UTTAR PRADESH JAL NIGAM (URBAN)

[E-Tender]

NAME OF WORK: "SURVEY, SOIL INVESTIGATION, DESIGN, SUPPLY OF ALL MATERIALS, T&P ETC. REQUIRED FOR COMPLETION OF DIRECT FROM TAP (24X7) WATER SUPPLY SCHEME IN SELECTED WARDS OF (1. WARD 25 (PARTIAL), MODIPONE COLONY AND KAVERI ENCLAVE), MODI NAGAR, DISTT GHAZIABAD 2. KAVINAGAR (OPERATIONAL ZONE-1), DISTT. GHAZIABAD 3. WARD NO.-18, NPP BARAUT, DISTT. BAGHPAT 4. WARD-03 (YAMUNA PURAM), DISTT. BULANDSHAHAR 5. WARD-22, NPP, KHURJA, DISTT. BULANDSHAHAR. 6. WARD-20 (PARTIAL OF RAMGARHI AND RAFIQ NAGAR), DISTT. HAPUR. 7. WARD-32, DISTT. MEERUT. 8. WARD-30, DISTT. MUZAFFARNAGAR 9. WARD-8, DISTT. SHAMLI 10. WARD-21, PARTIALLY 37 & 39, DISTT. SAHARANPUR WARD 16 , DISTT. MORADABAD,WARD 4 NPP SAMBHAL , WARD 15 NPP CHANDAUSI,WARD 8 AMROHA, AWAS VIKAS COLONY 9(SECTOR9&10) SIKANDARA ,AGRA, SURESHNAGAR DISTT-FEROZABAD, MAINPURI,WARD 2 HATHRAS,KASGANJ,S SHANTINAGAR ETAH,WARD 33 ALIGARH) ON TURNKEY BASIS":

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Atal Mission for Rejuvenation and Urban Transformation

अमृत 2.0

Tender Document

NIT No.: 132 / NIVIDA / 18 dated 15.03.2024

Office of the Superintending Engineer,
Construction Circle, Uttar Pradesh Jal Nigam (Urban), Meerut.

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LIST OF IMPORTANT DATES

Sl. No.	Description	Dates
1	Name of Work	"Survey, Soil investigation, Design, Supply of all Materials, T&P etc. required for completion of Direct From Tap (24x7) Water Supply Scheme in selected wards of (1. Ward 25 (Partial), Modipone Colony and Kaveri Enclave), Modi Nagar, Distt Ghaziabad 2. Kavinagar (Operational Zone-1), Distt. Ghaziabad 3. Ward No.-18, NPP Baraut, Distt. Baghpat 4. Ward-03 (Yamuna Puram), Distt. Bulandshahar 5. Ward-22, NPP, Khurja, Distt. Bulandshahar. 6. Ward-20 (partial of Ramgarhi and Rafiq Nagar), Distt. Hapur. 7. Ward-32, Distt. Meerut. 8. Ward-30, Distt. Muzaffarnagar 9. Ward-8, Distt. Shamli 10. Ward-21, Partially 37 & 39, Distt. Saharanpur ward 16 , Distt. MOradabad,ward 4 NPP sambhal , ward 15 npp chandausi,ward 8 Amroha, Awas vikas colony 9(sector9&10) sikandara ,agra, sureshnagar distt-ferozabad, mainpuri,ward 2 hathras,kasganj,s shantinagar Etah,ward 33 Aligarh) on TURNKEY basis **under Amrut 2.0 Programme**.
2	Completion Period for Construction	15 Months (including trial run)
3	Period of Trial Run	03 months
3	Period of Defect Liability	12 months For Civil Works 24 months for E/M Works. (This period shall commence after trial run, commissioning including operation & maintenance works with all consumable items excluding electricity.)
4	Date of Issue of Notice Inviting Tender	15-03-2024
5	Period of Sale of Bidding Documents:	From: 01.04.2024 To 26.04.2024 Through E-Tendering Portal https://etender.up.nic.in
6	Web site of U P Jal Nigam:	www.jn.upsdc.gov.in
7	Last date and time for submission of queries:	26-04-2024Time-17.00hrs
8	Time, Date and Place of Pre-bid Meeting Date (If any):	15-04-2024Time -11:00 hrs Place: Office of the Superintending Engineer. Construction Circle, U P JalNigam, Urban Meerut.
9	Bid Submission Start Date:	01-04-2024 Time: 17:00 Hrs.
10	Last Date of Bid Submission:	26-04-2024 Time: 17:00 Hrs. On E-Tendering Portal https://etender.up.nic.in
11	Date, Time and Place for opening Technical Bid/Bids Date	27-04-2024Time 15:00 hrs On E-Tendering Portalhttps://etender.up.nic.in Place- Office of the Superintending Engineer. Construction Circle, U P Jal Nigam,Uran Meerut.
2	Time and Date of opening Financial Bids: -	Date to be notified through Portal.
13	Bid Validity Period:	120 days (One hundred and twenty days)

21	Kasganj.	576.93					
22	Shanti Nagar Operating Zone, Etah.	1504.99					
23	Ward 33, Aligarh.	608.21					
	Total	**19216.85**					

Z

SECTION-2

CHAPTER-1

BRIEF PARTICULARS OF WORK

"Survey, Soil investigation, Design, Supply of all Materials, T&P etc. required for completion of Direct From Tap (24x7) Water Supply Scheme in selected wards of (1. Ward 25 (Partial), Modipone Colony and Kaveri Enclave), Modi Nagar, Distt Ghaziabad 2. Kavinagar (Operational Zone-1), Distt. Ghaziabad 3. Ward No.-18, NPP Baraut, Distt. Baghpat 4. Ward-03 (Yamuna Puram), Distt. Bulandshahar 5. Ward-22, NPP, Khurja, Distt. Bulandshahar. 6. Ward-20 (partial of Ramgarhi and Rafiq Nagar), Distt. Hapur. 7. Ward-32, Distt. Meerut. 8. Ward-30, Distt. Muzaffarnagar 9. Ward-8, Distt. Shamli 10. Ward-21, Partially 37 & 39, Distt. Saharanpur ward 16 , Distt. MOradabad,ward 4 NPP sambhal , ward 15 npp chandausi,ward 8 Amroha, Awas vikas colony 9(sector9&10) sikandara ,agra, sureshnagar distt-ferozabad, mainpuri,ward 2 hathras,kasganj,s shantinagar Etah,ward 33 Aligarh) on TURNKEY basis":)n TURNKEY basis".

Scope of work:-

1. It shall include 03 months initial trial& run. The defects liability period shall be 24 months including operation & maintenance work with consumable items excluding electricity, will be after completion of trial & run period or handing over of completed works to the 23 ULBS of package 1 AGRA and GHAZIABAD ZONE", whichever comes later.
2. GIS survey of the selected wards for Direct From Tap (24x7)water supply. Validation and Conditionassessment of the existing water supply components, including distribution network.Updating of the network map: GIS map of the network.
3. Formation of Zones/ District Meter Areas.
4. Consumer survey, number of current consumers, location of consumers and assessment ofZones/ District Meter Area wise water demand.
5. Development of the Hydraulic Model and Hydraulic design and analysis through WaterGems.Identification of Average Zonal Pressure (AZP) and Critical Pressure Points (CPP) for eachof the DMAs and providing of data logger on the same.
6. (Setting up of baseline levels for 24 x 7 water supplies.
7. Rehabilitation of existing tube well/ Construction of tube wells, procurement & erection ofpumps, execution of associated Electrical, Instrumentation and Mechanical works. IncludingPLC, SCADA automation of all tube wells.
8. Rehabilitation of existing rising main/ Laying of new rising main.
9. Rehabilitation of existing pump house/ Construction of new pump houses.
10. Rehabilitation of existing Over Head Tank/ Construction of new Over Head tanks of varyingcapacities.
11. Rehabilitation of existing feeder, distribution network system/ Laying of New feeder,distribution network system.

12. Supply and installation of flow meters in zones/ district meter areas and consumer watermeters (AMR) at both existing and new house service connections.
13. Rehabilitation of existing SCADA building/ Construction of new SCADA building.
14. Rehabilitation of existing boundary wall/ Construction of new boundary wall.
15. Development of existing water works campus/ New water works campus.
16. Rehabilitation of existing water recharge unit/ Construction of new water recharge unit.
17. NRW/ UFW assessment and leakage reduction activities.
18. SITC of Isolation valve, FCV, PCV, Bulk meters, Level sensors, Residual Chlorine Detector
19. Pressure transmitter etc. required for 24 x 7 supply system.
20. Establishment of monitoring points for quantity & quality.
21. Development of Volumetric consumption-based computerized billing system.
22. Achievement of the performance targets for Network Pressure, Continuity of Supply, redressof customer complaints and reduction of NRW and UFW etc.
23. Customer awareness programs to educate customers to avoid the waste of water.
24. Provide As-built drawings of all the works implemented, preventive and breakdownmaintenance plan for instruments, analyzers etc. Diversion of traffic with necessary sign/caution board, required as per site conditions and as approved by Engineer in charge shall be made by the contractor for which no extra payment shall be admissible.
25. The roads cut during executions of works shall have to be made walkable/motorable immediately after proper back filling and compaction as specified by using specified quantity of old material obtained during cutting of same. This work shall be executed as per direction of Engineer in charge after proper refilling and proper compaction of earth, so that no hindrance / inconvenience occurs for traffic / public. It will also include obtaining permission from the concerned authority for cutting of the roads.
26. Providing necessary barricading with necessary ballies and GI sheet as per site requirement and as per direction of Engineer in charge.
27. Diversion and restoration of utility services such as telephone lines/ electric cables / data cables, water supply lines, sewers, drains, minors, irrigation channels, roads metalled or kuccha etc. as per site requirement and as per direction of Engineer in charge for which no extra claim shall be admissible.
28. Trial run and testing of all works executed under the agreement for a period of 03 (Months) during this period all expenses shall be borne by the contractor and no extra payment shall be admissible for this activity.

Trial run of 03 months and defect liability period of 12 months for civil work and 24 months for E&M workmonths including operation & maintenance work with consumable items excluding electricity.After the completion of works and after commissioning and stabilization of works i.e. after 03 months trial run period or handing over of completed works to the ULB, whichever comes later, any defect occurred in this period shall be rectified by contractor at his own cost.

29. Provide As-built drawings of all the works implemented, preventive and breakdown maintenance plan for instruments, analyzers etc.
30. The scope of work includes capital works and O&M works. For capital works BOQ is uploaded on e-tender portal whereas for O&M works the bill of quantities is mention under schedule H of bid document.
31. The rates quoted by the bidder for capital works (% above/below) shall be applicablefor O&M. Bidders are requested to take Cognizance of the departmental rates for O&M mentioned in Schedule – H, while quoting the rates for capital works.
32. (Contract agreement for Capital works shall be signed first. After successful completion, commissioning and trial run and its handing over to ULB, the contract for O&M shall be signed
33. The contractor shall also be responsible to get the works handed over Package – 1: Ghaziabad Zone & Agra Zone 23 nos ULBS.immediately after trial& run period for which no extra claim shall be admissible. In case of failure to do so the Security Money shall stand forfeited.

34. Supply of completion drawings (as built drawings in 04 copies) after completion and commissioning of work as per requirement of Engineer in charge . No extra payment for this shall be admissible.
35. Permission from the department whose property is to be used, dismantled, disturbed is mandatory.
36. Any other activity of work as contractor or Engineer in charge may feel necessary to complete the work as per drawings, specifications & contract agreement.Which are not included in above or not mentioned elsewhere in the tender document but are necessary for proper completion of work shall be deemed to be incorporated in the scope of work.
37. Permanent reinstatement of roads as per P.W.D. / Local body specifications and to the satisfaction of the Engineer in charge. The roads if settled or damaged during work or defect liability period shall be repaired/rebuilt by the contractor at his own cost.
38. Supply of all materials, labour, T&P etc. complete.
39. Testing, commissioning and maintenance of work as provided in the contract documents.
40. Dismantling of roads - The rates of dismantling of roads as mentioned in Schedule G / BOQ includes the cutting of existing thickness of road either single or multiple layer of roads. No extra payment shall be made to the contractor for cutting multiple layers of roads.
41. Reinstatement of roads -
    a. The Interlocking tiles road and BOE road cut during executions of works shall have to be made motorable immediately after proper back filling and proper compaction as specified by using old material obtained during cutting of same and permanent reinstatement of Interlocking tiles and BOE roads after proper compaction should be done not later than 7 days or earlier if required by Engineer in charge.
    b. The Bitumen road cut during executions of works shall have to be made motorable with GSB layer within 3 days after proper back filling and proper compaction as specified and permanent reinstatement of Bitumen road after proper compaction should be done not later than 21 days or earlier if required by Engineer in charge.
    c. The Cement concrete road cut during executions of works shall have to be made motor able within 3 days after proper back filling and proper compaction as specified by using old material obtained during cutting of same and permanent reinstatement of Cement concrete road after proper compaction should be done not later than 15 days or earlier if required by Engineer in charge.
42. The scope of work also includes diversion of drains, diversion of traffic, display of caution boards, arrangement of caution lights in the night, marking of level pillars etc. reinstatement of water pipe line, cleaning of side drain filled by excavated earth etc. as mentioned elsewhere for which no extra payment shall be made to the contractor. The contractor should make sufficient provision for these works in his rates. The contractor should make all arrangement for safety of Public and Private Property for convenience of public at the time of execution of work.

Note: - Price Bid
The scope of work includes capital works and O&M works. For capital works BOQ is uploaded on e-tender portal whereas for O&M works the bill of quantities is mention under schedule H of bid document
2. The rates quoted by the bidder for capital works (% above/below) shall be applicable for O&M the bidders are requested to take Congnigence of the departmental rates for O&M mentioned in schedule H while quoting the rates for capital works.

SCOPE OF WORK & CONTRACTOR / OPERATORS OBLIGATIONS

The total scope of works can be divided into mainly two phases:

- Phase -1: Works Contract
- Phase -2: O&M Contract

The details of the above works are given below in Table below.

Table 1: Details of Work Contract and O&M Contract

Contract	Phases	Proposed Works	Time Period
Works Contract	Validation of Baseline Data(Survey and base line phase)	Fixing the boundaries of District Metered Area (DMA)s, determination and validation of initial service levels of flow, pressure, hours of supply, Unaccounted for Water (UFW) etc.	12 months
	Capital Works (Construction& Rehabilitation Phase)	Fixing of District Metered Area (DMA)s, Leakage detection and reduction of leakage and NRW, procurement and construction/rehabilitation of the distribution network including flow measuring devices, consumer meters, house service connection and remedying any defects, achievement of performance targets	
O&M Contract	Operation and maintenance of the system as per performance parameter benchmarks (O & M Phase)	Operation and Maintenance of the distribution network to maintain performance targets achieved or further reduce it during the Operation and Maintenance Period	60 months

The various performance targets to be achieved as part of this contract are presented in Table below.

Table 2 : Performance Targets for the PCM Works

S. No.	Service Level Benchmark	Benchmark as per MoUD	Targeted Performance
1	Coverage of Water Supply	100%	End of 12 months
2	Per Capita Supply of Water	150 LPCD	
3	Continuity of supply	24 hrs	
4	Network Pressure	17mtrs	
5	Extent of Metering of water connections	100%	
6	Extent of Non-Revenue Water	30%	End of Commissioning
		15%	End of Trial-run
		15%	End of 24 months of Defect Liability Period
		15%	End of 36 months of O& M Contract
7	Efficiency in redress of customer complaints in 24 hours	60%	End of 12 months of O& M Contract
		70%	End of 24 months of O& M Contract
		80%	End of 36 months of O& M Contract

S. No.	Service Level Benchmark	Benchmark as per MoUD	Targeted Performance
		90%	End of 48 months of O& M Contract
8	Quality of Water	100%	End of 12 months
9	Billing Efficiency	95%	End of 15 months

The major tasks to be undertaken by the contractor/ operator during various phases of the contract area are listed below. These are the contractor / operator's obligation for the project. These tasks include, but not limited to, all the obligations of the Contractor / Operator as required to achieve the deliverables under this project and the overall objective to provide sufficient quantity and good quality of water to the citizens residing in Selected area of ULB's.

The Contractor / Operator shall perform the Services in accordance with this Contract, and carry out its obligations with all due diligence, efficiency, and economy, in accordance with generally accepted professional techniques and practices, and shall observe sound management practices, and employ appropriate advanced technology and safe methods. The Contractor / Operator shall always act in good faith, in respect of any matter relating to this Contract or to the Services, to the UPJN / Jal Kal / Nagar Nigam, and shall at all times support and safeguard the UPJN / Jal Kal / Nagar Nigam legitimate interests in any dealings with other stakeholders or third parties

Phase-1 Works Contract:
Phase-1 works shall be conducted in two sub phases i.e. survey & baseline formation and capital works implementation.

1.1.1. Survey and Baseline Phase: - (1 to 3 months)
The tasks involved are as below:

- Validation of the Network data like boundaries, pipeline network, valves, washout etc
- Customer awareness programs to educate customers to avoid the waste of water.
- Consumer survey, number of current consumers, location of consumers
- Flow and pressure measurements using temporary flow and pressure measuring devices
- Review of existing functioning of the area with valves, supply hours, chlorination and updating of map and suggest improvements
- Updating of the network map: GIS map of the network
- Study the available drawings and develop a Record Plan for each Pilot zone which will include a schematic diagram of the feeder and distribution network including sizes and materials, inflow meters location, boundary valves, other valves, major consumers etc.
- Development of the Hydraulic Model and Hydraulic Analysis
- Hydraulic analysis shall be done through latest version of Water Gems
- Formation of District Meter Areas / Zones
- Identification of Average Zonal Pressure (AZP) and Critical Pressure Points (CPP) for each of the Selected area and providing of data logger on the same.
- Procurement and installation of bulk water meter on inlet and outlet: volume of production (distribution input) and consumption.
- Establishment of the consumption in each of the DMAs / zones
- Establishment of baseline UFW levels using the flow data from the DMA / Zonal meters and the consumption assessed (since consumer metering is not present during this phase of the contract the consumption has to be assessed by the bidder with the help of sample metering or using any other methodology as mutually agreed with the client)
- Procurement of DMA meters, for flow measurement, and sample consumer meters, for assessing consumption need to be done during this phase of the contract.

- Conditions assessment of the network
- Leakage detection and estimation of volume lost or weakness of pipes
- Assessment of the non-leakage components of the UFW

1.1.2. Capital Works Implementation Phase:- (4 to 12 months)

The following are the task to be undertaken by the Contractor during the capital works implementation phase.

- Implementation of Capital Investment plan.
  - ♦ Rehabilitation & installation of pipes keeping safe and secure site all the time. All AC pipes needs to be replaced. It will be the sole responsibility of the Contractor to maintain zero tolerance policies to ensure the safety and quality all the time.
  - ♦ Installation of valves and other equipment keeping safety measures.
  - ♦ Installation of 100 % consumer meters. During the capital works implementation phase the consumers will not be charged based on volumetric consumption recorded from the installed meters. Sample meter readings will be done only for assessment of the NRW / UFW in the zones. Volumetric consumption-based billing to the consumer will only start from the O&M phase of the contract when the consumers will start getting water with improved service levels.
  - ♦ Replacement and Installation of Service connections
  - ♦ Establishment of chlorination system and points.
  - ♦ Establishment of monitoring points for quantity & quality
  - ♦ Establishment of a consumer water meter test bench (for sizes 15, 20mm) as per ISO 4064 within the Pilot area. The Operator need to get a certification from Fluid Control and Research Institute (FCRI), Palghat on the suitability of the test bench.
  - ♦ Permissions required for all Rail/NH/SH/ roads/Nallah/River crossing along with the required widths along the pipe route and necessary area of land for temporary/ permanent structures shall be provided to the contractor by the employer but contractor shall facilitate the timely necessary actions for such permissions. For such permissions, necessary charges will be paid by employer however liaison with concerned departments shall be carried out by contractorLiaison with other utilities while executing the laying works within the city.
  - ♦ Provide As-built drawings of all the works implemented by the contractor.
  - ♦ NRW assessment and leakage reduction activities
  - ♦ Monitoring of the performance parameters
  - ♦ The Contractor / Operator shall achieve the Performance Target relating to physical losses by using a combination of different measures including, but not limited to, the following:
    - o Control of pressure in the system, while meeting the minimum zone pressure requirement, by a combination of pressure control and by network strengthening measures within the Distribution Operating Zone.
    - o Detection, location and repair of leaks on the distribution networks using good quality pipe repair clamps.
  - ♦ The Contractor / Operator shall use their experience and diagnostic analysis of the system to determine the most cost-effective measures to achieve the Performance Targets during the each Phase of Contract.
  - ♦ Flow and Pressure measurements
  - ♦ Assessment and reduction of Non-Leakage component of UFW like free water usage, illegal connections, slum consumption etc.
  - ♦ Direct tapping from the rising / feeder mains is not allowed. All the connection which are taken from the rising and feeder mains need to be transferred to the nearest distribution mains. If required distribution headers may be provided for connecting the house connection. The cost for the same can be claimed using the items under Bill-II.
  - ♦ The assessment of UFW / NRW and its components need to be done based upon the IWA Water Balance Template
  - ♦ Leakage Detection and repair
  - ♦ Addressing customer complaints within the Selected area
  - ♦ Devising a customer relation management mechanism

- ♦ Preparation and submission of the monthly progress reports
- ♦ The Contractor / Operator shall organize Public Awareness Programmeat least once in every month during trial run period and thereafter once in 03 month during Defect Liability and O&M period.
- ♦ To prepare and submit to UPJN / AJK for its approval a draft operation and maintenance plan ("Draft Operation and Maintenance Plan") containing the proposed operating strategy, method statement, resource plan including the number and details of the employees of the Operator, the implementation plan for effective operations and management, maintenance, leakage control, asset management and Customer service, procedure for installation of new connections, and achievement of Performance Target for the Operation and Maintenance Phase
- ♦ A completion report on the Capital Works Phase.

Phase-2 – DLP and O&M Contract:

1.1.3. Operation & Maintenance Phase:- (30 to 90 months)

The following are the tasks to be undertaken by the Contractor during the O&M phase.

- ♦ Operation and Maintenance of the distribution system within the Selected area. The jurisdiction of the Contractor for the O&M of the system will include the zonal CWRs, pumping houses, zonal inflow meters, feeder mains, distribution mains, house service connection from the ferrule point till the consumer meter point within the customer premises. The house internal pipeline network beyond the consumer water meter point will not fall under the O&M jurisdiction of the Operator/Contractor.
- ♦ Leakage, if any, observed in pipeline shall be repaired within 6 hours and in no case should water supply remain interrupted more than 8 hrs a day.
- ♦ Such occurrence of water supply interruption for 8 hrs a day shall not exceed twice a month, failing to which proportionate cost per day, derived from the quoted O&M rate for corresponding year in proportion to the affected households shall be deducted. Further, penalty @Rs 1000/such occurrence shall be recovered from dues payable to the contractor.
- ♦ For initial 2 years proportionate cost per day derived from the retention amount to be released per year shall be deducted and further, penalty @Rs 1000/such occurrence shall be recovered from dues payable to the contractor.
- ♦ Day to Day O&M of all the OHT & Booster Pump houses which supplies water to the specified Selected area
- ♦ Valve Operation, if any, within the Selected area
- ♦ Establishment and operation of the chlorination system
- ♦ During DLP phase of 02-year, chlorine and other consumables shall be borne by the Contractor and energy cost will be borne by ULB's. However, the chlorine use and energy audit is in the scope of the Contractor. Thereafter, during O&M phase, chlorine and other consumables including energy cost will be borne by ULB's.
- ♦ The Contractor/ Operator shall use their experience and diagnostic analysis of the system to determine the most cost-effective measures to achieve the Performance Targets during each Phase of Contract
- ♦ Leakage Detection and repair (pipelines, house service connection)
- ♦ Assessment and reduction of Non-Leakage component of UFW like free water usage, illegal connections, slum consumption etc.
- ♦ Flow and Pressure measurement. The flow measurement at the inlet / outlet to the zone from the electromagnetic meters installed and the pressure measurements from the DM, AZP and CPP points of each zone need to be recorded. The logged flow and pressure data for the month for the zone need to submitted as a part of the monthly progress report.
- ♦ Maintenance of the DMA / zonal meters installed in the Pilot zone. The Operator should keep a stock of spare parts of the DMA meters for the 5 years O&M period. Operator should ensure uninterrupted recording of flows by these DMA meters and should avoid scenarios where the performance monitoring in the Selected area are not possible due to non-working DMA meters. This will attract additional penalty as decided by the Engineer during the period of the contract.

- Maintenance of the consumer meters installed in the Selected area. The responsibility of non-measurement of water consumption due to non-working of consumer meter shall be with Operator/Contractor. The Operator is expected to keep necessary spare parts and spare consumer meters ready so as to ensure uninterrupted
- The Operator/Contractor should operate and maintain the consumer meter test bench established. The space for the test bench and the water required for the same will be made available from the local service stations. However the Operator will be responsible for the O&M of the test bench along with the handling of the consumer meters required for testing. The Operator should test the consumer meters on sample basis and as per the request raised by consumers in the Pilot area and should produce the test results as per ISO 4064. The meter reading errors percentage in each of these Selected area need to be also assessed suing these test results by the operator.
- Consumer meter reading
- Monthly volumetric billing for domestic customers
- Monthly volumetric billing for bulk water customer and major consumers
- Bill preparation. This will include development of a computerized billing system.
- Providing of new consumer connection. Operator shall provide the new connection within 72 hrs. after receipt of approval letter from ULB / Nagar Nigam.
- Monitoring of the water quality through the water quality monitoring points. A minimum level of 0.2ppm of residual chlorine to be maintained at all the critical points of measurement in the network and all measures to ensure quality of supplied water during emergencies. To maintain throughout the distribution network within the Pilot Zone the quality of water at the same level as the quality of Bulk Water supplied to the Operator for the Pilot Zone by AJK. The Operator shall in this regard take two spot samples of the water supplied into the Pilot Zone at each of the bulk supply meter chamber on entrance to the Distribution Operating Zone and at the Critical Zone Points, where minimum zone pressure is measured. These samples are to be taken fifteen days as per BIS standards throughout the DLP and O&M Phase of the Contract Term. One of the samples should be analysed on site for chlorine residual. The other sample, taken in accordance with the sterile requirements for bacterial analysis, shall be analysed at a laboratory approved by the UPJN / ULB/ Nagar Nigamfor Total Coliform and E. Coliform bacteria. A representative of the ULB/ UPJNwill be present at the sampling.
- Monitoring of the performance parameters as stipulated in the contract
- Quarterly performance report in agreed format.
- Undertaking of minor capital works like sectional pipeline and fittings replacement as required during the O&M period.
- The Contractor / Operator shall on a periodic basis update the plan of the distribution system within each Pilot Zone at a scale of 1:2500. The plan should show the inlet chamber, the boundary valves, the distribution system location in plan (providing diameter, material and approximate depth data) and list of every stand-post and property connected to the public water distribution network.
- Addressing customer complaints within the Selected area. Logging of customer complaint receipts shall be kept at central location with one soft copy to zone office of ULB / Nagar Nigam by email. Weekly report of complaint receipt & attended shall be given to UPJN / ULB/ Nagar Nigam. The digital photograph of each customer complaint &it's solution shall be submitted before & after solution provided to customer on behalf of Operator (in case of works required).
- Devising a customer relation management mechanism including establishment of customer care centre for addressing customer complaints
- The Contractor / Operator shall supply the water to all the consumers by way of water tankers or any other mode under any exigencies, if the water supply through pipeline suffers to such areas/ consumers.
- The Contractor / Operator shall provide to the UPJN / ULB/ Nagar Nigam, for the Selected area, a report on the project operational data **("Project Operational Data")**.

- The Contractor / Operator shall provide to UPJN / ULB/ Nagar Nigam, for the Pilot Zone, Monthly Progress Reports from the commencement of the O&M Phase till the expiry of the Contract, provided that the last Progress Report may represent a period lesser than a month.

- Water Supply Services shall include the operation, maintenance and repairs of all existing and new assets created for the proposed water supply system to deliver the services. Computerized billing &distribution of bills, operating 24 hour consumer care Centre, consumer complaint redressal within specified time period etc.
- Continuous Pressurized Water Supply means a continuous supply of water for 24 hours a day, at consumer meter point. Continuous supply and pressure to be measured at Critical Points in the zone from mid night to mid night.
- Critical Points in the zone means the points on the distribution network at which the flow or pressure measuring devices would be installed which shall be mutually agreed by the Employer and the Contractor during the works contract.
- Potable Water means water meeting the Water Quality as per the standards specified in IS 10500-1991.The following important parameters are to be checked, documented and ensured properly.
- The bacteriological examination shall be carried out for one sample daily per 10,000 populations as given in CPHEEO manual.
- The minimum residual chlorine of 0.2 ppm shall be maintained continuously at the consumer end.
- Nonrevenue Water (NRW) = System Input Volume (SI) –Billed Authorized Consumption (BC)

CHAPTER-2

INSTRUCTION TO BIDERS FOR PRE-QUALIFICATION

2.1. Throughout these documents-

2.1.1. The terms “bid” and “tender” and their derivatives (bidder/ tenderer, bid/ tender, bidding/tendering, etc.) are synonymous.

