designed ecosystem, along with the natural attenuation processes can be combined together to achieve the possible solution for wastewater treatment. It is one such technological solution, which can be easily implemented in urban, rural and industrial areas. This technology is promoted and supported by CSIR-NEERI. Phytorids are natural processes similar to stabilization ponds. Phytorids are shallow ponds comprising of submerged plants and floating islands of marshy species. Natural forces including chemical, physical, biological and solar is involved in the process to achieve wastewater treatment. Thick mats of vegetation trap suspend solids and biological process takes place at the roots of the plants. It produces the desired quality of treated sewage but land requirement is very high, though it is less compared to waste stabilization pond. Running cost is comparatively low. Cross Sectional View of Phytorid System is presented in **Figure 1.9.**

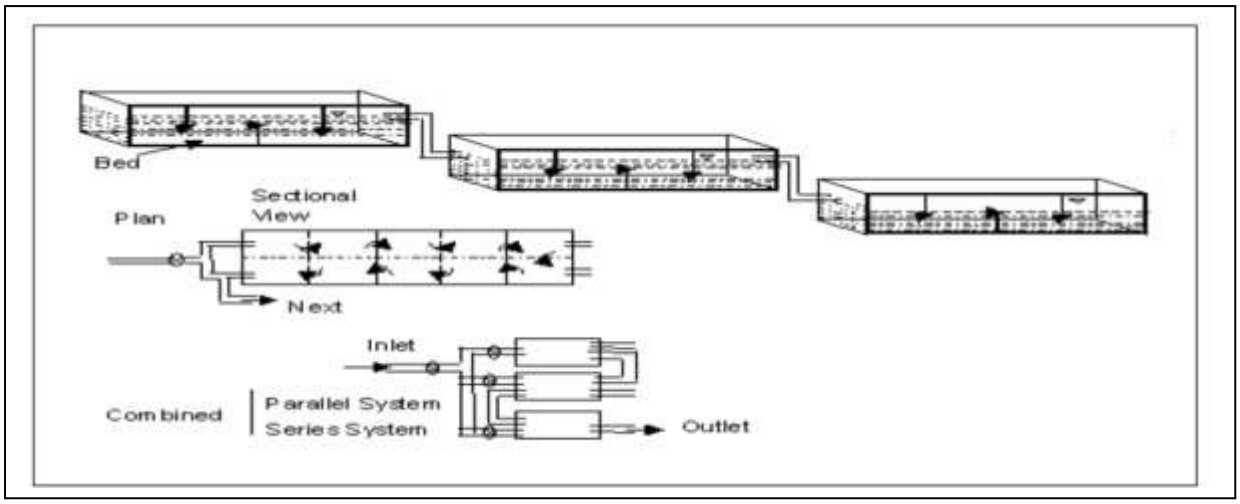

Figure 1.9 Cross Sectional View of Phytorid System

Merits and demerits of Phytorid System are delineated as below;

2.7.1 Merits

- Simple to construct and operate and maintain
- Low operating and maintenance cost
- Self-sufficiency, ecological balance, and economic viability is greater
- Possibility of complete resource recovery
- Good ability to withstand hydraulic and organic load fluctuations

2.7.2 Demerits

- Solids have to be removed; therefore septic tank or passive clarifier shall be required
- Maximum intake BOD & COD for efficient treatment shall not exceed 1200mg/lit & 1500mg/lit respectively
- Requires large area
- Depth of bed shall not exceed 2.5m
- Disinfection may be required depending upon the desired end use

Furthermore, this state of art technology has already found its way as a probable solution to the India's top most issues related to sewage treatment such as those demonstrated under Godavari action plan in Nashik wherein in-situ nallah treatment without any energy or O&M needs are in place, Ganga Action Plan, Namami Gange wherein UP government have already published tender for the same, Local Body wherein feasibility of recycling of treated sewage is sought for using this technology, Mithi River action plan of Mumbai and several others. Similarly, Maharashtra Jeevan Pradhikaran the apex body in Maharashtra State working in areas of water supply and wastewater treatment provided nallah wastewater treatment in almost100 villages in first phase of implementation of Phytorid technology and

has also empaneled Phytorid as one of the most suitable technologies for rural applications. NABARD has funded Rs.200Cr to treat such wastewater that usually pollutes adjoining rivers of Maharashtra to be extended to 400 such villages that do not have sufficient mechanism to handle this fugitive source of sewage.

Also as per Environmental Policy 2005, Ministry of Environment & Forest as well as Ministry of Drinking water & Sanitation, Government of India has recommended decentralized system based on phytorid technology for treatment of wastewater.[8]

2.0. Decentralized Wastewater Technology

Wastewater management systems can be either conventional centralized systems or decentralized systems. Centralized systems are usually planned, designed and operated by government agencies which collect and treat large volumes of wastewater for the entire communities. On the other hand, decentralized wastewater management (DWWM) systems treat wastewater of individual houses, apartment blocks or small communities close to their origin. Typically, the decentralized system is a combination of many technologies within a given geographical boundary, namely, onsite systems, low cost collection systems and dispersed siting of treatment Guidelines for Decentralized Wastewater Management 1 facilities. It may also be noted that any city or town can have a combination of centralized, decentralized and on-site wastewater management systems, to meet the overall city sanitation.