2.1.2. The terms "Performance Security", "Performance Guarantee"& "Security Deposit" are synonymousand have been used interchangeably.

2.2. Prohibition from Bidding:

2.2.1. Bidders shall not be under a declaration of ineligibility for corrupt and fraudulent practices by the Central or State Government Department, U.P. Jal Nigam or any public undertaking,Autonomous body, authority by whatever name called under the Central or the State Government.

2.2.2. Any bidder having criminal record is not allowed to participate in the bidding process. Any person who is having criminal cases against him or involved in the organised crime or Gangster activities or Mafia or Goonda or Anti-social activity are strictly prohibited to participate in the bidding process. If it is established that any bidder has criminal record, his bid shall be automatically cancelled.

2.2.3. Any bidder who is an Advocate and/or Registered with any State Bar Council/Bar Council of India shall not be allowed to participate in the bidding. If it is established that the Contractor is registered with the state bar council, his bid shall be treated as automatically cancelled.

2.2.4. Any agency / firm or its known Partners/ Directors against which/ whom any investigating authority has instituted any vigilance enquiry or there are criminal proceedings in any Court of Law or has been debarred or blacklisted by any Govt. / Semi Govt. /Board/ Corporation shall not be considered for award, unless such debarment/blacklisting period has ended. An affidavit to this effect shall be submitted by the participating agencies / firms.

2.2.5. The bidder shall have to enter into Integrity Pact with U.P. Jal Nigam, he should therefore acquaint himself with the contents of the Integrity Agreement.

2.3. The bidder has to upload and produce for execution of agreement, original copies of Integrity Agreement, Annexures, Forms- I to IX. Original Experience certificates shall be returned after Verification. Rest of the documents may be retained for execution of Agreement.

2.4. The Pre-qualification of the agencies / firms is confined to invitation of such firms who have earlier demonstrated their capability and capacity in executing similar projects in a time bound, prestigious &Professional manner with high standards of workmanship within specified cost. The pre-qualification will be made on basis of the past record and successful completion of such projects inthe stipulated time with good quality, proven technical competence, experience of handling works of comparable magnitude and complexity, expertise and know-how in the relevant field, financial resources, technical manpower and construction equipment owned by Bidders and other requirements laid down in the prescribed Pre-qualification document.

2.5.1. The tender will be on Turnkey basis including trial run and defect liability period as described, which will commence after the project is commissioned, trial run, 2 year operation & maintenance work with consumable items excluding electricity completed and Handed over to the authority designated by Employer. It may be distinctly understood that responsibility of handing over of the project shall lie with the selected bidder.

2.5.2. The time allowed for carrying out the work will be reckoned from the date of start as Defined in Schedule ‘F’ or from the first date of handing over of the site, whichever is later, in accordance with the phasing, if any, indicated in the bid documents.

2.6. The Bidder intending to submit pre-qualification documents will have to be experienced in executing similar type of works as defined in NIT and further as demonstrated in their experience Certificate. Such experience certificate should be detailed enough to make an informed decision. Ambiguous certificates shall not be considered for evaluation of bidder's eligibility.

2.7. Clarification of Bid Documents:-

2.7.1. The bidder or his official representative is invited to attend a pre-bid meeting (if scheduled) which will take place at the address, venue, time and date as indicated in "List Of Important Dates"

2.7.2. The purpose of the meeting will be to clarify issues and to answer questions on any matter thatmay be raised at that stage.

2.7.3. The bidder is requested to submit any questions in writing or by fax/e-mail to reach the Employer before last date of submission of queries as indicated in "List of Important Dates". Any query received after scheduled date and time would not be entertained and will be treated as void.

2.7.4. Minutes of the meeting, including the text of the questions raised (without identifying the sourceof enquiry) and the responses thereon will be posted exclusively on e-procurement Portal.

2.7.5. Any modification of the bidding documents which may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an Addendum and will be posted exclusively on e-procurement portal.

2.7.6. Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.

2.8. Pre-qualification document contains various formats and the same are to be used for furnishing the required information. The enclosed formats should be filled in completely and response must be Provided for each item included in Appendices. In the event that a Bidder considers it inappropriate to respond to a particular item; this shall be completed as not applicable. If necessary, additional pages may be attached. Bidder should note that all the formats prescribed, need to be filled even if such information is Nil. It should be clearly indicated, failing which the bid may be treated as non-responsive.

2.9. All information requested shall be provided in English language, type written. Each page of the Pre-qualification document shall be duly signed and page numbered by the Bidder or his Authorized representative, over writing should be avoided. Correction, if any, should be made by neatly crossing out, initialling, dating and re-writing.

2.10. Supporting documents shall be uploaded after scanning original or photocopy, as may beapplicable, duly attested by a Gazetted Officer / Magistrate/ Notary as prescribed in NIT. Document generated by the firm can be self-attested. The Bidder shall have to submit original documents as and when demanded.

2.11. Each sheet shall be duly signed by the Bidder or a person or persons duly authorized to sign on behalf of Bidder in case of Partnership firm or Limited company. Such authorization shall be supported by written power of Attorney accompanying the application.

2.12. Failure to provide information which is essential to judge Bidder’s qualifications or to provide timely clarifications or substantiation of information supplied may result inDisqualification of the Bidder for the particular bid.

2.13. All documents submitted within due time and date, by the Bidders will be treated as confidential and will not be returned.

2.14. U.P.Jal Nigam (UPJN) may not necessarily inform all Bidders of the result of their applications. It reserves the right to accept or reject any or all applications and to annul the pre-qualification Process and there by reject all Bidders without incurring any liability to the affected Bidders or any obligation to inform the Bidder of the ground for the action.

2.15. The intending bidders who desire to see the site may visit at their own cost.

2.16. U.P.Jal Nigam will not reimburse any costs involved in the preparation and submission of pre-qualification document or in connection with any site visit made.

2.17. Suppression of Facts:Any information furnished by the Bidder found (immediately or at later stage) to be forged or incorrect or concealment of any information, would render him liable to be Debarred from tendering / taking up of works. Further, action may be taken as per tender conditions including forfeiture of earnest money deposited.

2.18. Information regarding litigation in past five years which the bidder is involved in, has to be submitted in prescribed format. The name of the parties' concerned, and disputed amount, should Also be given in the enclosed format.

2.19. Bank Solvency Certificate in prescribed format-'II-B' (equivalent to at least 40 percent of the cost put to bid) issued by a Scheduled Commercial Bank should be uploaded with the bid. It Should also be kept validated during the contract period.

NATURE OF FIRM/BIDDER:

The Bidder may be individual, propriety firm, firm in partnership, Joint Ventures (if permitted), limited company- public or private or corporation. In case of individual/proprietorship firm the bid is required to be signed by sole proprietor with his full name and current address, while in case of partnership firm the bid should be signed by all those partners in the firm with full name and current address, an affidavit to this effect and certified copy of partnership deed (as registered with registering authorities) is required to be attached with bid. However, in case of limited firms / companies, the bid is required to be signed by the authorized signatory, a power of attorney drawn in whose favour along with a copy of Memorandum & Articles of Association (as registered with registering authorities) duly notarized by a Public Notary should be attached with the bid.

Joint Venture (JV): The number of JV partners shall be limited to 2 (two) in number. The bidder shall further follow guidelines for Joint Venture Firms as described in Clause 3.6 of Chapter-3.

ELIGIBILITY FOR JV/CONSORTIUM:

1) The Joint Venture is allowed with maximum two members out of which lead member has to be an Indian firm/company. Foreign companies can be part of Joint Venture.
2) The lead Member of the JV/Consortium must have minimum 51% of the Stake Holding. Member of Joint venture, other than the lead member, should have at least 30 % Stake Holding.
3) Lead member should have a Turnover of at least 51 % of the total Turnover required.
4) Lead member should have a Solvency of at least 51 % of the total Solvency required.
5) Project costing <_ 10 cr. - JV/consortium shall have the required technical experience collectively.
6) Project costing >10 cr. upto 25 cr. - Lead member of JV/consortium should have at least 30% technical experience of required technical experience
7) Project costing > 25 cr. - Both members of JV/consortium should have at least 30% technical experience of required technical experience.
8) A member of JV/Consortium shall not participate either in individual capacity or as a member of another JV/Consortium in the same tender.
9) Tender form shall only be submitted in the name of the JV/Consortium. Tender fees may be submitted by lead partner/JV.

A Single performance guarantee shall be submitted by the JV/Consortium in the name of the JV/Consortium.

All the member of the JV/Consortium of bidders shall be liable jointly and severally for the execution of the project.

Note for 2.20.2.1: -

1) Value of a completed work done by a Member in an earlier JV Firm/ Partnership firm shall be reckoned only to the extent of the concerned member's share in that JV Firm/Partnership firm for the purpose of satisfying his/her compliance to the above-mentioned technical eligibility criteria in the tender under consideration.
2) Turnover on construction works by a Member in an earlier JV Firm/Partnership firm shall be reckoned only to the extent of the concerned member's share in that JV Firm/Partnership firm for the purpose of satisfying compliance of the financial eligibility criteria in tender under consideration.

JV/CONSORTIUM REQUIREMENTS:

Bids submitted by JV/Consortium of Bidders must comply with following requirements:

1) The JV/Consortium shall furnish a joint bidding agreement (the joint bidding agreement) on a non-judicial Stamp of a minimum of Rs. 100 (rupees one hundred only) as per the format provided in the relevant Bid Form, which shall be legally binding on all the Members. In case the JV/Consortium is selected, the Joint Bidding Agreement shall continue in full force and effect till the contract agreement signed with the JV/Consortium becomes effective and thereafter relevant equity lock in provisions will be part of Contract Agreement. Separate PAN,GST of JV Firm and separate Joint bank account for payment to JV Firm should be submitted duringsigning of contract bond for same. However, in the case the JV/Consortium is not selected for award of the project, the joint bidding agreement will stand terminated upon return of the Bid Security by Jal Nigam.
2) A member meeting the requirements described in para 2.20.2shall be authorized and nominated as the lead member to act and represent all the members of the JV/Consortium for bidding and implementation of the projects. This Authorization shall be evidenced by submitting a power of Attorney signed by legally authorized signatories of all the members as per format provided in the Bid Documents.
3) Change of the lead Member will not be allowed under any circumstances.

Notwithstanding anything mentioned elsewhere in the bid document, subcontracting shall not be permitted except for the works like SCADA/ Automation/I.T. solutions and construction of electric sub-station which can be out sourced/sub-contracted to other firms after approval of Engineer-in charge, but the main contractor will be responsible for the quality of work and its timely completion. For such out sourcing the successful bidder shall obtain prior permission from the Engineer-in-charge, who will accord his approval based upon past experience on similar works performed by the outsourced agency.

2.22. The Bidder shall adopt the Percentage Rate Method and quote the same in e-tender portal as specified in the excel sheet for the purpose; only the same option is allowed to all the Bidders. Percentage Rate Method requires the bidder to quote a percentage above / below/ at par of the cost of BOQ.

a. In case the lowest tendered amount (cost of work put to bid compared with amount worked on the basis of percentage above/below) of two or more contractors is same, such lowest contractors will be asked to submit sealed revised offer in the form of letter mentioning percentage above/below on cost of work put to bid including all sub sections/sub heads as the case may be, but the revised percentage quoted above/below on cost of work put to bid or on each sub section/sub head should not be higher than the percentage quoted at the time of submission of tender. The lowest tender shall be decided on the basis of revised offers.
In case any of such contractors refuses to submit revised offer, then it shall be treated as withdrawal of his tender before acceptance and 50% of earnest money shall be forfeited. If the revised tendered amount of two more contractors received in revised offer is again found to be equal, the lowest tender, among such contractors, shall be decided by draw of lots in the presence of General Manager/Superintending Engineer concerned.
In case all the lowest contractors those who have quoted same tendered amount, refuse to submit revised offers, then tenders will be recalled after for feinting 50% of EMD of each contractor.

Contractor(s), whose earnest money is forfeited because of non-submission of revised offer, shall not be allowed to participate in the re-tendering process of the work.

2.23. The Bidder will furnish the following mandatory information, scanned documents/certificates of originalson e-tender portal, failing which the bidder may get disqualified. Additional pages can be added to give complete desired information. Nil information is also required to be indicated as such and submitted. Omission of any format/information shall be taken as 'Nil' information and will be evaluated accordingly.

1) Proof of submission of Tender Fee and Earnest Money Deposit (EMD). In case EMD is deposited in the shape of Bank Guarantee it should be substantially in the format as per Annexure-6. (Original).
2) Integrity Pact- As per Annexure-2 (Original)
3) General information in Form-I (Original)
4) Declaration on Form - I A. (Earnest Money) (Original)
5) Declaration on Form - I B. (Affidavit of Bid Validity)(Original)
6) Standard Affidavit on Form- I-C. (It may be translated into English by bidders outside of U.P. however substance of the contents should not be altered) (Original)
7) Financial information in Form- II (A).(Original)

8) Bank Solvency Certificate issued by a prescribed Bank on Form II-B.(Original)orHaisiyat Certificate issued by District Magistrate.
9) List of similar works executed during last 10 years as per Form-III&IIIA. (See Clause 3.1of this section) (Original)
10) Details of work which are in progress/awarded/bid have been submitted as on the date of bid submission.Form-IV (Original)
11) Details of technical and administrative personnel with bidder in Form-V.(Original)
12) Format for performance report in Form-VI.(Original)
13) Details of construction plants and equipments with the bidder in Form-VII.(Original)
14) Litigation history on Form- VIII.(Original)
15) Letter comprising Bid - Form-IX (Original)
16) Proof of Registration with GST EPF, ESI etc.(As issued by authority)
17) All other documents required for Partnership/Limited/JV firms as described in relevant paras.(Annexures-3 to 5)
18) Any other document required in terms of the Bid document.
19) The bidder shall complete the check list as per Annexure-1 and submit along with other documents.

2.24. The tender shall be submitted in two bid system in accordance with the procedures detailed.

2.25. It is mandatory that each application shall contain the following: -

a. Technical Bid- Proof of tender fee, EMDInformation called for in the "Forms I to IX ." and Declaration I-A, I-B, I-C and audited balance sheets of Bidder / Contractor for immediate last five consecutive financial years, duly certified by Statutory Auditor as prescribed in NIT bid Document, Auditor's report (in case of companies and corporations) and all other Annexures etc. must be digitally signed and uploaded on e-procurement portal.

b.Financial Bid- Must be quoted in excel sheet (or as prescribed) for financial bid on e-tender portal.

2.26. The bidder must submit acknowledgement of Income Tax return submitted online along with relevant 26AS for the last 3 years. The demand status as displayed on Income Tax portal is to be Enclosed for verification of Tax demand.

2.27. Bidders are particularly advised to fill and upload the details strictly as per the enclosed forms. Tenders are liable to rejection if relevant details are not furnished in prescribed formats and also Which do not meet the qualification requirement given in the paragraphs that follow. The Bidder may furnish any additional information, along with his application which in his opinion will highlight his capacity to perform.

2.28. Firm should have valid registration in GST (as applicable) and they have to submit attested copies of the registration certificates.Contractor will have to register in labour cess deptt. Within a week of award of the works.

2.29. The contractor whose bid is accepted will also be required to furnish either copy of applicable licenses/ registrations or proof of applying for obtaining labour licenses, registration with EPFO, ESIC and BOCW Welfare Board including provident fund code no. if applicable and also ensure the compliance of aforesaid provisions by the sub-contractors, if any engaged by the contractor for the said work and Programme Chart (Time and Progress) within the period specified in Schedule F.

2.30. Original copy / attested copy of the partnership deed, if it is a partnership firm and notary attested copy of registration certificate / MOA (as registered with registered with registering Authorities), in case of Company and authorized declaration in case of Sole Proprietorship Firm should be submitted with PQ document.

2.31. General Power of Attorney / Special Power of Attorney substantially in format annexed, revalidated & notarized be submitted by firm / bidder in favour of the authorised person/partner who has signed the tender/will sign the agreement as the case may be, the tender Documents with telephone No. and complete postal address. Affidavit as prescribed should be Annexed on non-judicial stamp paper of Rs.100 duly signed by notary.

2.32. The Bidder shall extend his services free of charge, to the representative of the U.P.Jal Nigam (Urban) to visit the project/works from any of his referred project works, if the UPJN desires so. While

Applications are under consideration, Bidders and their representatives, or other interested parties, are advised to refrain from contacting by any means, any personnel or representative on matters related to the applications under consideration.

2.33. The Employer or his authorizedrepresentative, if necessary, will/ may obtain clarification of applications by requesting such information from any or all Bidders in writing. Bidders will not be permitted to change the substance of their applications after submission of tender. Noncompliance with this provision will be a cause of disqualification.

2.34. U.P. Jal Nigam reserves to itself the power to relax non-essential requirements of the bid which do not have impact on eligibility of the bidder.

2.35. The credentials submitted in respect of pre-qualification of the bidder, more particularly that of the lowest evaluated bidder shall be verified before award of work. Any information furnished by the bidder found to be incorrect either immediately or at a later date, suppression of information in forms, statements, enclosure and declarations would render him liable to be blacklisted/disqualified and debarred from tendering of work for UPJN for a period of one year besides forfeiture of his bid security/ security. If such bidder happens to be enlisted contractor of any class in UPJN, his name shall also be removed from, the approved list of contractors.

2.36. On acceptance of the tender, the name of the accredited representative(s) of the contractor who would be responsible for taking instructions from the Engineer shall be communicated in writing to the Engineer.

2.37.1 Performance Guarantee/Security Deposit/Additional Performance Guarantee: the performance guarantee @10% of the contract cost will have to be submitted at the time of signing the contract in the form of FDR/ Bank Guarantee from any scheduled commercial Bank Guarantee from any scheduled commercial Bank Alternatively on request of the contractor/firm, 5% of the performance Guarantee will be accepted at the time of signing of contract and rest 5% may be deducted from the initial running bill in a single deduction or at the rate of minimum 10% of the gross bill amount of running bill. However, in any case whole amount of balance performance guarantee shall be deducted within oneyear.

Additional Performance Security-

Works for which the cost of the tender received is more than 10% below the estimated cost of works, in such situation, the performance security for first 10% below shall be 10% thereafter, additional performance security @ 0.50% for each 1 % further below than 10% shall be deposited by the firm in order to safeguard against contractor leaving the works.

2.37.2. The Bank Guarantee shall be in a prescribed form (Annexure-7). Such bank guarantee should be verifiable &encash able from the branch situated in the city where Divisional Office is situated.

2.37.3. The earnest money deposited along with bid shall be returned after receiving the aforesaid performance guarantee. In case the contractor fails to deposit the said performance guarantee within the period as indicated in Schedule 'F' including the extended period if any, the Earnest Money deposited by the contractor shall be forfeited automatically without any notice to the contractor.

2.37.4.In order to safe guard against contractors leaving the works after quoting very low rates below the S.O.R. additional performance security have to be deposited by the contractors as per 2.37.1This additional performance security shall also be in the format prescribed for performance guarantee.

2.38. Contractor shall not divert any advance payments or part thereof for any other purpose other than needed for completion of the contracted work. All advance payments received as per terms of thecontract (i.e. mobilization advance, secured advance against materials brought at site and / or for work done during interim stages, etc.) are required to be re-invested in the contracted work to ensure advance availability of resources in terms of materials, labour, plant & machinery needed for required pace of progress for timely completion of work.

2.39. The contractor shall obtain all mandatory approval and No Objection Certificate/ Consent for Establishment from local body authorities like local Fire department, local ground water Authority, water way authorities, local electricity supply authority, local pollution control board, Forest, U.P. Jal Nigam (Urban), Environmental clearance, Lift inspectorate, Central Electricity Authority, Airport

Authority of India (AAI) etc., HoweverU.P. Jal Nigam (Urban) will assist the contractor to obtain clearances by way of correspondence.

2.40. The statutory payments or fees made to local/statutory bodies shall be reimbursed by on production of proof of such payments.

- **Note: - Price Bid**
- **The scope of work includes capital works and O&M works. For capital works BOQ is uploaded on e-tender portal whereas for O&M works the bill of quantities is mention under schedule H of bid document**
- **2. The rates quoted by the bidder for capital works (% above/below) shall be applicable for O&M the bidders are requested to take cognizance of the departmental rates for O&M mentioned in schedule H while quoting the rates for capital works.**

CHAPTER -3

ELIGIBILITY CRITERIA AND INFORMATION REQUIRED TO BE FURNISHED BY THE BIDDERS

The qualification information is required to be furnished in the enclosed forms. The Bidders should have following minimum qualifying requirements.

3.1 ELIGIBILITY REQUIREMENTS: Minimum requirements for pre-qualification are asfollows:

a) Turnover: The average audited annual turnover on construction works of the bidder during the immediate last three consecutive financial years should be at least 30% of the cost of work put to tender.

b)Solvency Certificate: Solvency Certificate of minimum 40% of the tender value will be required to be submitted.The bidder must maintain his solvency till completion of project.

• Solvency Certificate issued by any Scheduled Commercial Bank shall be accepted, which will be valid for a period of one year from the date of issue Unless otherwise mentioned.

or

• Solvency Certificate issued by District Magistrate will also be accepted, which will have a validity of one year from date of issue unless otherwise mentioned.

c)Net Worth: The firm should have positive net worth in the immediate last financial year and the same should be certified by Statutory Auditor. Further, net worth of all the partners in a JV should individually be positive.

d) Income Tax: The bidder must submit acknowledgement of Income Tax return submitted online along with relevant 26AS for the last 3 years. The demand status as displayed on Income Tax portal is to be enclosed for verification of Tax demand.

e)Available Bid Capacity: The available bid capacity of the bidder at the expected time of bidding shall be more then the total estimated cost of the work for which the tender is invited.

The available Bid Capacity shall be assessed using following formula:

Assessed Available Bid Capacity

= 2 x A x N – B where,

A= Maximum turnover during the last five financial year (corrected to the current level of value).

N = Stipulated period of execution of the work for which the tender is invited in years.

B= Value of existing commitments to be completed during the execution period of bid

Note: - The minimum Bid capacity of each JV member must be in the ratio of their stake holding in JV and sum of Bid capacity of JV must be more or equal to required Bid Capacity.

f) **Inflation factor for experience on construction work–** The value of experience on construction works / Value of experience shall be brought to current costing level by enhancing the actual values of works at simple rate @ 7% per year calculated **from** the date of completion to the date **of publication of NIT.**

A typical index is givenbelow.

YEAR	**ESCALATION/ENHANCE FACTOR**
YEAR 1	**1.00**
YEAR 2	**1.07**
YEAR 3	**1.14**
YEAR 4	**1.21**
YEAR 5	**1.28**

ELIGIBILITY

Experience

Contractors who inter alia fulfil the following requirements shall be eligible to apply.

Firm should have successfully completed and commissioned similar works during last Ten years as on date of publication of NIT, satisfying either of following: -

i. Three completed, tested and commissioned works each costing not less than the amount equal to 30% of estimated cost put to tender (i.e. Rs. 5665..06Lacs).

or,

ii. Two completed, tested and commissioned works each costing not less than the amount equal to 40% of estimated cost put to tender (i.e. Rs7786.04Lacs).

or,

iii. One completed, tested and commissioned works of aggregate cost not less than the amount equal to 60% of estimated cost put to tender (i.e. Rs. 11530.11Lacs).

Similar work shall mean "Completed, tested and commissioned works of Piped Water Supply Scheme and its associated infrastructure works".

Note: -

In Case of turn Key Projects experience of works/components put to tender namely OHT, T/W, Distribution Networks or Water supply project will also be considered accordingly.

The bidder should have experience of work contract, including testing and commissioning successfully in last 10 years as on date of publication of NIT.

The experience in foreign countries of a subsidiary or parent company will also be considered for qualification. In case the company is not registered in India, the experience has to be certified by the respective Embassy office/Apostille (in case of members of Hague Apostille Convention).

The works like SCADA/Automation/I.T. Solutions and construction of electric sub- station can be out sourced/sub-contracted to other firms after approval of Engineer-in charge, but the main contractor will be responsible for the quality of work and its timely completion.

The certificate(s) should be certified by an officer not be low the rank of Executive Engineer/ProjectManagerorequivalent.Alltheperformancecertificatessubmittedshouldbe clear and exhaustive enough to establish similarity with the work under Bid. Ambiguous Performance Certificates will not be considered for evaluation.

3.3 PERSONNEL CAPABILITIES: The Bidders must have qualified employed personnel to fill the following positions. The Bidders shall supply information on a prime candidate and an alternate for each position; both of whom shall meet the minimum experience requirements specified below:

Sl. No.	Position	Recommended Number	Total Experience (Years)	Experience in Similar Position	Minimum Qualification
Site Posting in accordance with mutually agreed work plan					

1	Graduate Engineer	1	5	1	B.E. (Civil)
2	Diploma Engineer	2	5	1	Diploma (Civil)
3	Graduate Engineer	1	5	1	BE(E&M)
4	Diploma Engineer	1	5	1	Diploma (Electrical)
5	Diploma Engineer	1	5	1	Diploma (Mechanical)
6	Diploma Engineer	1	5	1	Diploma (Scada Expert)

The requisite information shall be furnished in Form - V

3.4 **EQUIPMENT CAPABILITIES:** The Bidders should own or have assured access (through Hire, Lease, Purchase Agreement, availability of manufacturing equipment's or other means) to the equipment/machines listed here under and in full working order and must demonstrate that based on known commitments, they will be available for use in the proposed Contract. The Bidders may also list additional equipment's that they would propose for the Contract together with an explanation of the Proposal.

Form-VII

Sl. No.	EQUIPMENTS	MINIMUM REQUIREMENT
1	Vibrators (Needle Type)	2
2	Compression testing machine	5
3	Slump test apparatus	1
4	Steel tape	1
5	Sieve set for coarse aggregate	2
6	Sieve set for fine aggregate	1
7	Cube moulds	1
8	Jar for silt test	8
9	Vernier calliper	1
10	Precision levelling instrument with staff	1
11	Water tanker	1
12	Tractor with trolley	1
13	Winch machine for lifting the concrete	1
14	Pump set for pumping of water for curing	1
15	Hydraulic testing machine for sectional testing -	1

3.5 **LITIGATION HISTORY**: The Bidders shall provide accurate information on any litigation orarbitration resulting from Contracts completed or under its execution over the last 5 years in Form VIII.

Participation of Joint Venture (JV) Firms:

1) Eligibility for JV/Consortium-Eligibility for a JV/Consortium shall be as per Clause 2.20.2. The JV/Consortium shall fulfill following requirements.

2) The maximum number of members in a JV shall be limited to Two. Foreign companies can be part of Joint Venture.
3) All Joint Ventures partners should comply with Government guidelines regarding entity being registered under any Laws of India.
4) Separate identity/name shall be given to the Joint Venture firm.
5) A member of JV firm shall not be permitted to participate either in individual capacity or as a member of another JV firm in the same tender.
6) The tender form shall be purchased and submitted only in the name of the JV firm and not in the name of any constituent member.
7) A copy of irrevocable Joint Bidding Agreement (JBA) executed by the JV members shall be submitted by the JV firm along with the tender. The complete details of the members of the JV firm, their share and responsibility in the JV firm etc. particularly with reference to financial, technical and otherobligations shall be furnished in the JBA. (The JBA format is at Annexure-3).
8) After the contract is awarded, the constitution of JV firm shall not be allowed to be altered during the currency of contract except when modification become inevitable due to succession laws etc and in any case the minimum eligibility criteria should not get vitiated. However, the Lead Member should continue to be the Lead member of the JV firm. Failure to observe this stipulation shall be deemed to be breach of contract with all consequential penal action as per contract conditions.
9) On award of contract to a JV firm, a single performance Guarantee shall be submitted by the JV firm as per tender conditions. All the Guarantees like Performance Guarantee, Bank Guarantee for Mobilization Advance etc. shall be accepted only in the name of the JV firm and no splitting of guarantees amongst the members of the JV firm shall be permitted. Separate PanCard and GST no.for JV firm should be submitted along with joint bank account no.for receiving payments.
10) The joint bidding agreement shall have, inter-alia, following clauses:
11) Joint and several liabilities – Members of the JV firm to which the contract is awarded, shall be jointly and severally liable to the Employer for execution of the project in accordance with General and Special conditions of the contract. The JV members shall also be liable jointly and severally for the loss, damages caused to the Employer during the course of execution of the contract or due to non-execution of the contract or part thereof.
12) Duration of the Joint Bidding Agreement – It shall be valid during the entire currency of the contract including the period of extension, if any and the defect liability period after the work is completed and handed over.
13) Governing Laws – The Joint Bidding Agreement shall in all respect be governed by and interpreted in accordance with Indian Laws.
14) Lead Member –The authorization for lead member shall be evidenced by submitting a power of Attorney signed by legally authorized signatories of all the members as per format provided in the Bid Documents. Change of the lead Member will not be allowed under any circumstances. Role of lead member shall be on behalf of the Joint Venture firm to deal with the tender, sign the agreement or enter into contract in respect of the said tender, , to witness joint measurement of work done, to sign measurement books and similar such action in respect of the said tender/contract. All notices/correspondences with respect to the contract would be sent only to this lead member of the JV firm.
15) No member of the Joint Venture firm shall have the right to assign or transfer the interest, right or liability in the contract without the written consent of the other members and that of the Employer in respect of the said tender/contract.
16) Memorandum & Articles of Association: The Members undertake that if Memorandum of Agreement (MoA) & Articles of Association (AoA) of Firm is inconsistence with provisions of JV Agreement, then the MoA&AoA shall be amended accordingly.

Documents to be enclosed by the JV firm along with the tender:

1) The JV shall nominate a Representative through Power of Attorney as per Annexure-5 who shall have the authority to conduct all business for and on behalf of and all the Parties of the JV during the bidding process and, in the event of JV being awarded the contract, during contract execution.
2) Submit Power of Attorney by individual partners to lead partner as per Annexure -4
3) In case one or more of the members of the JV firm is/are partnership firm(s), following documents shall be submitted:

4) Notary certified copy of the Partnership Deed,

5) Consent of all the partners to enter into the Joint Bidding Agreement on a stamp paper of appropriate value (in original).
6) Power of Attorney (duly registered as per prevailing law) in favour of one of the partners of the partnership firm to sign the JV Agreement on behalf of the partnership firm and create liability against the firm.
7) In case one or more members is/are Proprietary Firm or HUF, the following documents shall be enclosed:
8) Affidavit on Stamp Paper of appropriate value declaring that his/her Concern is a Proprietary Concern and he/she is sole proprietor of the Concern OR he/she is in position of "KARTA' of Hindu Undivided Family (HUF) and he/she has the authority, power and consent given by other partners to act on behalf of HUF.
9) In case one or more members is/are limited companies, the following documents shall be submitted:
10) Notary certified copy of resolutions of the Directors of the Company (Board of Directors) permitting the company to enter into a JV agreement, authorizing MD or one of the Directors or Managers of the Company to sign JV Agreement, such other documents required to be signed on behalf of the Company and enter into liability against the company and/or do any other act on behalf of the company.
11) Notary certified copy of Memorandum and Articles of Association of the Company.
12) Power of Attorney (duly registered as per prevailing law) by the Company authorizing the person to do/act mentioned in the Para e (i) above. Annexure-5.
13) All the members of the JV shall individually certify that they or their know partners/directors are not black listed or debarred by UP JAL NIGAM or any other Ministry/U.P. Jal Nigam of the Govt. of India/State Govt./Govt. Undertakings etc. from participation in tenders/contract on the date of opening of bids either in their individual capacity as members of the JV or the JV firm in which they were/are members.

3.7 CONFLICT OF INTEREST:

The Bidder shall not be one of the following:

3.7.1 Bidder (or any constituent thereof) and any other Bidder (or any constituent thereof) have common controlling shareholders/ directors.

3.7.2 A Firm or an Organization which has been engaged by the Employer to provide consulting services for preparation related to procurement for or implementation of this Project;

3.7.3 No Engineer of Gazetted rank or other gazetted officer employed in Engineering or Administrative duties in an Engineering deptt. Of the State/ Central government is Allowed to work as a contractor for a period of two years after his retirement from govt. services without government permission. This contract is liable to be cancelled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of the government as aforesaid before submission of the tender or engagement in the contractor's service.

3.7.4 A contractor black listed/debarred by any Govt. body shall not be eligible to bid.

3.8 UPDATING PREQUALIFICATION INFORMATION:

The Bidders shall be required to update the financial information/capability used for pre-qualification at the time of submitting their Bids and to ensure their continued compliance with the qualification criteria. A Bid shall be rejected if the Bidder's pre-qualification thresholds are no longer met at the time of issuing letter of acceptance (LOA).

3.9

3.9.1 GENERAL

I. Only Bidders who have been pre-qualified under this procedure will have their Financial Bids opened.

Ii. A Firm can submit only one Bid for the Contract. If a Firm submits more than one Bid, allbids which include that firm will be rejected.

3.9.2 BID SECURITY/EARNEST MONEY/BID VALIDITY:

- EMD will be 2% for works up to Rs 5.00 Cr. and 1% or Rs 10.00 Lac whichever is higher for works above5.00Cr.

- EMD shall be paid through RTGS/ FDR/Bank Guarantee issued by any scheduled commercial Bank.
- Validity of BG will be at least 65 days beyond the validity of Tender. This Bank Guarantee must be in the prescribed format given in Annexure-6 of tender document.
- In case of JV Earnest money may be submitted by lead partner/JV.
- The RTGS component of earnest money shall be deposited in the account of Executive Engineer,
- Construction Division, UP Jal Nigam (Urban), Meerut only by **RTGS/NEFT in Axis Bank, Shivaji road, Meerut A/c No. 917010061987739 IFSC CodeUTIB0003339..**
- The bidder shall deposit tender fees and earnest money separately in account mentioned as above. Further he shall upload digitally signed copies of original receipts of bank showing clearly the above details and / other Bank Guarantee.
- In case EMD is submitted in the form of Bank Guarantee, bidder should ensure that such Original Bank Guarantee is mandatorily deposited in the office of under signed on the day of scheduled date (during office hours) of opening of Technical Bid, either in person or by Speed Post and duly pledged in the favour of tender inviting authority, unless otherwise mentioned. The liability for timely submission shall lie with the Bidder, U.P. Jal Nigam (Urban) shall not be responsible for delay on account of any reason what so ever.
- Subject to limit as described in foregoing para, EMD may also be submitted in the form of CDR/FDR issued by a scheduled commercial bank and duly pledged inthe favour of tender inviting authority, unless otherwise mentioned. It is made clear that Tender Fee and Earnes tMoney deposited in any other form besides as mentioned above sub-paras shall render the bidnon-responsive.
- In case of JV the EMD should be in the name / from the account of JV or lead partner as specified in the JV agreement.

3.9.3. All the Bank Guarantees submitted to wards EMD/Performance Security/Additional Performance Security should be verifiable and encash able from a branch situated in a city where the office of Divisional Officer islocated.

3.9.4. All the documents as specified in the technical bid/eligibilitybid document should be uploaded within the period of bid submission. U.P. Jai Nigam (Urban) will not be liable for incomplete/inaccurate/non-submission of bid for any reason what so ever including technical reasons. It is made clear that separate submission of originals of any documents (except Bank Guarantee) other than scanning and uploading them, are not required, unless called for, after opening of financial bid.

3.9.5. The bid submission shall be come in valid if:

The bidder is found ineligible.

The bidder does not upload all the documents as stipulated in the bid document.

If any discrepancy is noticed between uploaded documents and originals / hard copies submitted later.

If subsequent to due date of submission of bid and/or after its submission bidder makes any further communication/ representation with regard to the bid (whether technical or financial) than otherwise called for by the undersigned as aclarification.

If a bidder does not quote any percentage above / below / par on the total amount of the tender or any section / sub head in percentage rate tender. Further the tender will not be as lowest bid.

Conditional tenders or Tenders without e-tender document fee & earnest money or invalid earnest money shall be summarily rejected.

a. The Bid Security/EMD shall be deposited only by mechanism of as outlined in NIT.

2. Tender Fee and EMD must be submitted by the bidder out of his own resources else his bid shall be disqualified.
   a. Any bid not uploaded with valid proof of deposit of Earnest Money and required tender fee, shall be rejected forthwith by the Employer as non-responsive. The bidder shall not have any claim in this regard.
   3. iii.The Earnest Money of unsuccessful bidders will be returned soon after approval of technical bid by the competent authority and latest on or before the 30th day after award of the contract.
   4. iv.The Earnest Money of the successful Bidder will be discharged when the Bidder has signed the Agreement and furnished the required Performance Security.

5. v.The Bid shall be kept valid for 120 days from last date of submission of bid. A bid valid for a shorter period shall be rejected by the Employer as non-responsive.
6. vi. In exceptional circumstances, prior to expiry of the original time limit, the Employermay request that the bidders may extend the period of validity for a specified additional period. The request and the bidders' responses shall be made in writing. A bidder may refuse the request without forfeiting his Earnest Money.

3.9.3 The Employer reserves the right to:

i. Amend the scope and value of any Contract to be Bid, in which event the Contract will only be Bid among those pre-qualified Bidders who meet the requirements of the Contract as amended;
ii. Reject or accept any application/bid; and
iii. Cancel the pre-qualification process and reject all Applications/bids.
iv. Cancel the entire bid process.
v. The Employer shall neither be liable for any such actions nor be under any obligation to inform the Bidder of the grounds for them.

3.9.4

i. The Bidder will be advised by the Employer or his representative in writing or by fax/e-Mail/SMS, within 90 days of the date for submission of bids, of the result of their application and of the names of the pre-qualified Bidders without being assigned any reason for the Employer's decision.
ii. If the Bidder feels that technical credentials of his own or other Bidders have been Wrongly evaluated/ verified, he may raise objections within 2 (Two) working days from the date of uploading of result. Opening of financial bid will be scheduled accordingly. No requests/objections shall be entertained beyond above limit, else it may be treated as an obstruction in tender process and shall be dealt with accordingly.

3.9.5 The Employer reserves the right to verify and seek clarification of the information furnished by any/all Bidders to make an informed decision.

3.10 QUALIFIED BIDDERS:

U.P. Jal Nigam (Urban) will decide which Bidders are qualified and will inform them through e-tender portal. Qualified contractors will be given an invitation to participate in opening of Financial Bid of the tender at the date and time to be specified in the intimation. This information will be disseminated on e-tender portal.

3.11 Even though the Bidders are pre-qualified, they are subject to be disqualified if they have:

3.11.1 Made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements, and/or

3.11.2 Participated in the previous bidding for the same work and had quoted unreasonably high/low bid prices and could not furnish rational justification to the Employer.

and/or

3.11.3 Record of past poor performance such as abandoning the work, not properly completingthe contract, inordinate delays in completion, or financial failures, etc.

3.11.4 The bidder's litigation history will be examined and if the Employer, in its opinion, finds the litigation history against the interest of work, such bidder/bidders may be disqualified.

CHAPTER-4

EVALUATION AND QUALIFICATION PROCEDURE

4.1. Evaluation criterion of applications for pre-qualification:

The pre-qualification document shall be examined to ascertain whether the applications:

I. Fulfil responsiveness criteria of the Bid i.e. deposit/uploading of proof of earnest moneyDeposit, tender fees, standard affidavit in prescribed form 'I-C'.

II. Meet the eligibility requirements,

III. Have been properly prepared & signed,

IV. Contain all the details called for and are in proper format.

Assessment of the firms who have applied for the pre-qualification, will also include the following items:

Submission of the bidders will be evaluated in detail in the second stage, regarding following factors.

1. Financial status of the firm including annual turnover, solvency, net worth, and works in hand, financial arrangements proposed viz. own resources/bank credits etc.
2. 2. Resources of the firm in respect of personnel, equipment and plants.
3. 3. The experience of the firms for works of similar nature.

4.2. The bidder should state in detail about the contracts where delay has occurred, the Period of delay and the reasons thereof. Details of works that have been abandoned for reasons whatsoever should also be furnished. In case the bidder or any known partners were ever black listed the same should be indicated.

4.3. Qualified bidders will be called for opening of financial bid.

4.3.1. U.P. Jal Nigam, however, reserves the right to restrict the list of such qualified Contractors to any number deemed suitable by it.

4.4. Examination of Bids and Determination of Responsiveness:

4.4.1. During the detailed evaluation of “Technical Bids”, the Employer willdetermine whether each Bid (a) meets the eligibility criteria defined in Chapter3; (b) has been properly signed; (c) is accompanied by the required securities; and (d) is substantially responsive to the requirements of the bidding documents. During the detailed evaluation of the “Financial Bids”, the responsiveness of the bids will be further determined with respect to the remaining bid conditions, i.e., priced bill of quantities, technical specifications and drawings.

4.4.2. A substantially responsive “Financial Bid” is one that conforms to all the terms, conditions, and specifications of the bidding documents, without materialdeviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works;

(b) which limits in any substantial way, inconsistent with the bidding documents, the Employer’s rights or the Bidder’s obligations under the Contract;

or

(c) whose rectification would affect unfairly the competitive Position of other bidders presenting substantially responsive bids.

4.4.3. If a “Financial Bid” is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or Withdrawal of the nonconforming deviation or reservation.

4.4.4. The conditional bids shall be treated as non-responsive forthwith.

4.5. If the Bid of the successful Bidder is seriously unbalanced in relation to the Engineer’s Estimate of the cost of work to be performed under the contract, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the Employer may require that the amount of the performance security be increased at the expense of the successful Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract. The amount of the increased performance security shall be decided at the sole discretion of the Employer, which shall be final, binding and conclusive on the bidder.

4.6. Stamp duty charges shall be borne by the tenderer as applicable at the time of award of The contract. The contract agreement will be executed on non judicial stamp paper of the value of Rs. 100/- along with Rs. 2/- Revenue stamp.

CHAPTER-5

PREPARATION & SUBMISSION OF e-Bids

(For guidance purposes only. The Bidder is advised to familiarize himself with Terms and Conditions of NIT, Bid document and process of bid submission on e-tender portal on their own. U.P. Jal Nigam bears no responsibility for incorrect submission of bid. The procurement portal is updated continuously therefore the bidder must keep himself updated .)

4.1. Documents Constituting the e-Bid

The e-Bids prepared by the Bidder shall comprise the following components: e-Bids will comprise of:

a)Technical proposal submission forms

b)Financial proposal submission forms

4.2. Documents Establishing Bidder's Qualification

The Bidder shall furnish, as part of Technical Proposal, documents establishing the qualification to perform the Contract. The documentary evidence in support of the information furnished should be submitted by the Bidder electronically in the PDF format. The Bidder's eligibility criteria and selection procedure are defined in previous Chapters.

4.3. Format and Signing of e-Bids

The Bidder shall prepare one electronic copy for the e-Bids.

All the pages/ documents of the e-Bid shall also be signed manually by the person authorized to sign the e-Bids before converting them into PDF and uploading them as bidding documents. If for some reason the uploaded documents/files are corrupted/ not able to be opened after downloading, its responsibility shall lie with the Bidder only.

4.4. Submission of e-Bids:

The e-Bid Submission module of e-tender portal "http://etender.up.nic.in" enables the Biddersto submit the e-Bid online against the e-tender published by U.P. Jal Nigam. Bid Submission can be done only from the Bid Submission start date and time till the e-Bid Submission end date and time given in the e-Bid. Bidders should start the Bid Submission process well in advance so that they can submit their e-Bid in time. The Bidders should submit their Bids considering the server time displayed in the e-tender portal. This server time is the time by which the Bid submission activity will be allowed till the permissible time on the last/end date of submission indicated in the e-tender schedule. Once the Bid submission date and time is over, the Bidders cannot submit their e-Bid. For delay in submission of e-Bids due to any reasons what so ever, the Bidders shall only be held responsible.

The Bidders are advised to follow the following instructions for submission of their e-Bids:

For participating in e-tender through the e-Biding system, it is necessary for the Bidders to bethe registered users of the e-tender portal https://etender.up.nic.in. For this, the Bidders have to register themselves by depositing appropriate fee in the office of U.P. Electronics Corporation Limited, 10, Ashok Marg, Lucknow-226 001 for getting a valid User ID and password and the Required training/ assistance etc. on e-tender portal http://etender.up.nic.in. The Bidders may contact U.P. Electronics Corporation Limited for further assistance.

In addition to the normal registration, the Bidder has to register with his/her Digital Signature Certificate (DSC) in the e-Biding system and subsequently he/she will be allowed to carry out his/her e-Bids submission activities. Registering the Digital Signature Certificate (DSC) is a onetime activity till its validity. Before proceeding to register his/her DSC, the Bidder should first log on to the e-

Biding system using the User Login option on the home page with the Login Id and Password with which he/ she has registered as enumerated in the preceding paragraph above. For successful registration of DSC on e-Procurement portal http://etender.up.nic.in the Bidder must ensure that he/she should possess Class-2/ Class-3 DSC issued by any one of certifying authorities approved by Controller of Certifying Authorities, U.P. Jal Nigam of India. The Bidder may also apply to office of U.P. Electronics Corporation Limited, (UPLC) for getting DSC at the address given in the preceding paragraph above on a prescribed form available at UPLC's website www.uplc.in along with the payment of fee of Rs 1704/- per person, The Bidder is also advised to register his/her DSC on e-tender portal well in advance before Bid submission end date so that he/she should not face any difficulties while submitting his/her e-Bid against this e-tender. The Bidder can perform User Login registration/creation and DSCregistration exercise as described in preceding paragraphs above even before e-Bid submission date starts. The U P Jal Nigam shall not be held responsible if the Bidder tries to submit his/her e-Bids at the last moment before end date of submission but could not submit due to DSC registration or any other technical problems.

The Bidder can search for active Bids through "Search Active Bids" link, select a Bid in which he/she is interested in and then move it to 'My Bids' folder using the options available in the e-Bid Submission menu. After selecting and viewing the Bid, for which the Bidder intends to e-Bid, from "My Bids" folder, the Bidder can place his/her Bid by clicking "Pay Offline" option available at the end of the view Bid details form. Before this, the Bidder should download the Bid document and study them carefully. The Bidder should keep all the documents ready as per the requirements of e-Bid document in the PDF format.

After clicking the 'Pay Offline' option, the Bidder will be redirected to the Terms and Conditions page. The Bidder should read the Terms & Conditions before proceeding to fill in the Processing Fee offline payment details. After entering and saving the Processing fee details, the Bidder should click "Encrypt & Upload" option given in the offline payment details form so that "Bid Document Preparation and Submission" window appears to upload the required documents Technical Proposal Submission Form etc. of this e-tender document. The details of the Demand Draft or any other accepted instrument which is to be physically sent/submitted in original before/after Bid submission end date and time, should tally with the details available in the scanned copy and the data entered during e-Bid submission time otherwise the e-Bid submitted will not be accepted.

Before uploading, the Bidder has to select the relevant Digital Signature Certificate. He may beprompted to enter the Digital Signature Certificate password, if necessary. For uploading, theBidder should click "Browse" button against each document label in Technicalschedules/packets and then upload the relevant PDF files already prepared and stored in theBidder's computer. The required documents for each document label of Technical. Schedules/packets can be clubbed together to make single different files for each label.

The Bidder should click "Encrypt" next for successfully encrypting and uploading of required documents. During the above process, the Bid documents are digitally signed using the DSC ofthe Bidder and then the documents are encrypted/locked electronically with the DSC's of the Bid openers to ensure that the Bid documents are protected, stored and opened by concerned Bid openers only.

After successful submission of e-Bids, a page giving the summary of e-Bid submission will be displayed confirming end of e-Bid submission process. The Bidder can take a printout of the Bid summary using the "Print" option available in the window as an acknowledgement for future reference.

4.5. Deadline for Submission of e-Bids

E-Bids must be submitted by the Bidders on e-tender portal https://etender.up.nic.in, not laterthan the date and time specified in this e-tender notice document.

The UPJN may extend this deadline for submission of e-Bids by amending the e-tender document, in which case all rights and obligations of the UPJN and Bidders previously subject to the deadline will thereafter be subject to the deadline as extended.

UPJN (U) shall not consider any request for date-extension for e-Bid-submission on account of late downloading of e-tender (RFP) by any prospective Bidder. E-Bids should be uploaded on e-tender portal http://etender.up.nic.in on or before the scheduled date and time.

4.6. Late e-Bids

Theserver time indicated in the Bid Management window on the e-tender portal https://etender.up.nic.in will be the time by which the e-Bids submission activity will beallowed till the permissible date and time scheduled in the e-tender. Once the e-Bids submission date and time is over, the Bidder cannot submit his/ her Bid. Bidder has to start thee-Bid Submission well in advance so that the submission process passes off smoothly. The Bidder only, will be held responsible if his/ her e-Bids are not submitted in time due to any reasons.

4.7. Withdrawal and Resubmission of e-Bids.

At any point of time, a Bidder can withdraw his/ her e-Bids submitted online before the e-Bids submission end date and time (if allowed). For withdrawing, the Bidder should first log in using his/ her Login Id and Password and subsequently by his/ her Digital Signature Certificate on the e-procurement portal https://etender.up.nic.in. The Bidder should then select "My Bids" option in the Bid Submission menu. The page listing all the Bids submitted by the Bidder willbe displayed. Click "View" to see the details of the Bid to be withdrawn. After selecting the "Bid Withdrawal" option, the Bidder has to click "Yes" to the message "Do you want to withdraw this Bid?" displayed in the Bid Information window for the selected Bid. The Bidder also has to enter the Bid Withdrawing reasons and upload the letter giving the reasons for withdrawing before clicking the ”Submit" button. The Bidder has to confirm again by pressing "Ok" button before finally withdrawing his/ her selected Bid. Once the Bidder has withdrawn his /her Bid he/she cannot re-submit this Bid again.

The Bidder can resubmit his/ her e-Bids as and when required till the Bid submission end dateand time. The e-Bids submitted earlier will be replaced by the new one. The payment made by the Bidder earlier will be used for revised e-Bids and the new Bid submission summary generated after the successful submission of the revised e-Bids will be considered for evaluation purposes. For resubmission, the Bidder should first log in using his/ her Login ID and Password and subsequently by his/ her Digital Signature Certificate on the e-procurement portal http://etender.up.nic.in. The Bidder should then select "My Bids" option in the Bid Submission menu. The page listing all the Bids submitted by the Bidder will be displayed. Click "View" to see the details of the Bid to be resubmitted. After selecting the "Bid Resubmission" option, click "Encrypt & Upload" to upload the revised e-Bids documents.

The Bidders can submit their revised Bids as many times as possible by uploading their e-Bids documents within the scheduled date & time for submission of e-Bids.

No e-Bids can be resubmitted subsequently after the deadline for submission of e-Bids.

4.8. Receipt and Opening of e-Bids by the Purchaser/TIA

Bidders are advised to submit their e-bids in `Two-Bid’ system or as applicable with Technical and Financial bids separately on e-tender portal.

Please note that prices should not be quoted in the Technical Bid. The Prices should be quoted in the Financial Bid only. On receipt on e-tender portal, the technical proposals will be opened first.

UPJN (U) will open all e-Bids, in the presence of bidder's authorized representatives who choose to attend at scheduled date and time at designated place. The bidder's representatives who are present shall sign a register evidencing their attendance. In the event of the specified date of e-Bid opening being declared a holiday, the e-Bids shall be opened at the appointed time and place on the next working day. The name of such bidders not meeting the qualification requirement shall be notified subsequently.

After evaluation of technical e-Bids, UPJN shall notify those bidders whose e-Bids were considered non-responsive to the Conditions of the Contract and not meeting the Qualification Requirements indicating that they did not technically qualify for selection. UPJN, through e-bid portal,will simultaneously notify the bidders, whose technical e-Bids were considered acceptable and have been short listed for opening of their financial e-bids.

Note: - Price Bid

1. The scope of work includes capital works and O&M works. For capital works BOQ is uploaded on e-tender portal whereas for O&M works the bill of quantities is mention under schedule H of bid document

2. The rates quoted by the bidder for capital works (% above/below) shall be applicable for O&M the bidders are requested to take cognizance of the departmental rates for O&M mentioned in schedule H while quoting the rates for capital works.

Trial run of 03 months and defect liability period of 12 months for civil work and 24 months for E&M work after completion of successful trial run. All completed and commissioned work shall be handed over to respective ULBs after 03 months successful trial run period.

The scope of work includes capital works and O&M works. For capital works BOQ is uploaded on e-tender portal whereas for O&M works the bill of quantities is mention under schedule H of bid document

The rates quoted by the bidder for capital works (% above/below) shall be applicable for O&M. Bidders are requested to take Cognizance of the departmental rates for O&M mentioned in Schedule – H, while quoting the rates for capital works.

Contract agreement for Capital works shall be signed first. After successful completion, commissioning and trial run and its handing over to ULB, the contract for O&M shall be signed

SECTION-3

ANNEXURE-1

CHECK LIST REQUIRED FOR SUBMISSION OF DOCUMENTS.

Sl. No.	Check Item	Yes/No	Page Nos.	
			From	To
1	Tender Fee			
2	Earnest Money/Bid Security (In case of BG:- as per Annexure-6)			
3				
4	General Information in Form-I			
5	Declaration Form in Form-IA			
6	Declaration on Form - I B. (Affidavit of Bid Validity)			
7	Standard Affidavit on Form- I-C			
8	Financial information in Form- II (A)			
9	Bank Solvency Certificate issued by a prescribed Bank on Form II-B or HaisiyatCertifiateissued by District Magistrate.			
10	List of similar works executed during last 10 years as per Form-III & IIIA. (See Clause 3.1 ITB) *			
11	Details of work which are in progress/awarded/bid have been submitted as on the date of bid submission. Form-IV			
12	Details of technical and administrative personnel with bidder in Form-V			
13	Format for performance report of eligible woks in Form-VI			
14	Details of construction plants and equipments with the bidder in Form-VII			
15	Litigation history on Form- VIII			
16	Letter comprising Bid - Form-IX			
17	Proof of Registration with GST EPF, ESI etc.(As issued by authority).			
19	Income Tax Returns.			
20	Audited Balance sheets as per NIT and ITB			
21	(Partnership Deed, Memorandum of Association and Articles of Association as the case may be)			
22	Any other document required in terms of the Bid document: (Please specify and add lines below)			
23	Financial Bid/BOQ.		NA	NA

* Note- The bidder must fill up following information for works which he considers to be an "eligible work" as per terms of the document. These will be considered while evaluating the Technical Eligibility of the Bidder.

Sl. No.	Name of Work	Value of work done (Rs. Lacs)	Whether completed and commissioned (Yes/No)	Authority by whom Experience Certificate has been issued	Page Nos.	
					From	To
1						
2						
3						

Signature of the Bidder(s)

ANNEXURE-2

INTERGRITY PACT

To,
.....
.....
.....

Sub: NIT No .... for the work ....

Dear Sir,

It is here by declared that UPJN is committed to follow the principle of transparency, equity and competitiveness in public procurement.
The subject Notice Inviting Tender (NIT) is an invitation to offer made on the condition that the Bidder will sign the integrity Agreement, which is an integral part of tender/bid documents, failing which the tenderer/bidder will stand disqualified from the tendering process and the bid of the bidder would be summarily rejected.
This declaration shall form part and parcel of the Integrity Agreement and signing of the same shall be deemed as acceptance and signing of the Integrity Agreement on behalf of the UPJN.

Yours faithfully,

..... Engineer,
.....
U P Jal Nigm, ...

INTEGRITY PACT

To,

..... Engineer,
.....
U P Jal Nigam, ...

Sub: Submission of Tender for the work of . . ..

Dear Sir,

I/We acknowledge that UPJN is committed to follow the principles thereof as enumerated in the Integrity Agreement enclosed with the tender/bid document.
I/We agree that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that I/We will sign the enclosed integrity Agreement, which is an integral part of tender documents, failing which I/We will stand disqualified from the tendering process. We acknowledge that THE MAKING OF THE BID SHALL BE REGARDED AS AN UNCONDITIONAL AND ABSOLUTE ACCEPTANCE of this condition of the NIT.
I/We confirm acceptance and compliance with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by UPJN. I/We acknowledge and accept the duration of the Integrity Agreement, which shall be in the line with Article-1 of the enclosed Integrity Agreement.
I/We acknowledge that in the event of my/our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, UPJN shall have unqualified, absolute and unfettered right to disqualify the tenderer /bidder and reject the tender/bid is accordance with terms and conditions of the tender/ bid.

Yours faithfully

(Duly authorized signatory of the Bidder)
To be signed by the bidder and same signatory competent / authorized to sign the relevant contract.

INTEGRITY AGREEMENT

This Integrity Agreement is made at .... on this ..... day of 20 .....

BETWEEN

UPJN represented through

.....

(Name of Division)

UPJN, ... (Hereinafter referred as the 'Principal/Owner', which expression shall unless repugnant to the meaning or context hereof include it successors and permitted assigns)

AND

.....

(Name and Address of the Individual/firm/Company)

through ..... (Hereinafter referred to as the (Details of duly authorized signatory) "Bidder/Contractor" and which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

Preamble

WHEREAS the Principal/ Owner has floated the Tender (NIT No .....) (hereinafter referred to as "Tender/Bid") and intends to award, under laid down organizational procedure, contract for.....

(Name of work)

hereinafter referred to as the "Contract".

AND WHEREAS the Principal/Owner values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relation with its Bidder(s) and Contractor(s).

AND WHEREAS to meet the purpose aforesaid both the parties have agreed to enter into this Integrity Agreement (hereinafter referred to as "Integrity Pact" or "Pact"), the terms and conditions of which shall also be read as integral part and parcel of the Tender/Bid documents and Contract between the parties.