Decentralized systems are small, individual or cluster type wastewater facilities to provide wastewater treatment services to residents. In India, more than 75% of wastewater is not addressed by centralized treatment facilities. The state of pollution of rivers and water bodies, big and small, shows that conventional, centralized approaches to wastewater management have generally failed to address the needs of communities for the collection and disposal of domestic wastewater and faecal sludge. The aim of these systems is to manage wastewater both as a resource as well as a pollutant. There is a growing body of science and practice which demonstrates the opportunities for implementing wastewater management systems, based on a decentralized approach that may lead to wastewater re-use and resource recovery as well as improvements in local environmental health conditions. These systems are designed to limit pollution by enhancing the assimilative and regenerative capacities of the natural system. Designing and managing these systems can be done at a fraction of the cost of conventional, centralized traditional sewerage system. It is widely recognized today that for areas that are not connected to centralized sewerage systems, it is more viable to look at alternative and decentralized approaches.

[8] Environmental Policy,2005

Before the development of the centralized sewerage systems, sewage management systems consisted of septic tanks, cesspools and wastewater stabilization ponds. Recent developments in the technology of sewage treatment has greatly improved upon these systems and today there are a range of methods and technologies to treat sewage at source with the least possible use of energy or machines and in a manner that enhances the natural habitats.[9]

DEWATS: In the Decentralized Wastewater Treatment Systems (DEWATS), both aerobic and anaerobic techniques are applied. DEWATS is based on different natural treatment techniques, put together in different combinations according to need. It is used for recycling both “grey” and “black” domestic wastewater. The systems include;

- Primary treatment, which includes pre-treatment and sedimentation in settlement tank or septic tank;
- Secondary anaerobic /anaerobic treatment in baffled reactors;
- Tertiary aerobic/anaerobic treatment

3.1 The Key Features of DEWATS

- Can treat a wide range of wastewater types
- Does not need energy
- Low-cost and minimal maintenance
- Can treat wastewater flows from 1-1000 m^3 per day
- Tolerant to inflow fluctuation
- Wastewater is turned into a resource for irrigation or reuse of water
- Fulfills discharge standards and environmental laws
- Does not require deep sewer line construction
- Reliable and sustainable
- Can be integrated into the landscape
- Involves local communities in the management

3.0. Wastewater Treatment - Centralized Vs. Decentralized Approaches

Wastewater treatment approaches vary from the conventional centralized, semi-centralized to decentralized systems. The problems and limitations of centralized wastewater treatment (such as Sewage Treatment Plants (STPs), Wastewater Treatment Plants (WWTPs) etc.) are gradually surfacing. Sustainable sewerage includes many components like environmental, technical and socio-cultural factors but economy of scale is the most important determinant of sustainable practices in developing countries.

[9] Decentralized Wastewater Treatment, Centre for Science & Environment, New Delhi, March 2010

While decentralized systems treat and reuse/dispose wastewater on-site, the publicly owned centralized systems use extensive pipelines or sewerage, major excavations and manholes for access. The unavoidable costs of sewer lines in case of centralized systems may threaten the economies of scale; sewerage may cost up to five times more than the central sewage treatment plant itself. Centralized systems are high-cost and energy-and maintenance-intensive systems and are not so suitable for developing countries. Small and isolated villages or settlements with low population densities can be served by decentralized systems that are simpler and cost effective.[10]

Most importantly, the huge operation and maintenance cost and the power dependency to run the plants is of a great concern. However on-site wastewater treatment facilities set up locally are not representative of current state-of-the-art or developed technology. They rely on natural processes and landscapes to treat the waste. Centralized management of decentralized treatment systems is essential to ensure regular monitoring and evaluation of performance.

4.0. Comparative Analysis

The process of design, construction and operation of sewage treatment plant (STP) requires multi-disciplinary approach. Numerous conventional methods are available for design of sewage treatment plants. The process involved in these treatments is either aerobic, anaerobic or combination requiring number of mechanical and electrical items thereby requiring substantial energy. The ever growing need of energy makes the design, operation and maintenance of STP a challenging task. The conventional method of sewage treatment can be made efficient by advanced technologies and intelligent supervision but this in turn increases the total cost. Conventional wastewater treatment systems comprising of energy intensive and mechanized treatment components require heavy investment and entail high operating costs. Reasons for inadequate treatment include high maintenance costs, lack of local expertise and poor governance.

It is important to adopt those technologies for wastewater treatment which can adequately treat wastewater in the long run i.e. sustainable technologies. Incorporation of high-tech wastewater treatment systems seems irrelevant as it is techno-economically not feasible.

One such technology that uses no electricity requires minimal manpower and uses natural plants in a manner that they achieve the desired treatment levels; and reuse the treated

[10] Decentralized Wastewater Treatment, Centre for Science & Environment, New Delhi, March 2010

water while becoming part of the landscape and aesthetics, a patented phytorid technology is developed by National Environmental Engineering Research Institute (NEERI).