NOW, THEREFORE, in consideration of mutual covenants contained in this Pact, the parties hereby agree as follows and this Pact witnesses as under:

Article 1: Commitment of the Principal/Owner

(1). The Principal/Owner commits itself to take all measures necessary to prevent corruption and to observe the following principles:

a. No employee of the Principal/Owner, personally or through any of his/her family members, will in connection with the Tender, or the execution of the Contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

b. The Principal/Owner will, during the Tender process, treat all Bidder(s) with equity and reason. The Principal/Owner will, in particular, before and during the Tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/additional information through which the Bidder(s) could obtain an advantage in relation to the Tender process or the Contract execution.

c. The Principal/Owner shall Endeavour to exclude from the Tender process any person, whose conduct in the past has been of biased nature.

(2). If the Principal/Owner obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal code (IPC)/Prevention of Corruption Act, 1988 (PC Act) or is in violation of the principles herein mentioned or if there be a substantive suspicion in this regard, the Principal/Owner will inform the competent authority and in addition can also initiate disciplinary actions as per its internal laid down policies and procedures.

Article 2: Commitment of the Bidder(s)/Contractor(s)

1) It is required that each Bidder/Contractor (including their respective officers, employees and agents) adhere to the highest ethical standards, and report to U.P. Jal Nigam/U.P. Jal Nigam all suspected acts of fraud or corruption or Coercion or Collusion of which it has knowledge or becomes aware, during the tendering process and throughout the negotiation or award of a contract.
2) The Bidder(s)/Contractor(s) commits himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Tender process and during the Contract execution:
3) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal/Owner's employees involved in the Tender process or execution of the Contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the Tender process or during the execution of the Contract.
4) The Bidder(s)/Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to cartelize in the bidding process.
5) The Bidder(s)/Contractor(s) will not commit any offences under the relevant IPC/PC Act. Further the Bidder(s)/ Contract(s) will not use improperly, (for the purpose of competition or personal gain), or pass on to others, any information or documents provided by the Principal/Owner as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
6) The Bidder(s)/Contractor(s) of foreign origin shall disclose the names and addresses of agents/representatives in India, if any. Similarly Bidder(s)/Contractor(s) of Indian Nationality shall disclose names and addresses of foreign agents/representatives, if any. Either the Indian agent on behalf of the foreign principal or the foreign principal directly could bid in a tender but not both. Further, in cases where an agent participate in a tender on behalf of one manufacturer, he shall not be allowed to quote on behalf of another manufacturer along with the first manufacturer in a subsequent/parallel tender for the same item.
7) The Bidder(s)/Contractor(s) will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract.
8) The Bidder(s)/Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.
9) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm indulge in fraudulent practice means a willful misrepresentation or omission of facts or submission of fake/forged documents in order to induce public official to act in reliance thereof, with the purpose of obtaining unjust advantage by or causing damage to justified interest of others and/or to influence the procurement process to the detriment of U.P. Jal Nigam interests.
10) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm use Coercive Practices (means the act of obtaining something, compelling an action or influencing a decision through intimidation, threat or the use of force directly or indirectly, where potential or actual injury may befall upon a person, his/ her reputation or property to influence their participation in the tendering process).

Article 3: Consequences of Breach

1) Without prejudice to any rights that may be available to the Principal/Owner under law or the Contract or its established policies and laid down procedures, the Principal/Owner shall have the following rights in case of breach of this Integrity Pact by the Bidder(s)/Contractor(s) and the Bidder/ Contractor accepts and undertakes to respect and uphold the Principal/Owner's absolute right:

2) If the Bidder(s)/Contractor(s), either before award or during execution of Contract has committed a transgression through a violation of Article 2 above or in any other form, such as to put his reliability or credibility in question, the Principal/Owner after giving 14 days notice to the contractor shall have powers to disqualify the Bidder(s)/Contractor(s) from the Tender process or terminate/determine the Contract, if already executed or exclude the Bidder/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Principal/Owner. Such exclusion may be forever or for a limited period as decided by the Principal/Owner.
3) Forfeiture of EMD/Performance Guarantee/Security Deposit: If the Principal/Owner has disqualified the Bidder(s) from the Tender process prior to the award of the Contract or terminated/determined the Contract or has accrued the right to terminate/determine the Contract according to Article 3(1), the Principal/Owner apart

from exercising any legal rights that may have accrued to the Principal/Owner, may in its considered opinion forfeit the entire amount of Earnest Money Deposit, Performance Guarantee and Security Deposit of the Bidder /Contractor.

4) Criminal Liability: If the Principal/Owner obtains knowledge of conduct of a Bidder or Contractor, or of an employee or a representative or an associate of a Bidder or Contractor which constitutes corruption within the meaning of IPC Act, or if the Principal/Owner has substantive suspicion in this regard, the Principal/Owner will inform the same to law enforcing agencies for further investigation.

Article 4: Previous Transgression

(1). The Bidder declares that no previous transgressions occurred in the last 5 years with any other Company in any country confirming to the anti corruption approach or with Central U.P. Jal Nigam or State U.P. Jal Nigam or any other Central/State Public Sector Enterprises in India that could justify his exclusion from the Tender process.

(2). If the Bidder makes incorrect statement on this subject, he can be disqualified from the Tender process or action can be taken for banning of business dealings/ holiday listing of the Bidder/Contractor as deemed fit by the Principal/ Owner.

(3). If the Bidder/Contractor can prove that he has resorted I recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal/Owner may, at its own discretion, revoke the exclusion prematurely.

Article 5: Equal Treatment of all Bidders/Contractors/Subcontractors:

(1). The Bidder(s)/Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact. The Bidder/Contractor shall be responsible for any violation(s) of the principles laid down in this agreement/Pact by any of its Subcontractors/sub-vendors.

(2). The Principal/Owner will enter into Pacts on identical terms as this one with al I Bidders and Contractors.

(3). The Principal/Owner will disqualify Bidders, who do not submit, the duly signed Pact between the Principal/ Owner and the bidder, along with the Tender or violate its provisions at any stage of the Tender process, from the Tender process.

Article 6- Duration of the Pact

This Pact begins when both the parties have legally signed it. It expires for the Contractor/Vendor 12 months after the completion of work under the contract or till the continuation of defect liability period, whichever is more and for all other bidders, till the Contract has been awarded. If any claim is made/lodged during the time, the same shall be binding and continue to be valid despite the lapse of this Pacts as specified above, unless it is discharged/determined by the Competent Authority, UPJN.

Article 7- Other Provisions

b. This Pact is subject to Indian Law, place of performance and jurisdiction is the Head quarters of the Division of the Principal/Owner, who has floated the Tender.

(2) Changes and supplements need to be made in writing. Side agreements have not been made.

(3) If the Contractor is a partnership or a consortium, this Pact must be signed by all the partners or by one or more partner holding power of attorney signed by all partners and consortium members. In case of a Company, the Pact must be signed by a representative duly authorized by board resolution.

(4) Should one or several provisions of this Pact turn out to be invalid; the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intensions.

(5) It is agreed term and condition that any dispute or difference arising between the parties with regard to the terms of this Integrity Agreement / Pact, any action taken by the Owner/Principal in accordance with this Integrity Agreement/ Pact or interpretation thereof shall not be subject to arbitration.

Article 8- LEGAL AND PRIOR RIGHTS

All rights and remedies of the parties hereto shall be in addition to all the other legal rights and remedies belonging to such parties under the Contract and/or law and the same shall be deemed to be cumulative and not alternative to such legal rights and remedies aforesaid. For the sake of brevity, both the Parties agree that this Integrity Pact will have precedence over the Tender/Contact documents with regard any of the provisions covered under this Integrity Pact.

IN WITNESS WHEREOF the parties have signed and executed this Integrity Pact at the place and

date first above mentioned in the presence of following witnesses:
..... (For and on behalf of Principal/Owner)
.....(For and on behalf of Bidder/Contractor)
WITNESSES:

1. .... (signature, name and address)

2. . ... (signature, name and address)

ANNEXURE-3

JOINT BIDDING AGREEMENT

(The J.V. Agreement should be made on a Rs.100/- Non-Judicial Stamp paper, purchased in favour of the J.V. firm and there should not be more than six month's time, from the date of purchase of those Non-Judicial papers and execution of the J.V. Agreement, on it)

JOINT BIDDING AGREEMENT

BETWEEN

M/s……. having its registered office at …… (hereafter referred to as ……...) acting as the Lead Partner of the first part.

And

M/s……...having its registered office at …… (hereafter referred to as '……...') in the capacity of a Joint Partner of the other part. **(add for more partners)**

Now, the Joint Venture formed by all the parties i.e. _____ and_____ and ..... will be known as M/s _____ (JV).

The expressions of ……and ……shall whatever the context admits, mean and include their respective legal representatives, successors-in-interest and assigns and shall collectively be referred to as "the Parties" and individually as "the Party"

1. WHEREAS; UP JAL NIGAM has invited bids for …….. (insert name of work and Tender Notice No.)

   ……..…… ……."

   And Whereas, the above parties to the Joint Venture intend to submit bid in the name of the said JV, we M/s……., the lead partner and M/s……..., ..., the Joint Partners herewith sign the above formal JV agreement for registration of the above joint venture viz M/s……. and for entering into contract Agreement with UP JAL NIGAM, the "Employer".
2. NOW, THEREFORE, THE PARTIES AGREE AS FOLLOWS:
   a. The 'Parties' have studied the documents, JV guidelines and have agreed to participate in submitting the 'Tender' jointly;
   b. M/s……., the Lead Partner, shall be the lead member of the JV for all intents and purposes and shall represent the Joint Venture in its dealing with the Employer. The lead member shall be authorized to sign and submit all documents and subsequent clarifications, if any, to the Employer. However, he will not submit any such proposals, clarifications or commitments before securing the written clearance of the other partner(s) which shall be expeditiously given by M/s……. , ..., to M/s……
   c. The lead member shall sign bid documents, submit the bid, sign the agreement or enter into contract in respect of the work awarded, , to witness joint measurement of work done, to sign measurement books and similar such action in respect of the said contract. All notices/correspondences with respect to the contract would be sent only to the lead member of the JV firm.
3. The 'Parties' have resolved that the distribution of share, responsibilities, profits, losses and remuneration shall be as under:

a) Lead Partner's share: ……. %;

Name ……

Responsibilities:

i) ……

ii) …….. .

i) ……

(Technical, Financial & other obligations)
b) Other Joint Venture Partner's share ----------%
Name ……
Responsibilities: i) ……...
ii) …….. .
iii)
(Technical, Financial & other obligations)

4. The constitution of JV firm shall not be altered during the currency of the bid/contract as the case may be except when modification become inevitable due to succession laws etc. provided that the minimum eligibility criteria are not got vitiated. Failure to observe this stipulation shall be deemed to be breach of contract, which will entitle the employer. the UP JAL NIGAM to take all consequential action as per contract conditions. We also undertake that the lead member shall continue to be the lead member during the period of contract.
5. **JOINTAND SEVERAL RESPONSIBILITIES:**
The parties undertake that they shall be jointly and severally liable to the UP JAL NIGAM or his assignees, for satisfactory execution and completion of the Project work in accordance with General and Special conditions of contract. The JV members shall also be liable jointly and severally for the loss, damages that may be caused to the UP JAL NIGAM and during the course of execution of the contract or due to non-execution of the contract or part thereof. The parties solemnly affirm and declare that every possible care will be taken by them for ensuring satisfactory execution and completion of the work awarded under the contract.
6. **ASSIGNMENT AND THIRD PARTIES:**
No member of the Joint Venture firm shall have the right to assign or transfer the interest, right or liability in the contract without the written consent of the other members and that of the Employer (UP JAL NIGAM) in respect of the said tender/contract.
7. **GUARANTEES AND BONDS**
The lead partner shall furnish all bonds/guarantees to the UP JAL NIGAM in the name of J.V. and on behalf of the J.V., which shall be legally binding on all the partners of the J.V.
8. **USE OF MACHINERY, INSTRUMENT, LABOUR FORCE etc.**
For the execution of the respective portions of works, the parties shall make full arrangements to bring the required finance, plants and equipment, materials, manpower and other resources. However, the parties here to undertake that whatever the machinery, instruments, labour force, (including unskilled, skilled, inspectors, Engineer etc.) they possess at the time of entering into Joint Venture Agreement or which subsequently shall come in their possession and if such machinery, instruments, labour force is required for the speedy and efficient execution of any portion of the work, the party/parties having the control over the said machinery, instruments, labour force etc. without having any regard to their share of profit and loss agreed to between the parties in Joint Venture Agreement shall hand over the same which shall be placed at the disposal of the other party actually executing that portion of the work at mutually agreed terms for the purpose of execution of the contract without any hindrance and obstacle.
9. **DURATION OF JOINT BIDDING AGREEMENT:**
It shall be valid during the entire currency of the contract including the period of extension if any and the defect liability period after the work is completed, handed over and Security Deposit is released.
10. **Name and address of the J.V. firm**
(indicate Address, Telephone No. and Fax Numbers of the J.V. firm)
11. **Governing Laws**: The J.V. Agreement shall in all respect be governed by and interpreted in accordance with Indian Laws.

12. We undertake that if Memorandum of Agreement (MoA) & Articles of Association (AoA) of Firm is inconsistence with provisions of JV Agreement, then the MoA&AoA shall be amended accordingly.

Declaration: -

It is to certify that we have not been blacklisted or debarred by UP JAL NIGAM or any other Ministries U.P. Jal Nigam of the Govt of India/State Govt./ Govt. undertakings etc. from participation in tenders/contracts in the past either in our individual capacity or the JV Firm or Partnership firm in which we were members/partners.

Lead Partner
(Name & Address)

Other Partner
(Name & address)

Name & Address of the JV Firm: -

.....

IN WITNESS WHEREOF, THE PARTIES, have executed this J.V. Agreement _____ the day, _____month and _____ year.

For M/s……
……..
…….
……..
(Seal)

For M/s……
……
(Seal)

Witness:

1. ……. (Name & Address……).
2. ……. (Name & Address……).

Place:

Date:

(The J.V. Agreement should be notarized first and thereafter it has to be got registered before the registrar of Companies under Companies Act or before the Registrar/Sub registrar under the relevant Registration Acts)

ANNEXURE-4

FORMAT FOR POWER OF ATTORNEY TO LEAD PARTNER OF JOINT VENTURE (JV)

(To be executed on non-judicial stamp paper of the appropriate value in accordance with relevant stamp Act. The stamp paper to be in the name of the company who is issuing the Power of Attorney)

POWER OF ATTORNEY

Whereas, U P Jal Nigam has invited Tender for the work of .....

Whereas, the members of the Joint Venture comprising of M/s……, M/s……, and ……. are interested in submission of bid for the work …… (insert name of work……. in accordance with the terms and conditions contained in the bidding documents.

Whereas, it is necessary for the members of the Joint Venture to designate one of them as the Lead Partner, with all necessary power and authority to do, for and on behalf of the Joint Venture, all acts, deeds and things as may be necessary in connection with the Joint Venture's bid for the project, as may be necessary in connection the Joint Venture's bid for the project.

NOW THIS POWER OF ATTORNEY WITNESSETH THAT:

We, M/s……., hereby designate M/s……, being one of the partners of the Joint Venture, as the lead partner of the Joint Venture, to do on behalf of the Joint Venture, all or any of the acts, deeds or things necessary or incidental to the Joint Venture's Tender for the contract, including submission of Tender, participating in conferences, responding to queries, submission of information/documents and generally to represent the Joint Venture in all its dealings with the UP JAL NIGAM or any other Government Agency or any person, in connection with the contract for the said work until culmination of the process of Tendering till the contract agreement is entered into with the UP JAL NIGAM and thereafter till the expiry of the defect liability period.

We hereby agree to ratify all acts, deeds and things lawfully done by lead member, our said attorney pursuant to this power of attorney and that all acts deeds and things done by our aforesaid attorney shall and shall always be deemed to have been done by us/ Joint Venture.

Dated this the ……day of……20...

Signature of the attorney

Signature of the attorney is attested

(by the authorised signatory of the company)

……(Signature)

Notes:

(i) To be executed by all the partners individually, in case of a Joint Venture.

(ii) The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required the same should be under common seal affixed in accordance with the required procedure.

(iii) In case of incorporated companies, the common seal of the company has to be embossed on all pages.

…….

(Name in Block letters of Executants)

Seal of Company

Witness 1:	Witness 2:
Name:	Name:
Address:	Address:
Occupation:	Occupation:

ANNEXURE-5

FORMAT FOR POWER OF ATTORNEY FOR AUTHORISED SIGNATORY OF JOINT VENTURE (JV) PARTNERS

POWER OF ATTORNEY*

(To be executed on non-judicial stamp paper of the appropriate value in accordance with relevant stamp Act. The stamp paper to be in the name of the company who is issuing the Power of Attorney.)

Know all men by these present, we …… do hereby constitute, appoint and authorize Mr/Ms……. who is presently employed with us and holding the position of ……..as our attorney, to do in our name and on our behalf, all such acts, deeds and things necessary in connection with or incidental to our bid for the work of including signing and submission of all documents and providing information/ responses to UP JAL NIGAM representing us in all matters, dealing UP JAL NIGAM in all matters in connection with our Tender for the said project.

We hereby agree to ratify all acts, deeds and things lawfully done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall and shall always be deemed to have been done by us.

Dated this the ……day of……201...

Signature of the attorney
(Signature of the attorney is attested by the authorised signatory)

(Signature of authorized signatory of the company)
……..
(Signature and Name in Block letters of Signatory)
Seal of Company

Witness:

Witness 1:	Witness 2:
Name:	Name:
Address:	Address:
Occupation:	Occupation:

Notes:

(i) To be executed by all the partners individually, in case of a Joint Venture.

(ii) The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required the same should be under common seal affixed in accordance with the required procedure.

(iii) In case of incorporated companies, the common seal of the company has to be embossed on all pages

ANNEXURE-6

Form of Bid Security/Earnest Money Deposit

(Bank Guarantee Bond)

Ref.....Date..... Bank Guarantee No:

In accordance with Notice Inviting Tender (NIT) No._____ Date
d
_____ for invited by ..... U. P. Jal Nigam ..... [herein after referred
to as the "Nigam"] M/s _____ Address
_____
[Hereinafter referred to as Tenderer (s)] wish /wishes to participate in the said tender and a Bank Guarantee for the sum of Rs._____ _____ valid for a period of [Rupees
120 days (in words) is required to be submitted by the Tenderer towards the Bid Security/Earnest Money Deposit.

AND WHEREAS the Bank has accordingly at the request of the said Tenderer agreed to furnish this guarantee.

NOW THIS DEED WITNESSES AS FOLLOWS:

1. In consideration of Rs (Rupees only)

2. The Bank shall pay to the Nigam on demand the sum under the clause above without demur and withoutrequiring the Nigam to invoke any legal remedy that may be available to it, it being understood and agreed FIRSTLY that the Nigam shall be the sole judge of and as to whether the said Tenderer have committed breach, if any, of the terms and conditions of the said Tender and the extent of losses, damages, costs, charges and expenses caused to or suffered by or that may be caused to or suffered by the Nigam from time to time shall be final and binding on the Bank and SECONDLY that the right of the Nigam to recover from the Bank any amount under this Guarantee shall not be affected or suspended by reason of the fact that anydispute or disputes have been raised by the said Tenderer with regard to their liability or the proceedings are pending before any Tribunal, Arbitrator(s) or Court with regard thereto or in connection therewith, and THIRDLY that the Bank shall immediately pay the sum under clause to the Nigam on demand and it shall not be open to the Bank to know the reasons of or to investigate or to go into the merits of the demand or to question or to challenge the demand or to know any facts affecting the demand, and LASTLY that it shall not be open to the Bank to require proof of the liability of the said Tenderer to pay the amount before paying the sum demanded under clause above.

3. This guarantee is in addition to and not in substitution for any other guarantee executed by the Bank in favour of the Nigam on behalf of the said Tenderer.

4. The said Tenderer and the Nigam will be at liberty to vary and modify the terms and conditions of the said Tender without affecting this guarantee notice of which modification to the Bank hereby waived.

5. This guarantee shall not be affected by any change in the constitution of the bank or of the said Tenderer nor shall the guarantee be affected by any change in the constitution of the Nigam or by amalgamation or absorption with any other body corporate and this guarantee will be available to or enforceable by such bodycorporate.

6. The neglect or forbearance of the Nigam in enforcing any payments of moneys, the payment whereof is intended to be hereby secured or the giving of time by the Nigam for the payment thereof shall in no way, release the Bank from its liability under this deed.

7. This guarantee is irrevocable except with the written consent of the Nigam.

8. This guarantee shall come into force from the date hereof and shall remain valid till but if the period of the said Tender is, for any reason, extended and the Tenderer wishes to extend validity of his Tender, upon such extension if the said Tenderer fails to furnish or renew guarantee for the extended period, the Bank shall pay to the Nigam the said sum of Rs or such lesser sum as the Nigam may demand.
9. Notwithstanding anything stated hereinbefore the liability of the Bank under the guarantee is restricted to Rs..... (Rs only). This guarantee shall remain in force upto unless a demandor claim under the guarantee is presented to the Bank in writing within twelve months from the date or expiry all rights of the Nigam under the guarantee shall be forfeited and the Bank shall be released and discharged from all liabilities hereunder.

IN WITNESS WHEREOF

.....day of .....

For.....

(Indicate the name of the Bank)

Note:-Such bank guarantee should be verifiable &enchashable from a branch located in the city where Divisional Office is situated.

SAMPLE FORM-I

GENERAL INFORMATION

All Agencies/firms applying for pre-qualification are requested to complete the information in this form. Nationality information to be provided

1	Name of firm.	
2	Principal Place of business-	
3	Correspondence Address:	
4	Office Telephone:	Mobile:
5	Fax:	E-mail:
6	Place of incorporation/registration: (Attach copy)	Date of incorporation: Registration valid up to:
7	Constitution or Legal status of bidder- a) An individual b) Proprietary firm c) Partnership firm d) Limited company or corporation Another (Pl. specify)	(Attach copy)
8	Power of Attorney of signatory of Bid	(Attach)

Signature of Bidder.

SAMPLE FORM-I A

(EARNEST MONEY)

I / We deposit herewith an Earnest Money for (Rs. in words) ..... in the following form as per Clause 3.9.2 of Instruction to Bidders.

I/We also agree to deposit requisite performance security/ additional performance security/ security deposit as per conditions of this tender document.
The details of deposit of Earnest Money are given below:

Sl. No.	Description	Amount Rs.	Period of Validity	BG No. and Name of Issuing Bank	Remarks

DATE SIGNATURE & SEAL

ADDRESS NAME

SAMPLE FORM-I B

AFFIDAVIT OF BID VALIDITY

IMPORTANT :-

1- This affidavit is to be furnished positively at the time of submitting the tender.

2- The affidavit is to be typed on stamp paper worth Rs. 100/- duly signed and notarized, affixing a revenue stamp of Rs. 2/- only and the expenditure incurred shall be borne by the tenderer.

AFFIDAVIT FORM

Tender invited by …… …… ……

Tender for …… …… …… …… …… ……

……

Tender Notice No.& Date ……

Name of Tenderer …….

…… …… …… ……..…… …… …… …… …… ……...

IN

CONSIDERATION of the U.P. JAL NIGAM having treated the bidder to be an eligible person, whosetender may be considered, the bidder hereby agrees to the conditions that the proposal in response to the above invitation shall not be withdrawn within 120 (One hundred and twenty) days from the date of opening the tender, also to the condition that if, the bidder does withdraw his proposal within the said period, the earnest money deposited by him may be forfeited by the U.P. JAL NIGAM and I/we may, in addition to other actions detailed in bid document, be debarred from tendering for a period of one year reckoned from the date of opening of the tender, as per discretion of the later.

Signed this……day of …… 20...

Signed by: -

(BIDDER)
Signature & Seal

Witness: -

1……

…….

2…….

……

DECLARATION FORM-I C

शपथ–पत्र (STANDARD AFFIDAVIT)

शपथ–पत्र (STANDARD AFFIDAVIT)

(पार्टनरशिप फर्म की दशा में प्रत्येक पार्टनर द्वारा भरा जायेगा)

मैं ..... पुत्र श्री .....

निवासी .....

(स्थायी पता) .....

(अस्थायी पता) ..... का निवासी हूँ।

राजपत्रित अधिकारी द्वारा प्रामणित पासपोर्ट साईज नवीनतम फोटोग्राफ चस्पा किया जाय।

मैं शपथपूर्वक निम्न घोपणा करता हूँ: –

1. मेरे पास पर्याप्त चल और अचल सम्पत्ति है और व्यवसायिक रूप से मैं इस निविदा द्वारा आमंत्रित कार्यो को पूरा करने के लिए सक्षम और समर्थ हूँ । मेरे पास आवश्यक मशीनें और उपकरण आदि भी हैं तथा मुझे इस कार्य का पर्याप्त अनुभव है।
2. उ.प्र.जल निगम द्वारा (कार्य का विवरण लिखा जायें) ..... की निविदा निर्गत की गयी हैं, उसके लिये मै विभाग द्वारा निर्धारित प्रारूप पर निविदा भर रहा हूँ।
3. मेरे द्वारा निविदा में डाली गयी दरों को निविदा खुलने की तिथि से 120 (एक सौ बीस) दिनों तक वैध रखा जायेगा ।
4. मेरे द्वारा दिये जा रहे विभिन्न प्रमाण पत्र जैसे चरित्र प्रमाण पत्र, आयकर प्रमाण पत्र, जी.एस.टी. प्रमाण पत्र, बिड सिक्योरिटी प्रमाण पत्र, सॉल्वेन्सी प्रमाण पत्र, बिड कैपिसिटी प्रमाण पत्र, अनुभव प्रमाण पत्र, टर्न ओवर प्रमाण पत्र (अर्थात Format-I से IX) आदि तथा अन्य सुसंगत अभिलेख आदि अपेक्षित रूप में निविदा प्रपत्र के साथ अपलोड कर दिये गये हैं, जिनकी सत्यता प्रमाणित की जाती है।
5. मेरे विरूद्ध अपराधिक मुकदमों का विवरण निम्न प्रकार है । यहां पूरा विवरण दिया जाये।
   1. मुकदमा नम्बर .....
   2. धारायें .....
   3. थाना .....
   4. जनपद .....
6. न्यायालय (जहां मुकदमा चल रहा है) .....
7. मैं उ.प्र. जल निगम अथवा राज्य सरकार के अन्य विभागों द्वारा ब्लैक लिस्टेड ठेकेदार की श्रेणी में नहीं आता हूँ न ही मुझे किसी विभाग द्वारा डिबार किया गया है। मैं अपराधिक गतिविधियों, माफिया तथा गैंगेस्टर गतिविधियों और संगठित अपराध करने की गतिविधियों और असमाजिक कार्यो आदि में लिप्त नहीं हूँ। मैं माफिया और अपराधी नहीं हूँ। मेरा चाल–चलन, कार्य तथा आचरण उत्तम है।
8. मेरे विरूद्ध जनपद में तथा प्रदेश में कोई भी मुकदमा दर्ज नहीं है।
9. यदि ठेका प्राप्त करने के पश्चात मेरे विरूद्ध माफिया गतिविधियों/असामाजिक गतिविधियों व संगठित अपराधिक गतिविधियों में लिप्त होने के बारे में कोई शिकायत प्रमाणित पायी जाती है, अथवा मेरे द्वारा तकनीकी एवं वित्तीय क्षमता के सम्बन्ध में प्रस्तुत विवरण / प्रमाण पत्र असत्य पाया जाता है, तो सक्षम अधिकारी को यह अधिकार होगा कि वह मेरा ठेका/अनुबंध निरस्त कर दें तथा अनुबन्ध के अन्तर्गत अन्य सुसंगत कार्यवाही करें। इस पर मुझे कोई आपत्ति नहीं होगी।
10. मेरे द्वारा यदि विभाग/राज्य सरकार के विरूद कोई अपराधिक कार्य किया जाता है अथवा सरकारी धन का गबन किया जाता है, तो सक्षम अधिकारी को यह अधिकार होगा कि वह मेरे विरूद्ध अपराधिक मुकदमा सुसंगत धाराओं/ नियमों के अन्तर्गत दर्ज कर दें।
11. मैं अनुबंध की शर्तों के अनुसार समय से पूरी गुणवत्ता के साथ तथा निर्धारित विशिष्टियों के अनुरूप कार्य पूरा करूंगा और विभाग को पूरा सहयोग प्रदान करूंगा।
12. मेरा कार्य एवं आचरण उत्तम हैं।
13. मैं शपथपूर्वक घोपणा करता हूं कि मेरा स्थाई पता और अस्थाई पता निम्न प्रकार है –
    (अ) स्थाई पता (दूरभाप सहित) .....
    .....
    (ब) अस्थाई पता (दूरभाप सहित).....
    .....

(यहां पूरा पता दूरभाष सहित एवं पिन कोड सहित लिखा जायें)

14. मैं शपथपूर्वक घोषणा करता हूं कि उपरोक्त पते पर रहता हूं तथा विभाग द्वारा प्रदान किये गये कार्य के पूरा होने तक मेरे किसी पते में सामान्यत: कोई परिवर्तन नहीं होगा यदि अपरिहार्य परिस्थितियों में किसी पते में परिवर्तन आता है तो इसकी सूचना मैं तत्काल संबंधित प्राधिकृत अधिकारी, और जिला मजिस्ट्रेट/ कलेक्टर को दूंगा।
15. मेरा पैन नं0 ..... है। (आयकर विभाग द्वारा प्रदत्त प्रमाण पत्र संलग्न किया जाये)
16. मेरा आधार संख्या (प्रोपराईटर/पार्टनरशिप फर्मों हेतु).....(आधार कार्ड की स्वसत्यापित प्रति संलग्न की जाय)
17. मेरा जी.एस.टी. पंजीयन संख्या .....है।(पंजीयन प्रमाण पत्र की स्वसत्यापित प्रति संलग्न की जाय)
18. मैं अपनी पूर्ण जानकारी में पूरे होशों हवाश में स्वस्थ चित्त से पूरी सत्यनिष्ठा से तथा स्वेच्छा से यह शपथ–पत्र लिख कर दें रहा हूं । ईश्वर मेरी मद्द करें।

दिनांक :

शपथी का पूरा हस्ताक्षर

पूरा नाम–
पता–

नोट–

1. यह स्वघोषणा शपथ पत्र रू0 100/– (रू0 एक सौ) के स्टाम्प पेपर पर नोटरी द्वारा सत्यापित कराते हुए दिया जायेगा, **तथा शपथ पत्र के समस्त बिन्दुओं को समाहित किया जायेगा, अन्यथा निविदा अस्वीकार की जा सकती है।**
2. असत्य शपथ–पत्र देना एक संगीन और संज्ञेय अपराध है।
3. संबंधित व्यक्ति द्वारा पासपोर्ट साइज का अपना रंगीन फोटोग्राफ, जो राजपत्रित अधिकारी/नोटरी द्वारा प्रमाणित हो, शपथ –पत्र के ऊपर निर्धारित स्थान पर चस्पा किया जायेगा।
4. Bidders from out side the State may translate the above format in English and submit the notarised affidavit, however the contents should remain the same.

FORM-II (A)

FINANCIAL INFORMATION

Details to be furnished duly supported by Audited Balance sheets/profit & loss account for the immediate past 5 (Five) consecutive financial years duly certified by the Statutory Auditor of the firm as submitted by the Bidder to the Income Tax

BANKER

Name of Banker-	
Address of Banker-	
Telephone	Contact name & Title
Fax	Email-

Sl. No.	Particulars	Financial Year				

1	Gross Annual Turnover on Construction works					
2	Profit/Loss					
3	Share Capital/Fixed Assets					
4	Net Worth					
5	Current liabilities: a) Book Cash credit b) Other sundry creditors					
6	Solvency					

Note-

(1) The information provided above shall be certified by the Statutory Auditor of Firm and supported by copies of tax returns.

(2) Permanent Account Number (IT):

(3) Goods& Service Tax Registration Number.

(4) Acknowledgement of Income Tax return: for the last 3 years. (Enclose copies for the Last Three Years)

Signature of Statutory Auditor with Seal. Signature of Bidder

SAMPLE FORM (II-B)

SAMPLE FORMAT FOR SOLVENCY CERTIFICATE ON THE LETTER HEAD OF BANK

No ..... Dated: .....

(On Letter Head of Bank)

This is to certify that M/s /Sri ……. address …… ..... a customer of our bank is/are respectable.

To the best of our knowledge and information he/they is/are are solvent to the extent of Rs. ……. (Rupees ……..). This certificate is issued without any responsibility on the Bank or any of the officers.

(Signature)

of the Bank
Authority

Date : Name of Bank & Seal

Note :

1. Solvency Certificate should be issued only by a scheduled commercial bank.
2. In case of partnership firm, certificate should include names of all partners as recorded with the Bank.
3. Solvency Certificates should be signed, dated and stamped by an authorised signatory of the Bank, else they shall be summarily rejected.

FORM- III

DETAILS OF SIMILAR TYPE OF WORKS COMPLETED (In the same name and style)
DURING LAST 10 YEARS (as on the date of publication of NIT)
(Supported with Form-IIIA)

Sl. No.	Name of Work	Brief Scope of Work	Name of client U.P. Jal Nigam / Employer	Contract Value (Rs. in Lacs)	Scheduled dates of		Actual Date of completion		Litigation/ Arbitration cases pending	Penalties /Liquidated damages imposed, if any	Reasons of delay, if any
					Start of work	Completion of work					

Note: The attested photocopy of the experience certificate of the Engineer-in- charge not below the rank of Executive Engineer/Project Manager or equivalent be appended with the detail. In the absence of these documents, the work would not be considered for eligibility criteria.

Dated signature of Bidder with stamp

SAMPLE FORM-IIIA

DETAILS OF CONTRACTS OF SIMILAR NATURE AND COMPLEXITY

Name of Applicant : …….

Use a separate sheet for each contract-

1	Number of contract:	
2	Name of work:	
3	Country:	
4	Name, address and contact number of employer:	
5	Employer address & phone nos.:	
6	Nature of works and special features relevant to the contract for which the Applicant wishes to	
7	Value in specified currencies at completion, or at date of award for current contracts: • Total Contract Amount : Rs: (Rs in words)	
8	Date of award:	
9	Scheduled Date of completion:	
10	Contract duration (years and months):	
11	Actual Date of Completion:	
12	Penalties/Liquidated Damages imposed if any:	
13	Arbitration awarded/ pending if any: (Provide Details)	

Signature & Seal of
Applicant/Bidder

FORM- IV

INFORMATION ABOUT WORKS UNDER PROGRESS/BIDS SUBMITTED

(A)DETAILS OF WORKS WHICH ARE IN PROGRESS/ AWARDED AS ON THE DATE OF SUBMITTING THIS APPLICATION

Sl No.	Name of work /Place and State	Brief Scope of work	Contract No. and Date	)	Name and Address of Employer	Value of Contract (Rs. in Lacs)	Stipulated date of start & completion	Up to date Physical progress in %age	Value of works remaining to be completed (Rs. in Lacs)	Anticipate date of completion with reasons of delay, if any.

(B)WORKS FOR WHICH BIDS ALREADY SUBMITTED AS ON THE DATE OF SUBMITTING THIS APPLICATION

Sl No.	Description of works	Place & State	Name and Address of Employer		Estimated value of works (Rs. in Lacs)	Stipulated date of Completion	Date when decision is expected	Remarks, if any

Certified that all works (with any organisation and of all categories/types) which have either been awarded to us or are in progress or for which bids have been submitted on the date of bid submission have been included in the details given above and no work has been left out.

Signature of Bidder

SAMPLE FORM - V.

DETAILS OF TECHNICAL & ADMINISTRATIVE PERSONNEL TO BE EMPLOYED FOR THE WORKS

(NIT issuing authority should amend as per requirement of bid)

S. No.	Designation	Total number	Number available for this work	Name	Qualification	Date of Birth	Experience in Yrs.	Remarks
1	2	3	4	5	6	7	8	9
1	Graduate Eng. Civil							
2	Diploma Eng. Civil							
3	Diploma Eng. Electrical							
4	Work Supervisor							
5	Others, specify							

UNDERTAKING:

1.I/we further understand that the decision of Executive Engineer regarding presence/absence of my/our Engineer from the work shall be final and binding upon us.

Signature of Bidder

SAMPLE FORM (VI)

EXPERIENCE OF WORKS

(**Attention:** This certificate shall only be accepted when all the contracted works have been successfully completed and commissioned)

Name of work & location:

Details about works executed:

Estimated cost: (Rs. Lacs) .....

Contract No.:

Contract Value:

Final Contract Value: (Rs. Lacs) .....

Date of start: .....

Dates of completion:

(i) Scheduled date of completion: .....

(ii) Actual date of completion: .....

Amount of compensation levied for delayed completion, if any: - .....

(if levy of compensation not yet decided, it may be mentioned accordingly)

Performance Report: Very Good/Good/Fair/Poor

Dated: Executive Engineer/ Project Manager or Equivalent

(Seal)

Note: - The performance certificate should be clear & exhaustive enough to establish similarity with the work under Bid otherwise such experience certificate shall be ignored for evaluation purpose.

SAMPLE FORM-(VII)

DETAILS OF CONSTRUCTION PLANT AND EQUIPMENT (LIKELY TO BE USED IN CARRYING OUT THE WORK) AVAILABLE WITH THE CONTRACTOR:

S. No	Name of Equipment	Nos.	Capacity	Age /Condition	Owned /Leased	Remarks
1	2	3	4	5	6	7
(a)	Machineries for Earth work.					
1.	Excavators /loaders (Min. 0.3 cum Bucket Capacity)					
2.	Trolley/Tractor (1.5 cum capacity)					
(b)	Machinery for structural concrete and Concrete lining.					
1.	Transit Mixers/Agitator cars of 4 cum capacity.					
2.	Vibrators (Needle and plate)					
3.	Power generating units of adequate capacity					
4.	Diesel Pump Set of 5HP. for dewatering					
(c)	Equipment for field testing					
	Compression testing machine					
1.	Concrete cube moulds 150 x 150 x 150mm					
2.	Slump cones					
3.	Graduated glass cylinder					
4.	Set of sieves for fine aggregate (4.75, 2.36, 1.18 mm &600, 300, 150 micron)					
5.	Weighing scale (Pan Type) with weights					
6.	Auto level					
7.	Measuring Tape 30m/3m					

UNDERTAKING:

1. I/we undertake that above machineries and centering& shuttering material will remain in Good working condition and in useable form throughout the currency of work.
2. I/we further undertake, that if, there is any reduction in the equipment, below the limit required for pre-qualification, I/we will inform competent authority to whom application for pre-qualification is being made, within 3 days of its occurrence and arrange to make it up within another one week, failing which, U.P. Jal Nigam will be free to impose any penalty that it may deem fit, which will be final and binding upon me/us.

Signature of Bidder (s)

SAMPLE FORM - VIII

LITIGATION HISTORY

Name of Bidder:

Date of Award or filing (if in process)	Name of client, cause of litigation, and matter in dispute and name of claimant party	Contract value (Rs. In Lacs)	Disputed amount (Rs. In Lacs)	Actual awarded amount (Rs. In Lacs)	Award For or against Bidder

Bidders shall provide information on the history of the pending vigilance/criminal investigations, litigation or arbitration resulting from contracts executed or under execution during the last five (5) years.

Providing any false or misleading information, or hiding any information, may result in disqualification of the Bidder.

In addition, each of the biddershall certify that they are not debarred from tendering nor blacklisted/removed from the list of enlisted contractors by U.P. Jal Nigam / CPWD/PWD/MES/ OR any Governmment authority.

Signature of
Bidder

SAMPLE FORM-IX

LETTER COMPRISING BID

To,

U.P. Jal Nigam,
(U.P.)
Sir,
Name of Work: - .....

1. Having examined the Press Note, Notice Inviting Tenders and bid document I/ We offer to execute the works described above and remedy any defects therein in conformity with the Conditions of Contract, specifications, drawings, Bill of Quantities and Addenda for percentage rate below/ percentage above/ at par as in the financial bid, as referred to in relevant clauses of Instructions to Bidder.
2. I/We confirm that our bid is according to the term & conditions and specifications laid down in the bid documents. I/we have furnished all information and details necessary for eligibility and have no further pertinent information to supply.
3. I/we also authorize employer or his representative to approach individuals, employers, firms and corporations to verify our competence and general reputation.
4. I/We undertake to commence the works on receiving the Notice to Proceed with work inaccordance with the contract documents.
5. I/We agree to keep the offer in this tender valid for a period of 120 (One hundred and twenty) daysas mentioned in the bid documents and not to modify the whole or any part of it for any reason within the above period. If the tender is withdrawn by me/us for any reason what so ever, the Earnest Money deposited by me/us will be forfeited by the U. P. Jal Nigam and other actions in accordance with bid documents may be taken against me.
6. Further, I/We agree that in case of forfeiture of Earnest Money or Performance Guarantee as aforesaid, I/We shall be debarred for participation in the re-tendering process of the work.
7. I/we hereby distinctly and expressly declare and acknowledge that before the submission of my/our tender I/we have carefully followed the instruction in the tender documents and that I/we have made such examination of the contract documents and of the plans, specifications and quantity, and of the location where the said work is to be done, and such investigation of the work required to be done and in regard to the materials required to be furnished as to enable me/us thoroughly understand the intention of the same and the requirements, covenants, agreements, stipulations and restrictions contained in the contract and in the said plans and specifications and distinctly agree that I/we will not hereafter make any claim or demand upon U.P. Jal Nigam based upon or arising out of any alleged misunderstanding or misconception, mistake on my/our part of the said requirements, stipulations, restrictions and conditions.
8. I understand that quantities given in Bill of Quantities in Schedule 'G' are liable to change up to any extent. I will not demand any compensation/cost on this account.
9. I/we have deposited and uploaded proof of EMD deposit for the work.
10. If my/our tender is not accepted, this sum shall be returned to me/us latest within 30th day of award of contract. If my/our tender is accepted, the earnest money shall be returned to me/us on my/our entering into contract agreement duly furnishing performance/additional performance security deposit. If upon intimation being given to me/us by the U. P. Jal Nigam of performance security/additional performance security deposit defined in Tender Document, I/we fail to deposit the same, then I/we agree to the forfeiture of the earnest money.
11. I/We undertake and confirm that eligible similar work(s) has/have not been got executed throughanother contractor on back to back basis. Further that, if such a violation comes to the notice of U.P. Jal Nigam, then I/We shall be debarred for tendering in future forever. Also, if

such a violation comes to the notice of U.P. Jal Nigam before date of start of work, the Engineer shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee/Additional Performance Guarantee.

12. Any notice required to be served on me/us if delivered to me/us personally or forwarded by post to me/us (registered) or left at my/our address given herein, such notice shall if sent by post, be deemed to have been served on me/us at the time when in due course of post, it would be delivered at the address to which is sent.
13. I/we fully understand that the written agreement (to be entered into between me/us and the U. P.
    Jal Nigam) shall be the foundation of the rights of both the parties and contract shall not be deemed to be complete until agreement has first been signed by me/us and then by the proper officer authorized to enter into contract on behalf of the U. P. Jal Nigam.
14. I/we understand that you are not bound to accept the lowest or any bid you receive.
15. I/We undertake that neither of our partners/directors have been banned by U.P. Jal Nigam /CPWD/PWD/MES/ OR any Govt. organisation. I/We further declare that no investigating authority has instituted any vigilance enquiry nor there are criminal proceedings against any of our
    partners/directors in any Court of law during the last 5 years from the last date of bid submission.

Encl: As above

Address with phone No. Signature of Contractor/Tenderer

Name-

Dated the …… day of …… 20...

Signature of Witnesses:

Name and address :

SECTION – 4

PART-I

- **CONDITIONS OF CONTRACT**
- **CLAUSES OF CONTRACT**

CONDITIONS OF CONTRACT

Definitions-

1. The contract means the document forming the tender and acceptances thereof and the formal agreement executed between the competent authority on behalf of the Chairman, U P Jal Nigam and the Contractor, together with the documents referred to therein including these conditions, the specifications, designs, drawings and instructions issued from time to time from one contract and shall be complementary to one another.
2. In the contract, the following expressions shall, unless the context otherwise requires have the meanings, hereby respectively assigned to them:-
   i. The expression works or work shall, unless there be something either in the subject or context repugnant to such construction, be construed and taken to mean the works by or by virtue of the contract contracted to be executed whether temporary or permanent, and whether original, altered, substituted or additional.
   ii. The site shall mean the land/or other places on, into or through which work is to be executed under the contract or any adjacent land, path or street through which work is to be executed under the contract or any adjacent land, path or street which may be allotted or used for the purpose of carrying out the contract.
   iii. The Contractor shall mean the individual, firm or company.
   iv. The Engineer-in-Charge means the Engineer/ officer who shall supervise and be in-charge of the work and who shall sign the contract on behalf of the Chairman, U P Jal Nigam as mentioned in Schedule F hereunder.
   v. Excepted Risk are risks due to riots (other than those on account of contractor employees), war (whether declared or not) invasion, act of foreign enemies, hostilities, civil war, rebellion revolution, insurrection, any act of Government, damages from aircraft, acts of God, such as earthquake, lightening and unprecedented floods, and other causes over which the contractor has no control and accepted as such by the Accepting Authority. Provided that the contractor is also to show that he has taken all due precautions to avoid /minimize any adverse effect / damage from the above or causes solely due to use or occupation by Government of the part of the works in respect of which a certificate of completion has been issued.
   vi. Bill of quantity means the price and completed Bill of Quantities form forming part of the Bid as per Schedule "G"
   vii. The Defect Liability Certificate is the certificate issued by Engineer-in-Charge after defect liability period has ended and upon correction of defects by the contractor.
   viii. The Defect Liability Period means a fixed period of time during which the contractor has anexpress contractual right to return to the site to rectify defects. It will be 24 months forCivil Works and 24 (Twenty Four) months for E/M works. The Defect Liability Period will bereckoned after successful completion of work, its commissioning, completion of trial run for a period as specified and handing over of entire work to the authority designated by Engineer-in-
   Charge, in writting.
   ix. The intended completion date is the time intended to complete the work by the contractor.
   x. The start date is as given to the contractor after execution of contract . It is the date whenthe contractor shall commence execution of the works.
   xi. A sub contractor is a person or corporate body who after due permission of Employer has a contract with the contactor to carry out a part of the construction work in the contract, which includes work on the site.
   xii. Temporary works are works designed, constructed, installed and removed by the contractor that are needed for construction or installation of the works.

xiii. Market Rate shall be the rate as decided by the competent authority on the basis of the cost of materials and labour at the site where the work is to be executed plus the percentage mentioned in Schedule F to cover, all overheads and profits.

xiv. Schedule(s) referred to in these conditions shall mean the relevant schedule(s) annexed to the tender papers, with the amendments thereto issued up to date of receipt of the tender.

xv. U.P. Jal Nigam means U P Jal Nigam (UPJN) which invites tenders on behalf of Government ofUttar Pradesh.

xvi. Specifications means the specifications followed by UPJN/ UPPWD/CPWD/BIS.

xvii. Tender value means the value of the entire work as stipulated in the letter of award.

Scope and Performance:

3. Where the context so requires, words imparting the singular only also include the plural and vice versa. Any reference to masculine gender shall whenever required include feminine gender and vice versa.
4. Heading and Marginal notes to these General Conditions of Contract shall not be deemed to formpart thereof or be taken into consideration in the interpretation or construction thereof or of the contract.
5. The contractor shall be furnished, free of cost one certified copy of the contract documents except standard specifications, Schedule of Rates and such other printed and published documents, together with all drawings as may be forming part of the tender papers. None of these documents shall be used for any purpose other than that of this contract.

Works to be carried out:

6. The work to be carried out under the Contract shall, except as otherwise provided under these conditions, all labour, materials, tools, plants, equipment and transport which may be required in preparation of and for and in the full and entire execution and completion of the works. The descriptions given in the Bill of Quantities (Schedule-G) shall unless otherwise stated, be held to include wastage on materials, carriage and cartage, carrying and return of empties, hoisting, setting, fitting and fixing in position and all other labourers necessary in and for the full and entire execution and completion of the work as aforesaid in accordance with good practice and recognized principles.

Sufficiency of Tender:

7. The contractor shall be deemed to have satisfied himself before tendering as to the correctness andsufficiency of his tender for the works and of the rates and prices quoted in the Schedule G, which rates and prices shall, except as otherwise provided, cover all his obligations under the Contract and all matters and things necessary for the proper completion and maintenance of the works.

Discrepancies and adjustment of Errors:

8. The several documents forming the contract are to be taken as mutually explanatory of one another, detailed drawings being followed in preference to small scale drawing and figured dimensions in preference to scale and special conditions in preference to General Conditions.

8.1. In the case of discrepancy between the Bill of Quantities, the Specifications and/or the Drawings, the following order of preference shall be observed:-

a. Description of Bill of Quantities.

b. Particular Specification and Special Condition, if any

c. Drawings.
d. UPJN/UPPWD/ CPHEEO specification.
e. Indian Standard Specifications of B.I.S.

8.2. If there are varying or conflicting provisions made in any one document forming part of the contract, the Accepting Authority shall be the deciding authority with regard to the intention of the document and his decision shall be final and binding on the contractor.

8.3. Any error in description, quantity or rate in Schedule of Quantities/Bill of Quantities of any omission there from shall not vitiate the Contract or release the Contractor from the execution of the whole or any part of the works comprised therein according to drawings and specifications or from any of his obligations under the contract.

Signing of Contract:

9. The successful tenderer /contractor, after submitting the performance guarantee within a period mentioned in letter of acceptance shall attend the office of the Engineer-in-Charge for authentication signing and completion of the contract document and execute the agreement consisting of :-

i. Drawings.
ii. The notice inviting tender, all the documents including drawings, if any, forming thetender as issued at the time of invitation of tender and acceptance thereof together withany correspondence leading thereto.
iii. Standard Forms along with relevant annexure.

CLAUSES OF CONTRACT

Performance Guarantee/ Security Deposit	CLAUSE 1 The performance guarantee @10% of the contract cost will have to be submitted at the time of signing the contract in the form of FDR/ Bank Guarantee from any scheduled commercial Bank, alternatively on request of the contractor/firm, 5% of the performance Guarantee will be accepted at the time of signing of contract and rest 5% may be deducted from the initial running bill in a single deduction or at the rate of minimum 10% of the gross bill amount of running bill. However, in any case whole amount of balance performance guarantee shall be deducted within one year. Additional performance security @ 0.50% for each 1.00% further below than 10% shall be deposited by the firm in order to safeguard against contractor leaving the works. This period can be further extended by the Engineer-in-Charge up to a maximum period as specified in Schedule 'F' on written request of the contractor stating the reason for delays in procuring the Performance Guarantee, to the satisfaction of the Engineer-in-Charge. This guarantee shall be in accordance with the form annexed hereto (Annexure-7). Such bank guarantee should be verifiable & enchashable from a branch located in the city where Divisional Office is situated. In case a fixed deposit receipt of a scheduled commercial Bank is furnished by the contractor to U.P. Jal nigam (urban) as part of the performance guarantee and the Bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to U.P. Jal nigam (urban) to make good the deficit. (i) The Performance Guarantee/Security Deposit shall be initially valid up to the stipulated date of completion plus 60 days beyond that. In case the time for completion of work gets enlarged, the contractor shall get the validity of Performance Guarantee extended to cover such enlarged time for completion of work. This guarantee shall thereafter be continued to be validated upto 60 days beyond the end of defect liability period. After end of the defect liability period as certified by the competent authority the performance guarantee / security deposit shall be returned to the contractor, without any interest. (ii) The Engineer-in-Charge shall not make a claim under the performance guarantee/Security except for amounts to which U.P. Jal nigam (urban) is entitled under the contract (not withstanding and/or without prejudice to any other provisions in the contract agreement) in the event of: a. Failure by the contractor to extend the validity of the Performance Guarantee as described herein above, in which event the Engineer-in-Charge may claim the full amount of the Performance Guarantee. b. Failure by the contractor to pay U.P. Jal nigam (urban) any amount due, either as agreed by the contractor or determined under any of the Clauses/Conditions of the agreement, within 30 days of the service of notice to this effect by Engineer-in-Charge. c. Failure by the contractor to rectify any defects as defined in the defect liability clause in the Schedule F of contract data to the satisfaction of the Engineer-in-Charge. (iii) In the event of the contract being determined or rescinded under provision of any of the Clause/Condition of the agreement, the performance guarantee shall stand

	forfeited in full and shall be absolutely at the disposal of U.P. Jal nigam (urban). (iv) Additional Performance Guarantee: Any additional peformance security deposited by the contractor pursuant to clauses of NIT/ITB shall be returned to the contractor on satisfactory completion of the work as certified by Engineer-in-charge.
Recovery of Security Deposit	**CLAUSE 1 A** The person/persons whose tender(s) may be accepted (hereinafter called the contractor) shall permit U.P. Jal nigam (urban) at the time of making any payment to him for work done under the contract to deduct a sum of 5% of contract value at the rate of 10% of the gross amount in a manner described in Clause-1. Such deductions will be made and held by U.P. Jal nigam (urban) by way of Security Deposit unless he/they has/have deposited the amount of Security at the rate mentioned above in the form of pledged fixed deposit receipts issued by any scheduled commercial bank. In case a fixed deposit receipt is furnished by the contractor to U.P. Jal nigam (urban) as part of the security deposit and the Bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to U.P. Jal nigam (urban) to make good the deficit. All compensations or the other sums of money payable by the contractor under the terms of this contract may be deducted from, or paid by the sale of a sufficient part of his security deposit or from the interest arising therefrom, or from any sums which may be due to or may become due to the contractor by U.P. Jal nigam (urban) on any account whatsoever and in the event of his Security Deposit being reduced by reason of any such deductions or sale as aforesaid, the contractor shall within 10 days make good in pledged fixed deposit receipt tendered by any scheduled commercial bank, or any sum or sums which may have been deducted from, or raised by sale of his security deposit or any part thereof. The security deposit shall be collected from the running bills and the final bill of the contractor at the rates mentioned above. The security deposit as deducted above can also be released against bank guarantee issued by a scheduled commercial bank on its accumulations to a minimum of Rs. 5 lac subject to the condition that amount of such bank guarantee, except last one, shall not be less than Rs. 5 lac. Provided further that the validity of bank guarantee including the one given against the earnest money shall be in conformity with provisions contained in **Clause 17** which shall be extended from time to time depending upon extension of contract granted under provisions of Clause 2 and Clause 5. Such bank guarantee should be verifiable & enchashable from a branch situated in the city where Divisional Office is situated
Compensation for Delay	**CLAUSE 2** If the contractor fails to maintain the required progress in terms of clause 5 or to complete the work and clear the site on or before the contract or justified extended date of completion, as per clause 5 (excluding any extension under Clause 5.5) as well as any extension granted under clauses 12 and 15, he shall, without prejudice to any other right or remedy available under the law to U.P. Jal nigam (urban) on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below as the authority specified in **Schedule 'F'** may decide (whose decision in writing shall be final and binding) on the amount of Tendered Value of the work for every completed day/month (as determined) that the progress remains below that specified in Clause 5 or that the work remains incomplete. This will also apply to items or group of items for which a separate period of completion has been specified.

	(i) Compensation for delay of work — @ 2 % per month of delay to be computed on per day basis on quantum of damage suffered due to stated delay on the part of the contractor. Provided always that the total amount of compensation for delay to be paid under this Condition shall not exceed 10 % of the accepted Tendered Value of work or of the accepted Tendered Value of the Sectional part of work as mentioned in **Schedule 'F'** for which a separate period of completion is originally given. In case no compensation has been decided by the authority in **Schedule 'F'** during the progress of work, this shall be no waiver of right to levy compensation by the said authority if the work remains incomplete on final justified extended date of completion. If the Engineer-in-Charge decides to give further extension of time allowing performance of work beyond the justified extended date, the contractor shall be liable to pay compensation for such extended period. If any variation in amount of contract takes place during such extended period beyond justified extended date and the contractor becomes entitled to additional time under clause 12, the net period for such variation shall be accounted for while deciding the period for levy of compensation. However, during such further extended period beyond the justified extended period, if any delay occurs by events under sub clause 5.2, the contractor shall be liable to pay compensation for such delay. Provided that compensation during the progress of work before the justified extended date of completion for delay under this clause shall be for non-achievement of sectional completion or part handing over of work on stipulated/justified extended date for such part work or if delay affects any other works/services. This is without prejudice to right of action by the Engineer-in-Charge under clause 3 for delay in performance and claim of compensation under that clause. In case action under clause 2 has not been finalized and the work has been determined under clause 3, the right of action under this clause shall remain post determination of contract but levy of compensation shall be for days the progress is behind the schedule on date of determination, as assessed by the authority in **Schedule F**, after due consideration of justified extension. The compensation for delay, if not decided before the determination of contract, shall be decided after of determination of contract. The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with U.P. Jal nigam (urban). In case, the contractor does not achieve a particular milestone mentioned in **Schedule F**, or the re-scheduled milestone(s) in terms of Clause 5.4, the amount shown against that milestone shall be withheld, to be adjusted against the compensation levied as above. With-holding of this amount on failure to achieve a milestone, shall be automatic without any notice to the contractor. However, if the contractor catches up with the progress of work on the subsequent milestone(s), the withheld amount shall be released. In case the contractor fails to make up for the delay in subsequent milestone(s), amount mentioned against each milestone missed subsequently also shall be withheld. However, no interest, whatsoever, shall be payable on such withheld amount.
When Contract can be Determined	**CLAUSE 3** 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 date of completion has or has not elapsed, by notice in writing absolutely determine the contract in any of the following cases: i. If the contractor having been given by the Engineer-in-Charge a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in an inefficient or otherwise improper or un-workman like manner shall omit to comply with the requirement of such notice for a period of seven days thereafter. ii. If the contractor has, without reasonable cause, suspended the progress of the work or has failed to proceed with the work with due diligence and continues to do so after a notice in writing of seven days from the Engineer-in-Charge. iii. If the contractor fails to complete the work or section of work with individual date of completion on or before the stipulated or justified extended date, on or before such date of completion; and the Engineer in Charge without any prejudice to any other right or remedy under any other provision in the contract has given further reasonable time in a notice given in writing in that behalf as either mutually agreed or in absence of such mutual agreement by his own assessment making such time essence of contract and in the opinion of Engineer-in-Charge the contractor will be unable to complete the same or does not complete the same within the period specified. iv. If the contractor 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. v. If the contractor shall offer or give or agree to give to any person in U.P. Jal nigam (urban) 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 U.P. Jal nigam (urban). vi. If the contractor shall enter into a contract with U.P. Jal nigam (urban) in connection with which commission has been paid or agreed to be paid by him or to his knowledge, unless the particulars of any such commission and the terms of payment thereof have been previously disclosed in writing to the Engineer-in-Charge. vii. If the contractor had secured the contract with U.P. Jal nigam (urban) as a result of wrong tendering or other non-bonafide methods of competitive tendering or commits breach of Integrity Agreement. viii. If the contractor 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. ix. If the contractor 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.

x. If the contractor shall suffer an execution being levied on his goods and allow it to be continued for a period of 21 days.

xi. If the contractor assigns, (excluding part(s) of work assigned to other agency(s) by the contractor as per terms of contract), transfers, sublets (engagement of labour on a piece-work basis or of labour with materials not to be incorporated in the work, 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 Engineer -in-Charge.