Comparing with conventional wastewater treatment systems, phytorids have a higher rate of biological activity which enables conversion of many of the pollutants that are contained in the wastewater into non-toxic byproducts or essential nutrients that can be reused for additional biological activity. They have been used for secondary and also in some cases for tertiary level treatment and reuse. Phytorids are achieving prominence as an active and low cost alternative for treatment of wastewater in both the developed and developing world. Typical performance characteristics for various methods as already discussed in above sections to treat the wastewater is given in **Table1.2.**[11]

Table 1.2 Typical performance characteristics for various treatment methods

Sr. No.	Items	Conventional activated sludge	UASB	Extended Aeration	Facultative aerated Lagoons	Phytorid Technology
1.	Performance BOD removal %	85- 92	75 – 78	95 – 98	75 - 85	80-95
2.	Sludge	First digest then dry on beds or use mech. Devices	Directly dry on beds or use Mech. Devices	No digestion, dry on sand beds or use Mech. devices	Mech. De-sludging once in 5 – 10 years	Negligible
3.	Equipment requirement (Excluding screening & grit removal common to all process)	Aerators, recycle pumps, scrappers, thickeners, digesters, dryers, gas equipments	Nil except gas collection and flaring gas conversion to elec. is operational	Aerations recycle pumps sludge scrappers for large settlers	Aerators only	None all flows by gravity
4.	Operational characteristics	Skilled operation required	Simpler than ASP	Simpler than ASP	Simple	Unskilled operator
5.	Special features	Considerable equipment and skilled operation required specially when gas collection and usage considered	Minimal to negligible power reqd. makes it economical at even if gas revenue is neglected	BOD removal highest effluent nitrified high power requirement favored for small and medium plants	Power reqd. similar to ASP operation simpler	Plant species and odor less operations

[11]Conventional systems of sanitation for safeguarding water quality through decentralized Phytoird systems, Dr. Rakesh Kumar, NEERI.

It is also important to take into consideration various decentralized technologies available in India. These technologies can be classified into natural and built treatment systems which are further classified into aerobic & anaerobic treatment systems. Combinations of technologies can also be used however the most suitable technology depends on various factors such as land availability, capacity for operation, energy requirement, desired quality of treated water and many other as described in detailed in **Table 1.3.**[12]

Table 1.3 Comparisons of Various Wastewater Treatment Technologies

Technology	Natural / Built	Aerobic / Anaerobic/ mixed	Expected effluent quality	Area requirement m^2/person	Power requirement kWh
Waste stabilization pond techniques	Natural	Mixed	Medium to high	2.0 – 3.0	Nil
Duckweed pond System	Natural	Aerobic	Medium to high	2.5 – 6.0	Nil
Constructed Wetlands	Natural	Aerobic	Medium to high	1.0-1.5	Nil
UASB	Built	Anaerobic	Low	0.1-0.2	Only for pumps
Anaerobic baffled Filters	Built	anaerobic	Low	0.2 – 0.4	Nil
Package aeration Systems	Built	Aerobic	High	0.1 – 0.15	20 – 30
Sequencing batch reactor systems	Built	aerobic	Very High	0.05 – 0.1	10 – 20

Capacity and technology-wise average cost of construction & operation & maintenance of STPs, is also studied and the same is represented in **Table 1.4.**

Table 1.4 Average Capital and O&M Cost Comparison

Treatment Process	Capacity M^3	Construction cost (Rs.)	Operation cost/day (Rs.)
Combination	250	31,00,000	3000
Combination	100	27,00,000	2700
Aerobic	200	32,50,000	1500
Aerobic	100	35,00,000	1200
Anaerobic	250	37,00,000	2800
Anaerobic	100	30,00,000	2000
Phytorid	50	15,00,000	350

[12] Energy Efficient & cost effective Sewage treatment using Phytorid Technology, Dept. of Civil Engineering, DY Patil College of Engineering, Pune

Phytorid	500	150,00,000	500

Note: Reference 6

A comparative account of different types of technologies with respect to the treatment efficiency, area, power requirement, capital & O&M cost is summarized in **Table 1.5.**

Table 1.5 Comparative Accounts of Different Technologies

Parameter	UASB+EA	ASP-EA	MBBR	MBR	SBR	Phytorid
BOD, mg/l	<30	<30	<20-30	<3-<5	<5	<30
COD, mg/l	<250	<250	<250	<100	<100	<50
TSS, mg/l	<100	<100	<100	<5	<10	<10
TKN &P, mg/l	No Treatment	No Treatment	No Treatment	No Treatment	<10 <2	15
Area, Acres	15.6	10.9	5.5	5	6.3	m^2/m^3
Chemical Cost	0.07	0.07	0.07	0.50	0.06	Nil
Power generation	Yes	Nil	Nil	Nil	Nil	Nil

Note: Reference 6

In general it is accepted worldwide that the technologies which are deemed to be appropriate have to be qualified through application of a rigorous framework under scoring the performance expectations as well as the choices could be concurrent with the socio-economic acceptability.

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