When the contractor has made himself liable for action under any of the cases aforesaid, the Engineer-in-Charge on behalf of the U.P. Jal nigam (urban) shall have powers:

a) To determine the contract as aforesaid so far as performance of work by the Contractor is concerned (of which determination notice in writing to the contractor under the hand of the Engineer-in-Charge shall be conclusive evidence). Upon such determination, 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 U.P. Jal nigam (urban).

b) After giving notice to the contractor to measure up the work 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 work. The contractor, whose contract is determined as above, shall not be allowed to participate in the tendering process for the balance work including any new items needed to complete the work.

In the event of above courses 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 materials or entered into any engagements or made any advances on account or with a view to the execution of the work 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.

CLAUSE 3A

In case, the work cannot be started due to reasons not within the control of the contractor within 1/8th of the stipulated time for completion of work or one month whichever is more, either party may close the contract by giving notice to the other party stating reasons. In such eventuality, the Performance Guarantee of the contractor shall be refunded within following time limits :

(i)If the Tendered value of work is up to Rs. 1 Crore : 15 days

(ii)If the Tendered value of work is more than Rs. 1Crore and up to Rs. 10 Crore : 21 days.

(iii)If the Tendered value of work exceeds Rs. 10 Crore : 30 days

Neither party shall claim any compensation for such eventuality. This clause is not applicable for any breach of the contract by either party.

Contractor liable to pay Compensation even if action not taken under Clause 3	**CLAUSE 4** In any case in which any of the powers conferred upon the Engineer-in-Charge by Clause-3 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 work/or 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, clerk of the works, foreman or other authorized agent to remove such tools, plant, materials, or stores from the premises (within a time to be specified in such notice) and in the event of the contractor failing to comply with any such requisition, the Engineer-in-Charge may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and his risk in all respects and the certificate of the Engineer-in-Charge as to the expenses of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the contractor.
Time and Extension for Delay	**CLAUSE 5** The time allowed for execution of the Works as specified in the **Schedule 'F'** or the extended time in accordance with these conditions shall be the essence of the Contract. The execution of the works shall commence from such time period as mentioned in **Schedule 'F'** or from the date of handing over of the site notified by the Engineer-in-Charge, whichever is later. If the Contractor commits default in commencing the execution of the work as aforesaid, the performance guarantee shall be forfeited by the Engineer in Charge and shall be absolutely at the disposal of U.P. Jal nigam (urban) without prejudice to any other right or remedy available in law. **5.1** As soon as possible but within 7 (Seven) days of award of work and in consideration of: a) Schedule of handing over of site as specified in the **Schedule 'F'**. The Contractor shall submit a Time and Progress Chart for each mile stone. In case the work is awarded on Trunkey basis wherein the contractor has to submit design and drawings, *it will also include timelines for submission of the same within over all time limit specified in* ***Schedule-F*****.** The Engineers-in-Charge may within 15 working days thereafter, if required, modify and communicate the program approved to the contractor failing which the program submitted by the contractor shall be deemed to be approved by the Engineer-in-Charge. The Chart shall be prepared in direct relation to the time stated in the Contract documents for completion of items of the works. It shall indicate the forecast of the dates of commencement and completion of various trades of sections of the work and may be amended as necessary by agreement between the Engineer-in-Charge and the Contractor within the limitations of time imposed in the

	Contract documents. i. In case of non submission of construction programme by the contractor, the program approved by the Engineer-in-Charge shall be deemed to be final. ii. The approval by the Engineer-in-Charge of such programme shall not relieve the contractor of any of the obligations under the contract. iii. The contractor shall submit the Time and Progress Chart and progress report using the mutually agreed software or in other format decided by Engineer-in-Charge for the work done during previous month to the Engineer-in-charge on or before 5th day of each month failing which a recovery as per **Schedule F** to be decided by the NIT approving authority shall be made on per week or part basis in case of delay in submission of the monthly progress report. b) **Minutes of Meeting:** The Engineer may require the contractor to attend a progress review meeting during execution of work. The Engineer shall record the minutes of the meeting and provide a copy to the Contractor for compliance. These minutes may be a part of evidence in case of any request for extension of time or for action against the contractor. c) **Accelerating the Pace of Work:** The Engineer-in-charge, under some circumstances, may require the contactor to accelerate the pace of work by engaging labour in two shifts (including night shifts). Whenever such a request is made the contractor will cooperate with the Engineer-in-charge by mobilizing additional resources. However the contractor shall neither be entitled for any incentive nor for any additional amount under this or any other clause.
	5.2 If the work(s) be delayed by:- (i) force majeure, or (ii) abnormally bad weather, or (iii) serious loss or damage by fire, or (iv) civil commotion, local commotion of workmen, strike or lockout, affecting any of the trades employed on the work, or (v) delay on the part of other contractors or tradesmen engaged by Engineer-in-Charge in executing work not forming part of the Contract, or (vi) any other cause like above which, in the reasoned opinion of the Engineer-in-Charge is beyond the Contractor's control. then upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the Engineer-in-Charge but shall nevertheless use constantly his best endeavours to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the Engineer-in-Charge to proceed with the works. The contractor shall have no claim of damages for extension of time granted or rescheduling of milestone/s for events listed in sub clause 5.2.

	5.3 In case the work is hindered by U.P. Jal nigam (urban) or any reasons/event for which U.P. Jal nigam (urban) is responsible, the authority as indicated in **Schedule F** shall, if justified, give a fair and reasonable extension of time and reschedule the mile stones for completion of work. Such extension of time or rescheduling of milestone/s shall be without prejudice to any other right or remedy of the parties in contract or in law; provided further that for concurrent delays under this sub clause and sub clause 5.2 to the extent the delay is covered under sub clause 5.2 **the contractor shall be entitled to only extension of time and no damages.**
	5.4 Request for rescheduling of Mile stones or extension of time shall be made by the Contractor in writing within fourteen days of the happening of the event causing delay on the prescribed forms to the authority as indicated in **Schedule F**. The Contractor shall indicate in such a request the period by which rescheduling of milestone/ s or extension of time is desired. With every request for rescheduling of milestones, or if at any time the actual progress of work falls behind the approved programme by more than 10% of the stipulated period of completion of contract, the contractor shall produce a revised programme which shall include all details of pending drawings and decisions required to complete the contract and also the target dates by which these details should be available without causing any delay in execution of the work. A recovery as specified in **Schedule F** shall be made on per day basis in case of delay in submission of the revised programme. **5.4.1** In any such case the authority as indicated in **Schedule 'F'** may give a fair and reasonable extension of time for completion of work or reschedule the mile stones. Such extension or rescheduling of the milestones shall be communicated to the Contractor by the authority as indicated in **Schedule F** in writing. In event of non application by the contractor for extension of time Engineer-in-Charge after affording opportunity to the contractor, may give, supported with a programme (as specified under 5.4 above), a fair and reasonable extension within a reasonable period of occurrence of the event.
	5.5 In case the work is delayed by any reasons, in the opinion of the Engineer-in-Charge, by the contractor for reasons beyond the events mentioned in clause 5.2 or clause 5.3 or clause 5.4 and beyond the justified extended date; without prejudice to right to take action under Clause 3, the Engineer-in-Charge may grant extension of time required for completion of work without rescheduling of milestones. The contractor shall be liable for levy of compensation for delay for such extension of time.
Measurements of Work Done	**CLAUSE 6** Engineer-in-Charge shall, except as otherwise provided, ascertain and determine by measurement, the value in accordance with the contract of work done. All 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 authorized representative on measurement books from time to time during the progress of the work and such measurements shall be signed and dated by the Engineer-in-Charge or his authorised representative and the contractor or their representatives in 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. If for any reason the contractor or his authorized representative is not available and the work of recording measurements is suspended by the Engineer-in-Charge or his representative, the Engineer-in-Charge and U.P. Jal nigam (urban) shall not entertain any claim from contractor for any loss or damages on this account. If the contractor or his authorized representative does not remain present at the time of such measurements after the contractor or his authorized representative 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 be accepted by the Contractor. The contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for measurements and recording levels. Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the 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. The contractor shall give, not less than seven days' notice to the Engineer-in-Charge or his authorized representative in charge of the work, before **covering up** or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or his authorized representative in charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of measurements without such notice having been given or the Engineer-in-Charge's consent being obtained in writing, the same shall be uncovered at the Contractor's expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed. Engineer-in-Charge or his authorized representative may cause either themselves or through another officer of U.P. Jal nigam (urban) 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. It is also a term of this contract that recording of measurements of any item of work 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 over measurement or defects noticed till completion of the defects liability period.
Computerized Measurement Book	**CLAUSE 6A** Engineer-in-Charge shall, except as otherwise provided, ascertain and determine by measurement the value of work done in accordance with the contract. All measurements of all items having financial value shall be entered by the contractor and compiled in the shape of the Computerized Measurement Book having pages of A-4

	size as per the format of U.P. Jal nigam (urban) so that a complete record is obtained of all the items of works performed under the contract. All such measurements and levels recorded by the contractor or his authorized representative from time to time, during the progress of the work, shall be got checked by the contractor from the Engineer-in-Charge or his authorized representative as per interval or program fixed in consultation with Engineer-in-Charge or his authorized representative. After the necessary corrections made by the Engineer-in-Charge, the measurement sheets shall be returned to the contractor for incorporating the corrections and for resubmission to the Engineer-in-Charge for the dated signatures by the Engineer-in-Charge and the contractor or their representatives in token of their acceptance. Whenever bill is due for payment, the contractor would initially submit draft computerized measurement sheets and these measurements would be got checked/test checked from the Engineer-in-Charge and/or his authorized representative. The contractor will, thereafter, incorporate such changes as may be done during these checks/test checks in his draft computerized measurements, and submit to U.P. Jal nigam (urban) a computerized measurement book, duly bound, and with its pages machine numbered. The Engineer-in-Charge and/or his authorized representative would thereafter check this MB, and record the necessary certificates for their checks/test checks. The final, fair, computerized measurement book given by the contractor, duly bound, with its pages machine numbered, should be 100% correct, and no cutting or over-writing in the measurements would thereafter be allowed. If at all any error is noticed, the contractor shall have to submit a fresh computerized MB with its pages duly machine numbered and bound, after getting the earlier MB cancelled by U.P. Jal nigam (urban). Thereafter, the MB shall be taken in the Divisional/Unit Office records, and allotted a number as per the Register of Computerised MBs. This should be done before the corresponding bill is submitted to the Divisional/Unit office for payment. The contractor shall submit two spare copies of such computerized MB's for the purpose of reference and record by the various officers of U.P. Jal nigam (urban). The contractor shall also submit to U.P. Jal nigam (urban) separately his computerized Abstract of Cost and the bill based on these measurements, duly bound, and its pages machine numbered along with two spare copies of the bill. Thereafter, this bill will be processed by the Division/Unit office and allotted a number as per the computerized record in the same way as done for the measurement book meant for measurements. The contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for checking of measurements/levels by the Engineer-in-Charge or his representative. Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the 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. The contractor shall give not less than seven days' notice to the Engineer-in-Charge or his authorized representative in charge of the work before **covering up** or otherwise placing beyond the reach of checking and/or test checking the measurement of any work in order that the same may be checked and/or test checked and correct dimensions thereof be taken

	before the same is covered up or placed beyond the reach of checking and/or test checking measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or his authorized representative in charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of checking and/or test checking measurements without such notice having been given or the Engineer-in-Charge's consent being obtained in writing the same shall be uncovered at the Contractor's expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed. Engineer-in-Charge or his authorized representative may cause either themselves or through another officer of U.P. Jal nigam (urban) to check the measurements recorded by contractor and all provisions stipulated herein above shall be applicable to such checking of measurements or levels. It is also a term of this contract that checking and/or test checking the measurements of any item of work in the measurement book and/or its payment in the interim, on account of 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 over measurement or defects noticed till completion of the defects liability period.
Payment on Intermediate Certificate to be Regarded as Advances	**CLAUSE 7** For payment interim or running account bills shall be submitted by the contractor for the work executed on the basis of such recorded measurements on the format of U.P. Jal nigam (urban) in duplicate on or before the date of every month fixed for the same by the Engineer-in-Charge. The contractor shall not be entitled to be paid any such interim payment if the gross work done together with net payment/ adjustment of advances for material collected, if any, since the last such payment is less than the amount specified in **Schedule F**, in which case the interim bill shall be prepared on the appointed date of the month after the requisite progress is achieved. Engineer-in-Charge shall arrange to have the bill verified by taking or causing to be taken, where necessary, the requisite measurements of the work. In the event of the failure of the contractor to submit the bills, no claims whatsoever due to delays on payment including that of interest shall be payable to the contractor. Payment on account of amount admissible shall be made by the Engineer-in-Charge certifying the sum to which the contractor is considered entitled by way of interim payment at such rates as decided by the Engineer-in-Charge. The contractor should note that in many programmes the Govt./U.P. Jal nigam (urban) have adopted **PFMS** system, wherein bills and other details are uploaded and thereafter payments are released. The Engineer-in-Charge may not have any control on the timeline for release of funds. The amount admissible and released shall, as far as possible, be paid by 7th working day after the day of release on PFMS. In other cases amount admissible shall, as far as possible, be paid by 15th working day after the day of presentation of the bill by the Contractor to the Engineer-in-Charge or his authorised together with the account of the material issued by U.P. Jal nigam (urban), or dismantled materials, if any. In the case of works outside the headquarters of the Engineer- in-Charge, the period of ten working days will be extended to thirty working days. All such interim payments shall be regarded as payment by way of advances against final payment only and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be rejected, removed, taken away and reconstructed or re-erected. Any

	certificate given by the Engineer-in-Charge relating to the work done or materials delivered forming part of such payment, may be modified or corrected by any subsequent such certificate(s) or by the final certificate and shall not by itself be conclusive evidence that any work or materials to which it relates is/are in accordance with the contract and specifications. Any such interim payment, or any part thereof shall not in any respect conclude, determine or affect in any way powers of the Engineer-in-Charge under the contract or any of such payments be treated as final settlement and adjustment of accounts or in any way vary or affect the contract. Pending consideration of extension of date of completion, interim payments shall continue to be made as herein provided without prejudice to the right of U.P. Jal nigam (urban) to take action under the terms of this contract for delay in the completion of work, if the extension of date of completion is not granted by the competent authority. The Engineer-in-Charge in his sole discretion on the basis of a certificate from the Assistant Engineer/Project Engineer to the effect that the work has been completed up to the level in question make interim advance payments without detailed measurements for work done working out 75% of assessed value. The advance payments so allowed shall be adjusted in the subsequent interim bill to be submitted by the contractor.
Payments in composite Contracts	In case of composite tenders, running payment for the Civil components shall be made by Division/Unit Office of Civil works to the main contractor. Running payment for Electrical /Mechanical works may, at the discretion of U.P. Jal nigam (urban), be made by the Engineer-in-Charge of the relevant discipline directly to the main contractor. **CLAUSE 7A** No Running Account Bill shall be paid for the work till the applicable labour licenses, registration with EPFO, ESIC and BOCW Welfare Board, whatever applicable are submitted by the contractor to the Engineer-in-Charge.
Completion Certificate and Completion Plans	**CLAUSE 8** Within ten days of the completion of the work, the contractor shall give notice of such completion to the Engineer-in-Charge and within thirty days of the receipt of such notice, the Engineer-in-Charge shall inspect the work and if there is no defect in the work, shall furnish the contractor with a final certificate of completion, otherwise a provisional certificate of physical completion indicating defects (a) to be rectified by the contractor and/or (b) for which payment will be made at reduced rates, shall be issued. But no final certificate of completion shall be issued, nor shall the work be considered to be complete until the contractor shall has removed from the premises on which the work shall be executed all scaffolding, surplus materials, rubbish and all huts and sanitary arrangements required for his/their work people on the site in connection with the execution of the works as shall have been erected or constructed by the contractor(s) and cleaned off the dirt from all wood work, doors, windows, walls, floor or other parts of the building, in, upon, or about which the work is to be executed or of which he may have had possession for the purpose of the execution; thereof, and not until the work shall have been measured by the Engineer-in-Charge. If the contractor shall fail to comply with the requirements of this Clause as to removal of scaffolding, surplus materials and rubbish and all huts and sanitary arrangements as aforesaid and cleaning off dirt on or before the date fixed for the completion of work, the Engineer-in-Charge may at the expense of the contractor remove such scaffolding, surplus materials and rubbish etc., and dispose off the same as he thinks fit and clean off such dirt as aforesaid, and the contractor shall have no claim in respect of

	scaffolding or surplus materials as aforesaid except for any sum actually realized by the sale thereof.
Completion Plans to be Submitted by the Contractor and Works to be Handed Over to Client.	**CLAUSE 8A** The contractor shall submit completion plan/ as built drawings for Civil as well as Electrical/Mechanical works as applicable within thirty days of the completion of the work. In case, the contractor fails to submit the completion plan as aforesaid, he shall be liable to pay a sum of 0.1 % of accepted Tendered Value or limit prescribed in **Schedule F** whichever is more as may be fixed by the Superintending Engineer concerned and in this respect the decision of the Superintending Engineer shall be final and binding on the contractor. **CLAUSE 8B** The Contractor shall be responsible for safety of assets so created till the completed work has been duly handed over by him to the Client. The Defect Liability period shall commence only after handing over of the works. Provided that, in event of different Defects Liability Periods being applicable to different sections or parts of the permanent works, the expression Defects Liability Period shall, for the purposes of this contract, be deemed to mean the expiration of the latest of such periods. In this respect the decision of the NIT accepting authority shall be final and bonding on the contractor.
Payment of Final Bill	**CLAUSE 9** The final bill shall be submitted by the contractor in the same manner as specified in interim bills within three months of physical completion of the work or within one month of the date of the final certificate of completion furnished by the Engineer-in-Charge 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 hereinunder, the period being reckoned from the date of receipt of the bill by the Engineer-in-Charge or his authorized Asstt. Engineer/Project Engineer, complete with account of materials issued by U.P. Jal nigam (urban) and dismantled materials. (i) If the Tendered value of work is up to Rs. 1 Crore : 2 months (ii) If the Tendered value of work is more than Rs. 1 Crore and up to Rs 10 Crore : 3 months (iii) If the Tendered value of work exceeds Rs. 10 Crore : 6 months
Payment of Contractor's Bills to Banks	**CLAUSE 9A** Payments due to the contractor may, if so desired by him, or if so instructed by the lending bank be made to his bank, recognized financial institutions instead of direct to him provided that the contractor furnishes to the Engineer-in-Charge (1) an authorization in the form of a legally valid document such as a power of attorney conferring authority on the bank; recognized financial institutions to receive payments and (2) his own acceptance of

	the correctness of the amount made out as being due to him by U.P. Jal nigam (urban) or his signature on the bill or other claim preferred against U.P. Jal nigam (urban) before settlement by the Engineer-in-Charge of the account or claim by payment to the bank or recognized financial institutions. While the receipt given by such banks 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 banks or recognized financial institutions. Nothing herein contained shall operate to create in favour of the bank or recognized financial institutions any rights or equities vis-a-vis U P Jal nigam (urban).
Materials supplied by U.P. Jal nigam (urban)	**CLAUSE 10 (Not applicable for Turnkey Projects)** Materials which U.P. Jal nigam (urban) will supply are shown in **Schedule B** which also stipulates quantum, place of issue and rate(s) to be charged in respect thereof. The contractor shall be bound to procure them from the Engineer-in-Charge. As soon as the work is awarded, the contractor shall finalise the programme for the completion of work as per clause 5 of this contract and shall give his estimates of materials required on the basis of drawings/or bill of quantities of the work. The Contractor shall give in writing his requirement to the Engineer-in-Charge which shall be issued to him keeping in view the progress of work as assessed by the Engineer-in-Charge, in accordance with the agreed phased programme of work indicating monthly requirements of various materials. The contractor shall place his indent in writing for issue of such materials at least 7 days in advance of his requirement. Such materials shall be supplied for the purpose of the contract only and the value of the materials so supplied at the rates specified in the aforesaid schedule shall be set off or deducted, as and when materials are consumed in items of work (including normal wastage) for which payment is being made to the contractor, from any sum then due or which may therefore become due to the contractor under the contract or otherwise or from the security deposit. At the time of submission of bills, the contractor shall certify that balance of materials supplied is available at site in original good condition. The contractor shall submit along with every running bill (on account or interim bill) material wise reconciliation statements supported by complete calculations reconciling total issue, total consumption and certified balance (diameter/section-wise in the case of steel) and resulting variations and reasons therefore. Engineer-in-Charge shall (whose decision shall be final and binding on the contractor) be within his rights to follow the procedure of recovery in clause 42 at any stage of the work if reconciliation is not found to be satisfactory. The contractor shall bear the cost of getting the material issued, loading, transporting to site, unloading, storing under cover as required, cutting assembling and joining the several parts together as necessary. Notwithstanding anything to the contrary contained in any other clause of the contract all stores/materials so supplied to the contractor or procured with the assistance of U.P. Jal nigam (urban) shall remain the absolute property of U.P. Jal nigam (urban) and the contractor shall be the trustee of the stores/materials, and the said stores/materials shall not be removed/disposed off from the site of the work on any account and shall be at all times open to inspection by the Engineer-in-Charge or his authorized agent. Any such stores/materials remaining unused shall be returned to the Engineer-in Charge in as good a condition in which they were originally supplied at a place directed by him, at a place of issue or any other place specified by him as he shall require, but in case it is decided not to take back the stores/materials the contractor shall

	have no claim for compensation on any account of such stores/materials so supplied to him as aforesaid and not used by him or for any wastage in or damage to in such stores/materials. On being required to return the stores/materials, the contractor shall hand over the stores/ materials on being paid or credited such price as the Engineer-in-Charge shall determine, having due regard to the condition of the stores/materials. The price allowed for credit to the contractor, however, shall be at the prevailing market rate not exceeding the amount charged to him, excluding the storage charges, if any. The decision of the Engineer-in-Charge shall be final and conclusive. In the event of breach of the aforesaid condition, the contractor shall in addition to throwing himself open to account for contravention of the terms of the licences or permit and/or for criminal breach of trust, be liable to U.P. Jal nigam (urban) for all advantages or profits resulting or which in the usual course would have resulted to him by reason of such breach. Provided that the contractor shall in no case be entitled to any compensation or damages on account of any delay in supply or non-supply thereof all or any such materials and stores provided further that the contractor shall be bound to execute the entire work if the materials are supplied by U.P. Jal nigam (urban) within the original scheduled time for completion of the work plus 50% thereof or schedule time plus 6 months whichever is more if the time of completion of work exceeds 12 months, but if a part of the materials only has been supplied within the aforesaid period, then the contractor shall be bound to do so much of the work as may be possible with the materials and stores supplied in the aforesaid period. For the completion of the rest of the work, the contractor shall be entitled to such extension of time as may be determined by the Engineer-in-Charge whose decision in this regard shall be final and binding on the contractor. The contractor shall see that only the required quantities of materials are got issued. Any such material remaining unused and in perfectly good/original condition at the time of completion or determination of the contract shall be returned to the Engineer-in-Charge at the stores from which it was issued or at a place directed by him by a notice in writing. The contractor shall not be entitled for loading, transporting, unloading and stacking of such unused material except for the extra lead, if any involved, beyond the original place of issue.
Materials to be provided by the Contractor	**CLAUSE 10A** The contractor shall, at his own expense, provide all materials, required for the works other than those which are stipulated to be supplied by U.P. Jal nigam (urban). The contractor shall, at his own expense and without delay, supply to the Engineer-in-Charge samples of materials to be used on the work and shall get these approved in advance. All such materials to be provided by the Contractor shall be in conformity with the specifications laid down or referred to in the contract. The contractor shall, if requested by the Engineer-in Charge furnish proof, to the satisfaction of the Engineer-in-Charge that the materials so comply. The Engineer-in-Charge shall, within thirty days of supply of samples or within such further period as he may require intimate to the Contractor in writing whether samples are approved by him or not. If samples are not approved, the Contractor shall forthwith arrange to supply to the Engineer-in-Charge for his approval, fresh samples complying with the specifications laid down in the contract. When materials are required to be tested in accordance with specifications, approval of the Engineer-in-Charge shall be issued after the test results are received. The Contractor shall at his risk and cost submit the samples of materials to be tested or

	analyzed and shall not make use of or incorporate in the work any materials represented by the samples until the required tests or analysis have been made and materials finally accepted by the Engineer-in-Charge. The Contractor shall not be eligible for any claim or compensation either arising out of any delay in the work or due to any corrective measures required to be taken on account of and as a result of testing of materials. The contractor shall, at his risk and cost, make all arrangements and shall provide all facilities as the Engineer-in-Charge may require for collecting, and preparing the required number of samples for such tests at such time and to such place or places as may be directed by the Engineer-in-Charge and bear all charges and cost of testing unless specifically provided for otherwise elsewhere in the contract or specifications. The Engineer-in-Charge or his authorized representative shall at all times have access to the works and to all workshops and places where work is being prepared or from where materials, manufactured articles or machinery are being obtained for the works and the contractor shall afford every facility and every assistance in obtaining the right to such access. The Engineer-in-Charge shall have full powers to require the removal from the premises of all materials which in his opinion are not in accordance with the specifications and in case of default, the Engineer-in-Charge shall be at liberty to employ at the expense of the contractor, other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. The Engineer-in-Charge shall also have full powers to require other proper materials to be substituted thereof and in case of default, the Engineer-in-Charge may cause the same to be supplied and all costs which may attend such removal and substitution shall be borne by the Contractor. The contractor shall at his own expense, provide a material testing lab at the site for conducting routine field tests. The lab shall be equipped at least with the testing equipment as specified in **Schedule F**.
Secured Advance on Non-perishable Materials	**CLAUSE 10B** (i) The contractor, on signing an indenture in the form in (**Annexure-8)** , shall be entitled to be paid during the progress of the execution of the work up to 75% of the assessed value (invoice value or market value whichever is less) of any materials which are in the opinion of the Engineer non-perishable, non-fragile and non-combustible (such as Pipes, Transformers, Pumps, Motors, Starters, Cables, DG Sets, Electric Panels etc.) and are in accordance with the contract and which have been brought on the site in connection therewith and are adequately stored and/or protected against damage by weather or other causes but which have not at the time of advance been incorporated in the works. This shall be subject to the following- a) Quantity of such material should not be more than 3 (three) months requirement. b) The materials supplied should be strictly as per specifications. c) The Contractor shall maintain records of indents, supply orders, challans, receipts and other records in a format approved by U.P. Jal nigam (urban). It will always remain open for inspection of Engineer or his authorised representatives. d) The Contractor shall submit monthly statements so that value of materials available at site may be ascertained. e) When materials on account of which an advance has been made under this sub-clause are incorporated in the work, the amount of such advance shall be recovered/ deducted from the next payment made under any of the clause or clauses of this contract.

	(Managing Director, U P Jal nigam (urban), Lucknow letter no.968/Pra-1/2005-0021/19 dated 29.08.2019)
Mobilisation Advance **(Applicable for Contract value being more than Rs. 5 Crores)**	(ii) The Engineer-in-Charge shall make interest free mobilization advance payment to the Contractor equal to 10% of contracted amount on Contractor's demand and submission of an Irrevocable Unconditional Bank Guarantee in a specified form **(Annexure-9)** and being issued by one of the scheduled commercial banks and branch acceptable to the Employer in amounts and currencies equal to 100% of the advanced payment. Such advance shall be subject to the following conditions: a) Mobilization advance shall be issued only after verification of the Bank Guarantee. b) Such advance shall be made in two equal instalments, out of this 5% amount shall be paid within 30 days of execution of agreement and balance 5% advance shall be paid after construction of contractor's site office, deployment of human resources and machineries and equipments required for the project. c) The firm shall within 3 months of receiving such advance, utilise it for the specific purpose for which it has been sanctioned, failing which, interest at the rate of 8% per annum shall be recovered from the date of issuing the advance, as if it was an interest bearing advance. d) In case the said work is not completed whithin a period of 6 (six) months of receiving first instalment of mobilization advance, the entire advance along with accrued interest @ 8% per annum shall be recovered by forfeiture of the Bank Guarantee. e) In case the Contractor is able to complete the work within a period of six months for which advance has been sanctioned, the advanced amount shall be recovered from 7th month in such a way that the entire advance is recovered by the end of 12 months. No interest shall be levied in such cases. f) The aforesaid Bank Guarantee shall remain effective until the advance payment has been repaid, but the amount of the Guarantee shall be progressively reduced by the amount repaid by the Contractor. However the contractor may, at his option, submit required amount of Bank Guarantee in not more than 3(three) parts for each instalment of Mobilization Advance made available to him. In any case such number of Bank Guarantees shall be limited to 6 (six). g) If the Contract is terminated due to default of the contractor, under such circumstances outstanding mobilization advance along with interest on the entire value of mobilization advance shall be recovered at the compounded interest of 8% calculated quarterly. h) Provided always that, if any amount becomes due to the department as a consequence of any of the above clauses and if such amount is not recoverable from the encashment of Bank Guarantees, it will be recovered from any other amount due to the contractor or from security deposit under the contract.
Interest & Recovery	(iii) If the circumstances are considered reasonable by the Engineer-in-Charge, the period mentioned in (i) for request by the contractor in writing for grant of secured advance may be extended in the discretion of the Engineer-in-Charge.
Dismantled Material Govt. Property	**CLAUSE 10 C** The contractor shall treat all materials obtained during dismantling of a structure, excavation of the site for a work, etc. as Government's property and such materials shall be

	disposed off to the best advantage of Government according to the instructions in writing issued by the Engineer-in-Charge.
Work to be Executed in Accordance with Specifications, Drawings, Orders etc.	**CLAUSE 11** The contractor shall execute the whole and every part of the work in the most substantial and workmanlike manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also conform exactly, fully and faithfully to the design, drawings and instructions in writing in respect of the work signed by the Engineer-in-Charge and the contractor shall be furnished free of charge one copy of the contract documents together with specifications, designs, drawings and instructions as are not included in the standard specifications specified in section of **Specifications** and/or **Schedule F** or in any Bureau of Indian Standard or any other, published standard or code or, Schedule of Rates or any other printed publication referred to elsewhere in the contract. The contractor shall comply with the provisions of the contract and with the care and diligence execute and maintain the works and provide all labour and materials, tools and plants including for measurements and supervision of all works, structural plans and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these, is specified or is reasonably inferred from the contract. The Contractor shall take full responsibility for adequacy, suitability and safety of all the works and methods of construction.
Deviations/ Variations Extent and Pricing	**CLAUSE 12 :** The Engineer-in-Charge shall have power (i) to make alteration in, omissions from, additions to, or substitutions for 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 and 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 (after due approval of competent authority) and such alterations, omissions, additions or substitutions shall form part of the contract as if originally provided therein and any altered, additional or substituted work 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 main work except as hereafter provided. **12.1** The time for completion of the works shall, in the event of any deviations resulting in additional cost over the accepted tendered value sum being ordered, 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 tendered value plus (ii) 25% of the time calculated in (i) above or such further additional time as may be considered reasonable by the Engineer-in-Charge.
Deviation, Extra Items and Pricing	**12.2** (i) In the case of extra item(s) (items that are completely new, and are in addition to the items contained in the contract), the contractor may within fifteen days of receipt of order or occurrence of the item(s) claim rates, supported by proper analysis, which shall include invoices, vouchers etc. and Manufacturer's specification for the work failing which the rate approved later by the Engineer- in- charge (after due approval of competent authority) shall be binding and the Engineer-in-Charge (after due approval of competent authority) shall within prescribed time limit of the receipt of the claims supported by

	analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the applicable S.O.R./market rates and the contractor shall be paid in accordance with the rates so determined, failing which it will be deemed to have been approved.
Deviation, Substituted Items, Pricing	(ii) In the case of substituted items (items that are taken up with partial substitution or in lieu of items of work in the contract), the rate for the agreement item (to be substituted) and substituted item shall also be determined in the manner as mentioned in the following para. (a) If the S.O.R./market rate for the substituted item so determined is more than the market rate of the agreement item (to be substituted), the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so increased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted). (b) If the S.O.R. / market rate for the substituted item so determined is less than the market rate of the agreement item (to be substituted), the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so decreased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).
Deviation, Deviated Quantities, Pricing	(iii) In the case of contract items, substituted items, contract cum substituted items, which exceed the limits laid down in **Schedule F**, the contractor may within fifteen days of receipt of order or occurrence of the excess, claim revision of the rates, supported by proper analysis for the work in excess of the above mentioned limits, provided that if the rates so claimed are in excess of the rates specified in the bill of quantities, the Engineer-in-Charge shall within prescribed time limit of receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, after due approval of competent authority determine the rates on the basis of the market rates (as per UPPWD/UPJN/CPWD schedules, invoice, vouchers from the manufacturers or suppliers submitted by the agency and duly verified by Engineer-in-Charge or his representative) and the contractor shall be paid in accordance with the rates so determined. The prescribed time limit for finalizing rates for Extra Item(s), Substitute Item(s) and Deviated Quantities of contract items is within 45 days after submission of proposal by the contractor without observation of the Engineer-in-Charge. **12.3** The provisions of the preceding paragraph shall also apply to the decrease in the rates of items for the work in excess of the limits laid down in **Schedule F,** and the Engineer-in-Charge shall after giving notice to the contractor within one month of occurrence of the excess and after taking into consideration any reply received from him within fifteen days of the receipt of the notice, after approval of competent authority, revise the rates for the work in question within one month of the expiry of the said period of fifteen days having regard to the market rates. **12.4** For the purpose of operation of **Schedule F**, the following works shall be treated as works relating to foundation unless & otherwise defined in the contract: i. For Buildings : All works up to 1.2 metres above ground level or up to floor 1 level whichever is lower. ii. For abutments, piers and well staining : All works up to 1.2 m above the bed

	level. iii. For retaining walls, wing walls, compound walls, chimneys, over head reservoirs/ tanks and other elevated structures : All works up to 1.2 metres above the ground level. iv. For reservoirs/tanks (other than overhead reservoirs/tanks) : All works up to 1.2 metres above the ground level. v. For basement: All works up to 1.2 m above ground level or up to floor 1 level whichever is lower. vi. For Roads, all items of excavation and filling including treatment of sub base. **12.5** Any operation incidental to or necessarily has to be in contemplation of tenderer while quoting tender, or necessary for proper execution of the item included in the Bill of quantities or in the schedule of rates mentioned above, whether or not, specifically indicated in the description of the item and the relevant specifications, shall be deemed to be included in the rates quoted by the tenderer or the rate given in the said schedule of rates, as the case may be. Nothing extra shall be admissible for such operations.
Foreclosure of contract due to Abandonment or Reduction in Scope of Work	**CLAUSE 13** If at any time after acceptance of the tender or during the progress of work, the purpose or object for which the work is being done changes due to any supervening cause and as a result of which the work has to be abandoned or reduced in scope the Engineer-in-Charge shall give notice in writing to that effect to the contractor stating the decision as well as the cause for such decision 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 foreclosure of the whole or part of the works. The contractor shall be paid at contract rates for the works executed at site. If any materials supplied by U.P. Jal nigam (urban) are rendered surplus, the same except normal wastage shall be returned by the contractor to U.P. Jal nigam (urban) 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 U.P. Jal nigam (urban) stores, if so required by U.P. Jal nigam (urban), shall be paid. 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 U.P. Jal nigam (urban) from the contractor under the terms of the contract. In the event of action being taken under Clause 13 to reduce the scope of work, the contractor may furnish fresh Performance Guarantee on the same conditions, in the same manner and at the same rate for the balance tendered amount and initially valid up to the extended date of completion or stipulated date of completion if no extension has been granted plus 60 days beyond that. Wherever such a fresh Performance Guarantee is furnished by the contractor the Engineer-in-Charge may return the previous Performance Guarantee.
Carrying out part work at risk &	**Clause 14**

cost of contractor	If contractor: (i) At any time makes default during currency of work or does not execute any part of the work with due diligence and continues to do so even after a notice in writing of 7 days in this respect from the Engineer-in-Charge; or (ii) Commits default in complying with any of the terms and conditions of the contract and does not remedy it or takes effective steps to remedy it within 7 days even after a notice in writing is given in that behalf by the Engineer-in-Charge; or Fails to complete the work(s) or items of work with individual dates of completion, on or before the date(s) so determined, and does not complete them within the period specified in the notice given in writing in that behalf by the Engineer-in-Charge. The Engineer- in-Charge without invoking action under clause 3 may, without prejudice to any other right or remedy against the contractor which have either accrued or accrue thereafter to U.P. Jal nigam (urban), by a notice in writing to take the part work / part incomplete work of any item(s) out of his hands and shall have powers to: (a) Take possession of the site and any materials, constructional plant, implements, stores, etc., thereon; and/or (b) Carry out the part work / part incomplete work of any item(s) by any means at the risk and cost of the contractor. The Engineer-in-Charge shall determine the amount, if any, is recoverable from the contractor for completion of the part work/ part incomplete work of any item(s) taken out of his hands and execute at the risk and cost of the contractor. In determining the amount, credit shall be given to the contractor with the value of work done in all respect in the same manner and at the same rate as if it had been carried out by the original contractor under the terms of his contract, the value of contractor's materials taken over and incorporated in the work and use of plant and machinery belonging to the contractor. The certificate of the Engineer-in-Charge as to the value of work done shall be final and conclusive against the contractor provided always that action under this clause shall only be taken after giving notice in writing to the contractor. Provided also that if the expenses incurred by U.P. Jal nigam (urban) are less than the amount payable to the contractor at his agreement rates, the difference shall not be payable to the contractor. Any excess expenditure incurred or to be incurred by U.P. Jal nigam (urban) in completing the part. work/ part incomplete work of any item(s) or the excess loss or damages suffered or may be suffered by U.P. Jal nigam (urban) as aforesaid after allowing such credit shall without prejudice to any other right or remedy available to U.P. Jal nigam (urban) in law or per as agreement be recovered from any money due to the contractor on any account, and if such money is insufficient, the contractor shall be called upon in writing and shall be liable to pay the same within 30 days. If the contractor fails 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 building at site etc. and adjust the proceeds of sale thereof towards the dues recoverable from the contractor under the contract and if thereafter there remains any balance outstanding, it shall be recovered in accordance with the provisions of the contract. In the event of any of the above course being adopted by the Engineer-in-Charge, the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any engagements or made

	any advance on any account or with a view to the execution of the work or the performance of the contract.
Suspension of Work	**CLAUSE 15** (i) The contractor shall, on receipt of the order in writing of the Engineer-in-Charge, (whose decision shall be final and binding on the contractor) suspend the progress of the works or any part thereof for such time and in such manner as the Engineer-in-Charge may consider necessary so as not to cause any damage or injury to the work already done or endanger the safety thereof for any of the following reasons: (a) on account of any default on the part of the contractor or; (b) for proper execution of the works or part thereof for reasons other than the default of the contractor; or (c) for safety of the works or part thereof. The contractor shall, during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given in that behalf by the Engineer-in-Charge. (ii) If the suspension is ordered for reasons (b) and (c) in sub-para (i) above: (a) the contractor shall be entitled to an extension of time equal to the period of every such suspension PLUS 25%, for completion of the item or group of items of work for which a separate period of completion is specified in the contract and of which the suspended work forms a part. (iii) If the works or part thereof is suspended on the orders of the Engineer-in-Charge for more than six months at a time, except when suspension is ordered for reason (a) in sub-para (i) above, the contractor may after receipt of such order serve a written notice on the Engineer-in-Charge requiring permission within 15 (Fifteen) days from receipt by the Engineer- in-Charge of the said notice, to proceed with the work or part thereof in regard to which progress has been suspended and if such permission is not granted within that time, the contractor, if he intends to treat the suspension, where it affects only a part of the works as an omission of such part by U.P. Jal nigam (urban) or where it affects whole of the works, as an abandonment of the works by U.P. Jal nigam (urban), shall within ten days of expiry of such period of 15 days give notice in writing of his intention to the Engineer-in-Charge. In the event of the contractor treating the suspension as an abandonment of the contract by U.P. Jal nigam (urban), he shall have no claim to payment of any compensation on account of any profit or advantage which he might have derived from the execution of the work in full but which he could not derive in consequence of the abandonment.
Compensation in case of Delay of Supply of Material by Govt.	**CLAUSE 15 A** The contractor shall not be entitled to claim any compensation from U.P. Jal nigam (urban) for the loss suffered by him on account of delay by U.P. Jal nigam (urban) in the supply of materials in **Schedule B.** This clause 15 A will not be applicable for works where no material is stipulated to be issued by U.P. Jal nigam (urban).
Action in case Work not done as per Specifications	**CLAUSE 16** All works 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 authorized subordinates in charge of the work and all the superior officers, officers of Technical Audit Cell (TAC) / authorised Third Party Inspection agency or any organization engaged by U.P. Jal nigam (urban) for Quality Assurance and 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 a responsible agent duly accredited in writing, present for that purpose. Orders given to the Contractor's agent shall be considered to have the same force as if they had been given to the contractor himself. If it shall appear to the Engineer-in-Charge or his authorized subordinates in charge of the work or to the superior officers, the officers of the organization engaged by U.P. Jal nigam (urban) for Quality Assurance or to the TAC or its subordinate officers, that any work has been executed with unsound, imperfect, or unskillful workmanship, or with materials or articles provided by him for the execution of the work which are unsound or 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 within twelve months (six months in the case of work costing Rs. 10 Lac and below except road work) of the completion and handing over of the work from the Engineer-in-Charge specifying the work, materials or articles complained of notwithstanding that the same may have been passed, certified and paid for forthwith rectify, or remove and reconstruct the work so specified in whole or in part, as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost. In the event of the failing to do so within a period specified by the Engineer-in-Charge in his demand aforesaid, then the contractor shall be liable to pay compensation at the same rate as under clause 2 of the contract (for non-completion of the work in time) for this default. In such case the Engineer-in-Charge may not accept the item of work at the rates applicable under the contract but may accept such items at reduced rates as the authority specified in **Schedule F** 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 work 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 will be final and binding on the contractor.
Contractor Liable for Damages, defects during defect liability period/ Refund of Security Deposit.	**CLAUSE 17** If the contractor or his working people or servants shall break, deface, injure or destroy any part of building in which they may be working, or any structure, building, road, road kerb, fence, enclosure, water/sewer pipe, cables, drains, electric or telephone post or wires, trees, grass or grassland, or cultivated ground contiguous to the premises on which the work or any part is being executed, or if any damage shall happen to the work while in progress, from any cause whatever or if any defect, shrinkage or other faults appear in the work within defect liability period of the entire project arising out of defect or improper materials or workmanship the contractor shall upon receipt of a notice in writing on that behalf make the same good at his own expense or in default the Engineer-in-Charge cause the same to be made good by other workmen and deduct the expense from any sums that may be due or at any time thereafter may become due to the contractor, or from his security deposit or the proceeds of sale thereof or of a sufficient portion thereof. **The security deposit/performance security/performance guarantee of the contractor**

	shall not be refunded before the expiry of defect liability period of the entire project or till final bill has been passed, whichever is later. As the defect liability of Electrical-Mechanical works is two years from the date of handing over, the Engineer-in-Charge may, on the request of Contractor and at his discretion, retain out of security deposit an amount sufficient to cover up residual period of defect liability of Electrical-Mechanical works following the end of defect liability period of Civil Works.
Contractor to Supply Tools & Plants etc.	**CLAUSE 18** 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 Engineer-in-Charge's stores), machinery, tools & plants as specified in **Schedule F**. In addition to this, appliances, implements, other plants, ladders, cordage, tackle, scaffolding and temporary works required for the proper execution of the work, whether original, altered or substituted and whether included in the specifications 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 as to any matter as to which under these conditions he is entitled to be satisfied, or which he is entitled to require together with carriage therefore to and from the work. 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 and from time to time of the work or materials. Failing his so doing, 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.
Recovery of Compensation paid to Workmen	**CLAUSE 18 A** In every case in which by virtue of the provisions sub-section (1) of Section 12, of the Workmen's Compensation Act, 1923 as amended till date, U.P. Jal nigam (urban) is obliged to pay compensation to a workman employed by the contractor, in execution of the works, U.P. Jal nigam (urban) will recover from the contractor, the amount of the compensation so paid; and, without prejudice to the rights of U.P. Jal nigam (urban) under sub-section (2) of Section 12, of the said Act, U.P. Jal nigam (urban) shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by U.P. Jal nigam (urban) to the contractor whether under this contract or otherwise. U.P. Jal nigam (urban) shall not be bound to contest any claim made against it under sub-section (1) of Section 12, of the said Act, except on the written request of the contractor and upon his giving to U.P. Jal nigam (urban) full security for all costs for which U.P. Jal nigam (urban) might become liable in consequence of contesting such claim.
Ensuring Payment and Amenities to Workers if Contractor fails	**CLAUSE 18 B** ln every case in which by virtue of the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 as amended till date, and of the Contract Labour (Regulation and Abolition) Central Rules, 1971, U.P. Jal nigam (urban) is obliged to pay any amounts of wages to a workman employed by the contractor in execution of the works, or to incur any expenditure in providing welfare and health amenities required to be provided under the

	above said Act and the rules under Clause 19H or under the Rules framed by Government from time to time for the protection of health and sanitary arrangements for workers employed by Contractors, U.P. Jal nigam (urban) will recover from the contractor, the amount of wages so paid or the amount of expenditure so incurred; and without prejudice to the rights of U.P. Jal nigam (urban) under sub-section(2) of Section 20, and sub-section (4) of Section 21, of the Contract Labour (Regulation and Abolition) Act, 1970, U.P. Jal nigam (urban) shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by U.P. Jal nigam (urban) to the contractor whether under this contract or otherwise U.P. Jal nigam (urban) shall not be bound to contest any claim made against it under sub-section (1) of Section 20, sub-section (4) of Section 21, of the said Act, except on the written request of the contractor and upon his giving to U.P. Jal nigam (urban) full security for all costs for which U.P. Jal nigam (urban) might become liable in contesting such claim.
Labour Laws to be complied by the Contractor	**CLAUSE 19** The contractor shall obtain a valid licence under the Contract Labour (R&A) Act, 1970, 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 comply with provisions of the Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979. The contractor shall also abide by the provisions of the Child Labour (Prohibition and Regulation) Act, 1986. The contractor shall also comply with the provisions of the building and other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1996 and the building and other Construction Workers Welfare Cess Act, 1996. Any failure to fulfil these requirements shall attract the penal provisions of this contract arising out of the resultant non-execution of the work. **CLAUSE 19A** No labour below the age of fourteen years shall be employed on the work.
Payment of Wages	**CLAUSE 19 B** Payment of wages: (i) The contractor shall pay to labour employed by him either directly or through subcontractors, wages not less than fair wages as defined in State Govt. 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 contractor's Labour Regulations made by Government from time to time in regard to payment of wages, wage period, deductions from wages recovery of wages not paid and deductions unauthorizedly 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) (a) 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-fulfilment 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. (b) Under the provision of Minimum Wages (Central) Rules, 1950, or any other similar rules of the State Govt., 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. (v) 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 Benefits Act, 1961, and the Contractor's Labour (Regulation and Abolition) Act 1970, or the modifications thereof or any other laws relating thereto and the rules made thereunder from time to time. (vi) The contractor shall indemnify and keep indemnified U.P. Jal nigam (urban) against payments to be made under and for the observance of the laws aforesaid and State Govt. Contractor's Labour Regulations without prejudice to his right to claim indemnity from his sub-contractors. (vii) 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. (viii) 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. (ix) 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.
	CLAUSE 19C In respect of all labour directly or indirectly employed in the work for the performance of the contractor's part of this contract, the contractor shall at his own expense arrange for the relevant safety provisions as per this contract or as may be ordered by the Engineer-in-Charge from 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 a penalty as decided by the authority mentioned in **Schedule F** for each default 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.

CLAUSE 19 D

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

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

(2) their working hours,

(3) the wages paid to them,

(4) 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

(5) the number of female workers who have been allowed maternity benefit according to Clause 19F and the amount paid to them.

Failing which the contractor shall be liable to pay to U.P. Jal nigam (urban), a sum as decided by the authority mentioned in **Schedule F** for each default or materially incorrect statement. The decision of the Divisional officer/Unit-in-charge shall be final in deducting from any bill due to the contractor, the amount levied as fine and be binding on the contractor.

CLAUSE 19 E

In respect of all labour directly or indirectly employed in the works for the performance of 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 U.P. Jal nigam (urban) and its contractors.

CLAUSE 19 F

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 - upto 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 was done during a period of three months immediately preceding the date on which she gives notice that she expects to be confined.

(ii) in the case of miscarriage - leave pay at the rate of average daily earning calculated on the 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) in the form prescribed by Engineer-in-charge and the same shall be kept at the place of work.

CLAUSE 19 G

In the event of the contractor(s) committing a default or breach of any of the provisions of the 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 relevant Regulations and' Rules which is materially incorrect, he/they shall, without prejudice to any other liability, pay to U.P. Jal nigam (urban) a sum as decided by the authority mentioned in **Schedule F** per day of default, breach or furnishing, making, submitting, filing such materially incorrect statements and in the event of the contractor(s) defaulting continuously in this respect, the penalty may be enhanced to as decided by the authority mentioned in **Schedule F** for each day of default subject to a maximum of 5 per cent of the contracted amount. The decision of the Engineer-in-Charge shall be final and binding on the parties.

Should it appear to the Engineer-in-Charge that the contractor(s) is/are not properly observing and complying with the provisions of the Contractor's Labour Regulations and Model Rules and the provisions of the Contract Labour (Regulation and Abolition) Act 1970, and the Contract Labour (R& A) Central Rules 1971, for the protection of health and sanitary arrangements for work-people employed by the contractor(s) (hereinafter referred as "the said Rules") the Engineer-in-Charge shall have power to give notice in writing to the contractor(s) requiring that the said Rules be complied with and the amenities prescribed therein be provided to the work-people within a reasonable time to be specified in the notice. If the contractor(s) 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(s). The contractor(s) shall erect, make and maintain at his/their own expense and to approved standards all necessary huts and sanitary arrangements required for his/their work-people on the site in connection 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(s) requiring that the said huts and sanitary arrangements be remodelled and/or reconstructed according to approved standards, and if the contractor(s) 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(s).

CLAUSE 19 H

The contractor(s) shall at his/their 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.

(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 labourer.

(b) The contractor(s) 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.

(c) The contractor(s) shall also construct temporary latrines and urinals for the use of the labourers each on the scale of not less than four per each one hundred of the

	total strength, separate latrines and urinals being provided for women. (d) The contractor(s) 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 sun-dried bricks, the walls should be plastered with mud gobri on both sides. The floor may be kutcha but plastered with mud gobri and shall be at least 15 cm (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. (b) The contractor(s) shall provide each hut with proper ventilation. (c) All doors, windows, and ventilators shall be provided with suitable leaves for security purposes. (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 availability of site with the approval of the Engineer-in-Charge. Back to back construction will be allowed. (iii) **Water Supply -** The contractor(s) shall provide adequate supply of water for the use of labourers. The provisions shall not be less than two gallons of pure and wholesome water per head per day for drinking purposes and three gallons of clean water per head per day for bathing and washing purposes. Where piped water supply is available, supply shall be at stand posts and where the supply is from wells or river, tanks which may be of metal or masonry, shall be provided. The contractor(s) shall also at his/ their own cost make arrangements for laying pipe lines for water supply to his/ their labour camp from the existing mains wherever available, and shall pay all fees and charges therefore. (iv) The site selected for the camp shall be high ground, removed from jungle. (v) **Disposal of Excreta** - The contractor(s) shall make necessary arrangements for the disposal of excreta from the latrines by trenching or incineration which shall be according to the requirements laid down by the Local Health Authorities. If trenching or incineration is not allowed, the contractor(s) shall make arrangements for the removal of the excreta through the Municipal Committee/authority 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/authority. The contractor shall provide one sweeper for every eight seats in case of dry system. (vi) **Drainage** - The contractor(s) shall provide efficient arrangements for draining away sullage water so as to keep the camp neat and tidy. (vii) The contractor(s) shall make necessary arrangements for keeping the camp area 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.
	CLAUSE 19 I The Engineer-in-Charge may require the contractor to dismiss or remove from the site of the work any person or persons in the contractors' employment upon the work who may be incompetent or misconduct himself and the contractor shall forthwith comply with such requirements. In respect of maintenance/repair or renovation works etc. where the labour have an easy access to the individual houses, the contractor shall issue identity cards to the labourers, whether temporary or permanent and he shall be responsible for any untoward action on the part of such labour. Resident Engineer will display a list of contractors working in the colony/Blocks on the notice board in the colony and also at the service centre, to apprise the residents about the same. **CLAUSE 19J** It shall be the responsibility of the contractor to see that the structure/building under construction is not occupied by anybody unauthorizedly during construction, and is handed over with vacant possession of complete building. If such building though completed is occupied illegally, then the Engineer-in-Charge shall have the option to refuse to accept the said structures/building/buildings in that position. Any delay in acceptance on this account will be treated as the delay in completion and for such delay, a levy upto 5% of contract amount as may be imposed by the competent authority whose decision shall be final both with regard to the justification and quantum and be binding on the contractor. However, the Engineer-in-Charge, through a notice, may require the contractor to remove the illegal occupation any time on or before construction and delivery.
Employment of skilled/semi skilled workers	**CLAUSE 19K** The contractor shall, at all stages of work, deploy skilled/semi skilled tradesmen who are qualified and possess relevant certificates in particular trade from Industrial Training Institute/National Institute of construction Management and Research (NICMAR)/ National Academy of Construction, CIDC or any similar reputed and recognized Institute managed/ certified by State/Central U.P. Jal nigam (urban). The number of such qualified tradesmen shall not be less than 20% of total skilled/semi skilled workers required in each trade at any stage of work. The contractor shall submit number of man days required in respect of each trade, its scheduling and the list of qualified tradesmen along with requisite certificate from recognized Institute to Engineer-in-Charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer-in-Charge. Failure on the part of contractor to obtain approval of Engineer-in-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate as may be decided by the authority mentioned in **Schedule F** per such tradesman per day. Decision of Engineer-in-Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding. Provided always, that the provisions of this clause, shall not be applicable for works with estimated cost put to tender being less than Rs. 10 crores.
Minimum Wages	**CLAUSE 20**

Act to be Complied with	The contractor shall comply with all the provisions of the Minimum Wages Act, 1948, and Contract Labour (Regulation and Abolition) Act, 1970, amended from time to time and rules framed thereunder and other labour laws affecting contract labour that may be brought into force from time to time.
Work not to be sublet. Action in case of insolvancy	**CLAUSE 21** The contract shall not be assigned or sublet without the written approval of the NIT approving authority. And if the contractor shall assign or sublet his contract, or attempt to do so, or become insolvent or commence any insolvency proceedings or make any composition with his creditors or attempt to do so, or if any bribe, gratuity, gift, loan, perquisite, reward or advantage pecuniary or otherwise, shall either directly or indirectly, be given, promised or offered by the contractor, or any of his servants or agent to any public officer or person in the employ of U.P. Jal nigam (urban) in any way relating to his office or employment, or if any such officer or person shall become in any way directly or indirectly interested in the contract, the Engineer- in-Charge on behalf of U.P. Jal nigam (urban) shall have power to adopt the course specified in Clause 3 hereof in the interest of Government and in the event of such course being adopted, the consequences specified in the said Clause 3 shall ensue. **CLAUSE 22** All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the use of U.P. Jal nigam (urban) without reference to the actual loss or damage sustained and whether or not any damage shall have been sustained.
Changes in firm's Constitution to be intimated	**CLAUSE 23** Where the contractor is a partnership firm, the previous approval in writing of the tender approving authority shall be obtained before any change is made in the constitution of the firm. Where the contractor is an individual or a Hindu undivided family business concern, such approval as aforesaid shall likewise be obtained before the contractor enters into any partnership agreement where under the partnership firm would have the right to carry out the works hereby undertaken by the contractor. If previous approval as aforesaid is not obtained, the contract shall be deemed to have been assigned in contravention of Clause 21 hereof and the same action may be taken, and the same consequences shall ensue as provided in the said Clause 21. **CLAUSE 24** All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the Engineer-in-Charge who shall be entitled to direct at what point or points and in what manner they are to be commenced, and from time to time carried on.
Life Cycle Cost	**CLAUSE 24** The contractor shall be responsible for safety, quality and soundness of the structures/ buildings including their structural elements beyond maintenance period. The contractor shall have obligation to rectify such defects minimum up to 5 (five) years from the date of completion of work. The defects have to be rectified within a reasonable time not exceeding three months after issue of notice by Engineer- in- Charge.

Settlement of Disputes & Arbitration	**CLAUSE 25** Except where otherwise provided in the contract, all questions and disputes relating to the meaning of the specifications, design, drawings and instructions here-in before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works or the execution or failure to execute the same whether arising during the progress of the work or after the cancellation, termination, completion or abandonment thereof shall be dealt with as mentioned hereinafter: (i) If the contractor consideres any work demanded of him to be outside the requirements of the contract, or dispute any drawings, record or decision given in writing by the Engineer-in-Charge on any matter in connection with or arising out of the contract or carrying out of the contract or carrying out of the work, to be unacceptable, he shall promptly within 7 days request the Superintending Engineer in writing for written instruction of decision. Thereupon, the Superintending Engineer shall give his written instructions of decision within a period of fifteen days from the receipt of the contractor's letter. If the Superintending Engineer fails to give his instructions or decision in writing within the aforesaid period or if the contractor is dissatisfied with the instructions or decision of the Superintending Engineer, the contractor may, within 15 days of the receipt of Superintending Engineer's decision, appeal to the Chief Engineer who shall accord an opportunity to the contractor to be heard, if the later so desires, and to offer evidence in support of his appeal. The contractor shall not be represented by an advocate or legal counsel. The Chief Engineer shall give his decision within 30 days of receipt of contractor's appeal. If the contractor is dissatisfied with this decision, the contractor shall within a period of 30 days from receipt of the decision, give notice to the Chief Engineer for appointment of arbitrator failing which the said decision shall be final binding and conclusive and not referable to adjudication by the arbitrator. It is a term of contract that each party invoking arbitration must exhaust the aforesaid mechanism of settlement of claims/disputes prior to invoking arbitration. (ii) Except where the decision has become final, binding and conclusive in terms of Sub Para (i) above disputes or difference shall be referred for adjudication through arbitrator appointed by Managing Director, U P Jal nigam (urban). If the arbitrator so appointed is unable or unwilling to act or resign his appointment or vacates his office due to any reason whatsoever another sole arbitrator shall be appointed in the manner aforesaid. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor. It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed in respect of each such dispute along with the notice for appointment of arbitrator and giving reference to the rejection by the Chief Engineer of the appeal. It is also a term of this contract that no person other than a person appointed by such Managing Director as aforesaid should act as arbitrator and if for any reason that is not possible, the matter shall not be referred to arbitrator at all. It is also a term of this contract that if the contractor does not make any demand for

	appointment of arbitrator in respect of any claims in writing as aforesaid within 45 days of receiving the intimation from the Engineer-in-Charge that the final bill is ready for payment, the claim of the contractor shall be deemed to have been waived and absolutely barred and U.P. Jal nigam (urban) shall be discharged and released of all liabilities under the contract in respect of these claims. The arbitration shall be conducted in accordance with the provisions of the Arbitration and Conciliation Act, 1996 (26 of 1996) or any statutory modifications or re-enactment thereof and the rules made there under and for the time being in force shall apply to the arbitration proceeding under this clause. Parties, before or at the time of appointment of Arbitral Tribunal may agree in writing for fast track arbitration as per the Arbitration and Conciliation Act, 1996 (26 of 1996) as amended in 2015. It is also a term of this contract that the member of the Arbitration Tribunal shall be a Graduate Engineer with experience in handling public works engineering contracts at a level not lower than Chief Engineer (Level-II), U P Jal nigam (urban). This shall be treated as a mandatory qualification to be appointed as arbitrator. It is also a term of the contract that if any fees are payable to the arbitrator these shall be paid equally by both the parties. It is also a term of the contract that the arbitrator shall be deemed to have entered on the reference on the date he issues notice to both the parties calling them to submit their statement of claims and counter statement of claims. The venue of the arbitration shall be such place as may be fixed by the arbitrator in his sole discretion. The fees, if any, of the arbitrator shall, if required to be paid before the award is made and published, be paid half and half by each of the parties. The cost of the reference and of the award (including the fees, if any, of the arbitrator) shall be in the discretion of the arbitrator who may direct to any by whom and in what manner such costs or any part thereof shall be paid and fix or settle the amount of costs to be so paid. Where the total amount of the claims by any party exceeds Rs. 1,00,000/-, the arbitrator shall give reasons for the award. It is also a term of the contract that if any fees are payable to the arbitrator, these shall be paid as may be fixed by the Managing Director, U P Jal nigam (urban) from time to time. The place of arbitration shall be as mentioned in **Schedule F**. In case there is no mention of place of arbitration, the arbitral tribunal shall determine the place of arbitration in consultation with Engineer-in-charge and contractor. The venue of the arbitration shall be such place as may be fixed by the Arbitral Tribunal in consultation with both the parties. Failing any such agreement, then the Arbitral Tribunal shall decide the venue.
Contractor to indemnify Govt. against Patent Rights	**CLAUSE 26** The contractor shall fully indemnify and keep indemnified U.P. Jal nigam (urban) against any action, claim or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties which may be payable in respect of any article or part thereof included in the contract. In the event of any claims made under or action brought against U.P. Jal nigam (urban) in respect of any such matters as aforesaid, the contractor shall be immediately notified thereof and the contractor shall be at liberty, at his own expense, to settle any dispute or to conduct any litigation that may

	arise therefrom, provided that the contractor shall not be liable to indemnify U.P. Jal nigam (urban) if the infringement of the patent or design or any alleged patent or design right is the direct result of an order passed by the Engineer-in-Charge in this behalf.
Lump sum Provisions in Tender	**CLAUSE 27** When the estimate on which a tender is made includes lump sum in respect of parts of the work, the contractor shall be entitled to payment in respect of the items of work involved or the part of the work in question at the same rates as are payable under this contract for such items, or if the part of the work 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.
Action where no Specifications are specified	**CLAUSE 28** In the case of any class of work for which there is no such specifications as referred to in Clause 11, such work shall be carried out in accordance with relevant CPHEEO Manual as amended from time to time, UPJN/UPPWD/CPWD specifications, the Bureau of Indian Standards Specifications. In case, there are no such specifications in Bureau of Indian Standards, the work shall be carried out as per manufacturers' specifications, if not available then as per State/District Specifications. In case there are no such specifications as required above, the work shall be carried out in all respects in accordance with the instructions and requirements of the Engineer-in-Charge.
Withholding and lien in respect of sum due from contractor	**CLAUSE 29** (i) Whenever any claim or claims for payment of a sum of money arises out of or under the contract or against the contractor, the Engineer-in-Charge or U.P. Jal nigam (urban) shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from the security/additional security, if any deposited by the contractor and for the purpose aforesaid, the Engineer-in-Charge or U.P. Jal nigam (urban) shall be entitled to withhold the security deposit, if any, furnished as the case may be and also have a lien over the same pending finalisation or adjudication of any such claim. In the event of the security being insufficient to cover the claimed amount or amounts or if no security has been taken from the contractor, the Engineer-in-Charge or U.P. Jal nigam (urban) shall be entitled to withhold and have a lien to retain to the extent of such claimed amount or amounts referred to above, from any sum or sums found payable or which may at any time thereafter become payable to the contractor under the same contract or any other contract with the Engineer-in-Charge or U.P. Jal nigam (urban) or any contracting person through the Engineer-in-Charge pending finalization of adjudication of any such claim. It is an agreed term of the contract that the sum of money or moneys so withheld or retained under the lien referred to above by the Engineer-in-Charge or U.P. Jal nigam (urban) will be kept withheld or retained as such by the Engineer-in-Charge or U.P. Jal nigam (urban) till the claim arising out of or under the contract is determined by the arbitrator (if the contract is governed by the arbitration clause) 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, joint venture or a limited company, the Engineer-in-Charge or U.P. Jal nigam (urban) 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. (ii) U.P. Jal nigam (urban) 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 and 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 and found not to have been executed, the contractor shall be liable to refund the amount of over-payment and it shall be lawful for U.P. Jal nigam (urban) 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 of any work executed by him under it, the amount of such under payment shall be duly paid by U.P. Jal nigam (urban) to the contractor, without any interest thereon whatsoever. Provided that U.P. Jal nigam (urban) 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 U.P. Jal nigam (urban) on the one hand and the contractor on the other under any term of the contract permitting payment for work after assessment by U.P. Jal nigam (urban).
Lien in respect of claims in other Contracts	**CLAUSE 29A** Any sum of money due and payable to the contractor (including the security deposit returnable to him) under the contract may be withheld or retained by way of lien by the Engineer-in-Charge or U.P. Jal nigam (urban) or any other contracting person or persons through Engineer-in-Charge against any claim of the Engineer-in-Charge or U.P. Jal nigam (urban) or such other person or persons in respect of payment of a sum of money arising out of or under any other contract made by the contractor with the Engineer- in-Charge or U.P. Jal nigam (urban) or with such other person or persons. It is an agreed term of the contract that the sum of money so withheld or retained under this clause by the Engineer-in-Charge or U.P. Jal nigam (urban) will be kept withheld or retained as such by the Engineer-in-Charge or U.P. Jal nigam (urban) or till his claim arising out of the same contract or any other contract is either mutually settled or determined by the arbitration clause or by the competent court, as the case may be and that the contractor shall have no claim for interest or damages whatsoever on this account or on any other ground in respect of any sum of money withheld or retained under this clause and duly notified as such to the contractor.
Unfiltered water supply	**CLAUSE 30** The contractor(s) shall make his/their own arrangements for water required for the work and nothing extra will be paid for the same. This will be subject to the following conditions. (i) That the water used by the contractor(s) shall be fit for construction purposes to the satisfaction of the Engineer-in-Charge. (ii) The Engineer-in-Charge shall make alternative arrangements for supply of water at the

	risk and cost of contractor(s) if the arrangements made by the contractor(s) for procurement of water are in the opinion of the Engineer-in-Charge, unsatisfactory.
Alternate Water Arrangement	**CLAUSE 30A** The contractor shall be allowed to construct temporary wells as may be chosen by the Engineer-in-charge for taking water for construction purposes only after he has got permission of the Engineer-in- Charge in writing. No charges shall be recovered from the contractor on this account, but the contractor shall be required to provide necessary safety arrangements to avoid any accidents or damage to adjacent buildings, roads and service lines. He shall be responsible for any accidents or damage caused due to construction and subsequent maintenance of the wells and shall restore the ground to its original condition after the wells are dismantled on completion of the work.
U.P. Jal nigam (urban) water supply, if available	**CLAUSE 30 B** Water, if available, may be supplied to the contractor by U.P. Jal nigam (urban) subject to the following conditions:- (i) The water charges @ 1 % shall be recovered on gross amount of the work done. (ii) The contractor(s) shall make his/their own arrangement of water connection and laying of pipelines from existing main of source of supply. (iii) U.P. Jal nigam (urban) does not guarantee to maintain uninterrupted supply of water and it will be incumbent on the contractor(s) to make alternative arrangements for water at his/ their own cost in the event of any temporary break down in U.P. Jal nigam (urban) water main so that the progress of his/their work is not held up for want of water. No claim of damage or refund of water charges will be entertained on account of such break down.
Hire of Plant and Machinery	**CLAUSE 31** The contractor shall arrange at his own expense all tools, plant, machinery and equipment (hereinafter referred to as T&P) required for execution of the work.
Employment of Technical Staff and Employees	**CLAUSE 32** **Contractors Superintendence, Supervision, Technical Staff & Employees**: (i) The contractor shall provide all necessary superintendence during execution of the work and all along 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(s), qualifications, experience, age, address(s) and other particulars along with certificates, of the principal technical representative to be in charge of the work and other technical representative(s) who will be supervising the work. Minimum requirement of such technical representative(s) and their qualifications and experience shall not be lower than specified in **Schedule F**. Even of the contractor (or partner(s) in case of firm/ company)is himself / herself an Engineers, it is necessary on the part of the contractor to Employ principal technical representative / technical representative (s) as per stipulation in **Schedule F.**

	The Engineer-in-Charge shall within 3 days of receipt of such communication intimate in writing his approval or otherwise of such a representative(s) 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(s) according to the provisions of this clause. Decision of the tender accepting authority shall be final and binding on the contractor in this respect. Such a principal technical representative and other technical representative(s) shall be appointed by the contractor soon after receipt of the approval from Engineer-in-charge and shall be available at site before start of work. All the provisions applicable to the principal technical representative under the Clause will also be applicable to other technical representative(s) The principal technical representative and other technical representative(s) shall be present at the site of work for supervision at all times when any construction activity is in progress and also present himself/themselves, as required, to the Engineer-in-Charge and/or his designated representative to take instructions. Instructions given to the principal technical representative or other technical representative(s) shall be deemed to have the same force as if these have been given to the contractor. The principal technical representative and other technical representative(s) shall be actually available at site fully during all stages of execution of work, during recording/checking/test checking of measurements of works and whenever so required by the Engineer-in-Charge and shall also note down instructions conveyed by the Engineer-in-Charge or his designated representative(s) in the site order book and shall affix his/their signature in token of noting down the instructions and in token of acceptance of measurements/checked measurements/ test checked measurements. The representative(s) shall not look after any other work. Substitutes, duly approved by Engineer-in-Charge of the work in similar manner as aforesaid shall be provided in event of absence of any of the representative(s) by more than two days. If the Engineer-in-Charge, whose decision in this respect is final and binding on the contractor, is convinced that no such technical representative(s) is/are effectively appointed or is/are effectively attending or fulfilling the provision of this clause, a recovery (non refundable) shall be effected from the contractor as specified **in Schedule F** and the decision of the Engineer-In-Charge as recorded in the site order book and measurement recorded checked/test checked in Measurement Books shall be final and binding on the contractor. Further if the contractor fails to appoint suitable technical Principal technical representative and/or other technical representative(s) and if such appointed persons are not effectively present or are absent by more than two days without duly approved substitute or do not discharge their responsibilities satisfactorily, the Engineer-in-Charge shall have full powers to suspend the execution of the work until such date as suitable other technical representative(s) is/are appointed and the contractor shall be held responsible for the delay so caused to the work. The contractor shall produce evidence of appointment of technical representative if at any time so required by the Engineer-in-Charge. (ii) 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. The Engineer-in-Charge shall be at liberty to object to and require the contractor to remove from the works any person who in his opinion misconducts himself, or is incompetent or negligent in the performance of his duties or whose employment is otherwise considered by the Engineer-in-Charge to be undesirable. Such person shall not be employed again at works site without the written permission of the Engineer-in-Charge and the persons so removed shall be replaced as soon as possible by competent substitutes. Technical officers / staff deployed by the Contractor at any construction site will also be responsible for inferior quality/poor performance of any work and his name will be circulated to all works divisions of U.P. Jal nigam (urban) to debar from any other site, if his name is being proposed by other contractors**.**
Levy/Taxes Payable by Contractor	**CLAUSE 33** (i)The rates quoted by the Contractor shall be exclusive of GST, but inclusive of all other taxes, levies, tolls, royalties, Labour Cess etc. The GST shall be paid by the contractor and U.P. Jal nigam (urban) will reimburse GST so paid on actual basis. Building and other Construction Workers Welfare Cess or any other tax, levy or Cess in respect of input for or output by this contract shall be payable by the contractor and U.P. Jal nigam (urban) shall not entertain any claim whatsoever in this respect except as provided under **Clause 34.** (ii)The contractor shall deposit royalty and obtain necessary permit for supply of the red bajri, stone, kankar, etc. from local authorities. If pursuant to or under any law, notification or order any royalty, cess or the like becomes payable by the Government of India and does not any time become payable by the contractor to the State Government, Local authorities in respect of any material used by the contractor in the works, then in such a case, it shall be lawful to U.P. Jal nigam (urban) and it will have the right and be entitled to recover the amount paid in the circumstances as aforesaid from dues of the contractor.
Condition of Reimbursement of Levies/Taxes if Levied after receipt of Tenders	**CLAUSE 34** (i) All tendered rates shall be inclusive of any tax **(excluding GST),** levy or cess applicable on last stipulated date of receipt of tender including extension if any. No adjustment i.e. increase or decrease shall be made for any variation in the rate of GST, Building and Other Construction Workers Welfare Cess or any tax, levy or cess applicable on inputs. However, effect of variation in rates of GST or Building and Other Construction Workers Welfare Cess or imposition or repeal of any other tax, levy or cess applicable on output of the works contract shall be adjusted on either side, increase or decrease. Provided further that for Building and Other Construction Workers Welfare Cess or any tax **(other than GST which will be reimbursed on actual basis),** levy or cess varied or imposed after the last date of receipt of tender including extension if any, any increase shall be reimbursed to the contractor only if the contractor necessarily and properly pays such increased amount of taxes/levies/ cess. Provided further that such increase including GST shall not be made in the extended period of contract for which the contractor alone is responsible for delay as determined

	by authority for extension of time under Clause 5 in **Schedule F**. (ii) The contractor shall keep necessary books of accounts and other documents for the purpose of this condition as may be necessary and shall allow inspection of the same by a duly authorized representative of U.P. Jal nigam (urban) and/or the Engineer-in-Charge and shall also furnish such other information/document as the Engineer-in-Charge may require from time to time. (iii) The contractor shall, within a period of 30 days of the imposition of any such further tax or levy or cess, give a written notice thereof to the Engineer-in-Charge that the same is given pursuant to this condition, together with all necessary information relating thereto.
Termination of Contract on death of contractor	**CLAUSE 35** Without prejudice to any of the rights or remedies under this contract, if the contractor dies, the Engineer-in-charge on behalf of U.P. Jal nigam (urban) shall have the option of terminating the contract without compensation to the contractor.
If relative working in U.P. Jal nigam (urban) then the contractor not allowed to tender	**CLAUSE 36** The contractor shall not be permitted to tender for works in the jurisdiction of Superintending Engineer responsible for execution of contracts in which his near relative is posted as Accountant or as an officer in any capacity between the grades of the Superintending Engineer and Junior 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 Officer in U P Jal nigam (urban). Any breach of this condition by the contractor would render him liable to be debarred from tendering in for any breach of this condition. **NOTE:** By the term "near relatives" is meant wife, husband, parents and grand parents, children and grand children, brothers and sisters, uncles, aunts and cousins and their corresponding in-laws.
No Gazetted Engineer to work as Contractor within one year of retirement	**CLAUSE 37** No engineer of gazetted rank (Category 'A' and 'B') or other gazetted officer employed in engineering or administrative duties in an engineering department of the Government-State or Central shall work as a contractor or employee of a contractor for a period of one year after his retirement from Government service without the previous permission of Government in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found at any time to be such a person who had not obtained the permission of Government as aforesaid, before submission of the tender or engagement in the contractor's service, as the case may be.
Theoretical Consumption of Materials	**CLAUSE 38** (i) After completion of the work and also at any intermediate stage in the event of non (reconciliation of materials issued, consumed and in balance - (see Clause 10), theoretical quantity of materials issued by U.P. Jal nigam (urban) for use in the work shall be calculated on the basis and method given hereunder:- (a) Quantity of cement shall be calculated on the basis of quantity of cement required for different items of work as shown in the Schedule of Rates mentioned

	in **Schedule 'F'**. In case any item is executed for which standard constants for the consumption of cement or bitumen are not available in the above mentioned schedule/statement or cannot be derived from the same shall be calculated on the basis of standard formula to be laid down by the Engineer-in-Charge. (b) Theoretical quantity of steel reinforcement or structural steel sections shall be taken as the quantity required as per design or as authorized by Engineer-in-Charge, including authorized lappages, chairs etc. plus 3% wastage due to cutting into pieces, such theoretical quantity being determined and compared with the actual issues each diameter wise, section wise and category wise separately. () For any other material as per actual requirements. (ii) Over the theoretical quantities of materials so computed a variation shall be allowed as specified in **Schedule F**. The difference in the net quantities of material actually issued to the contractor and the theoretical quantities including such authorized variation, if not returned by the contractor or if not fully reconciled to the satisfaction of the Engineer-in-Charge within fifteen days of the issue of written notice by the Engineer-in-Charge to this effect, shall be recovered at the rates specified in **Schedule F**, without prejudice to the provision of the relevant conditions regarding return of materials governing the contract. Decision of Engineer-in-Charge in regard to theoretical quantities of materials, which should have been actually used as per the Annexure of the standard schedule of rates and recovery at rates specified in **Schedule F**, shall be final & binding on the contractor. (iii) The said action under this clause is without prejudice to the right of U.P. Jal nigam (urban) to take action against the contractor under any other conditions of contract for not doing the work according to the prescribed specifications.
Compensation during warlike situations	**CLAUSE 39** Deleted
Apprentices Act provisions to be complied with	**CLAUSE 40** The contractor shall comply with the provisions of the Apprentices Act, 1961 and the rules and orders issued thereunder from time to time. If he fails to do so, his failure will be a breach of the contract and the competent authority 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.
Release of Security deposit after labour clearance	**CLAUSE 41** Release of Security Deposit of the work shall not be done till the contractor produces a clearance certificate from the Labour Officer. As soon as the work is virtually complete, the contractor shall apply for the clearance certificate to the Labour Officer under intimation to the Engineer-in-Charge. The Engineer-in-Charge, on receipt of the said communication, shall write to the Labour Officer to intimate if any complaint is pending against the contractor in respect of the work. If no complaint is pending, on record till after 3 months after completion of the work and/or no communication is received from the Labour Officer to this effect till six months after the date of completion, it will be deemed to have received the clearance certificate and the Security Deposit will be released if

	otherwise due.
Return of Surplus materials	**CLAUSE 42** Notwithstanding anything contained to the contrary in this contract, where any materials for the execution of the contract are procured with the assistance of U.P. Jal nigam (urban) either by issue from U.P. Jal nigam (urban) stocks or purchase made under orders or permits or licences issued by Government/U.P. Jal nigam (urban), the contractor shall hold the said materials economically and solely for the purpose of the contract and not dispose of them without the written permission of U.P. Jal nigam (urban) and return, if required by the Engineer-in-Charge, all surplus or unserviceable materials that may be left with him after the completion of the contract or at its termination for any reason whatsoever on being paid or credited such price as the Engineer-in-Charge shall determine having due regard to the condition of the materials. The price allowed to the contractor however shall not exceed the amount charged to him excluding the element of storage charges. The decision of the Engineer-in-Charge shall be final and conclusive. In the event of breach of the aforesaid condition, the contractor shall in addition to throwing himself open to action for contravention of the terms of the licence or permit and/or for criminal breach of trust, be liable to U.P. Jal nigam (urban) for all moneys, advantages or profits resulting or which in the usual course would have resulted to him by reason of such breach.
Condition relating to use of asphaltic materials	**CLAUSE 43** (i) The contractor undertakes to make arrangement for the supervision of the work by the firm supplying the tar or bitumen used. (ii) The contractor shall collect the total quantity of tar or bitumen required for the work as per standard formula, before the process of painting is started and shall hypothecate it to the Engineer-in-Charge. If any bitumen or tar remains unused on completion of the work on account of lesser use of materials in actual execution for reasons other than authorized changes of specifications and abandonment of portion of work, a corresponding deduction equivalent to the cost of unused materials as determined by the Engineer-in-Charge shall be made and the material return to the contractors. Although the materials are hypothecated to U.P. Jal nigam (urban), the contractor undertakes the responsibility for their proper watch, safe custody and protection against all risks. The materials shall not be removed from site of work without the consent of the Engineer-in-Charge in writing. (iii) The contractor shall be responsible for rectifying defects noticed within a year from the date of handing over of the work and the portion of the security deposit relating to asphaltic work shall be refunded after the expiry of this period.
Insurance	**CLAUSE 44** The Contractor shall provide, in the joint names of the Engineer-in-Charge and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the **Schedule F** for the following events which are due to the Contractor's risks : (a) loss of or damage to the Works, Plant and Materials; (b) loss of or damage to Equipment; (c) loss of or damage of property (except the Works, Plant, Materials and Equipment) in

	connection with the Contract; and (d) personal injury or death. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.
Safety Security and Protection of Environment	**CLAUSE 45** The Contractor shall, throughout the execution and completion of the Works and the remedying of any defects therein: (a) have full regard for the safety of all persons entitled to be upon the Site and keep the Site (so far as the same is under his control) and the Works (so far as the same are not completed or occupied by U.P. Jal nigam (urban)) in an orderly state appropriate to the avoidance of danger to such persons. (b) Provide and maintain at his own cost all lights, guards, fencing, warning signs and watchmen and where necessary or required by the Engineer or by any duly constituted authority, for the protection of the Works or for the safety and convenience of the public or others, and (c) take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

Appendix to Part I

General Condition of Contract

SALIENT FEATURES OF SOME MAJOR LABOUR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN BUILDING AND OTHER CONSTRUCTION WORK.

a) Workmen Compensation Act 1923: - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

b) Payment of Gratuity Act 1972: - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed the prescribed minimum years (say, five years) of service or more or on death the rate of prescribed minimum days'(say, 15 days) wages for every completed year of service. The Act is applicable to all establishments employing the prescribed minimum number (say, 10) or more employees.

c) Employees P.F. and Miscellaneous Provision Act 1952: The Act Provides for monthly contributions by the Employer plus workers at the rate prescribed (say, 10% or 8.33%). The benefits payable under the Act are:

i. Pension or family pension on retirement or death as the case may be.

ii. Deposit linked insurance on the death in harness of the worker.

iii. Payment of P.F. accumulation on retirement/death etc.

d) Maternity Benefit Act 1951: - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

e) Contract Labour (Regulation & Abolition) Act 1970: - The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by Law. The principal Employer is required to take Certificate of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ prescribed minimum (say 20) or more contract labour.

f) Minimum Wages Act 1948: - The Employer is to pay not less than the Minimum Wages fixed by appropriate U.P. Jal nigam (urban) as per provisions of the Act if the employment is a scheduled employment. Construction of buildings, roads, runways are scheduled employment.

g) Payment of Wages Act 1936: - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

h) Equal Remuneration Act 1979: - The Act provides for payment of equal wages for work of equal nature to male and female workers and for not making discrimination against female employees in the matters of transfers, training and promotions etc.

i) Payment of Bonus Act 1965: - The Act is applicable to all establishments employing prescribed minimum (say, 20)or more workmen. The Act provides for payments of annual bonus within the prescribed range of percentage of wages to employees drawing up to the prescribed amount of wages, calculated in the prescribed manner. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. States may have different number of employment size.

j) Industrial Disputes Act 1947: - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

k) Industrial Employment (Standing Orders) Act 1946: - It is applicable to all establishments employing prescribed minimum (say, 100, or 50). The Act provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get these certified by the designated Authority.

l) Trade Unions Act 1926: - The Act lays down the procedure for registration of trade unions of workmen and Employers. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.

m) Child Labour (Prohibition & Regulation) Act 1986: - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulations of employment of children in all other occupations and processes. Employment of child labour is prohibited in building and construction industry.

n) Inter-State Migrant Workmen's (Regulation of Employment & Conditions of Service) Act 1979: - The Act is applicable to an establishment which employs prescribed minimum (say, five) or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as Housing, Medical-Aid, Travelling expenses from home up to the establishment and back etc.

o) The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996: - All the establishments who carry on any building or other construction work and employs the prescribed minimum (say, 10) or more workers are covered under this Act. All such establishments are required to pay cosset the rate not exceeding 2% of the cost of construction as may be modified by U.P. Jal nigam (urban). The Employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by U.P. Jal nigam (urban).

p) Factories Act 1948: - The Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing the prescribed minimum (say, 10) persons or more with aid of power or another prescribed minimum (say, 20) or more persons without the aid of power engaged in manufacturing process.

q) Arbitration and Conciliation Act, 1996: - The Act lays down the procedure for appointment of Arbitrator, Arbitration and conciliation, Jurisdiction of Arbitral Tribunals, Recourse against Arbitral award appeals.

SECTION – 4

PART-II

CONDITIONS OF CONTRACT

(SPECIAL CONDITIONS OF CONTRACT)

SPECIAL CONDITIONS OF CONTRACT

(A)GENERAL

1. The contractor shall submit the time and progress chart and progress report using the mutually agreed sotware or in other format decided by Engineer-in-Charge for the work done during previous month to the Engineer-in-Charge on or before fifth day of each month failing which are over shall be made in case of delay in submission of the monthly progress report.

1.1 Project information, giving the broad features of the work under the contract, and the broadstructural as well as architectural and other details

1.2 Introduction, giving a brief scope of the work under the contract, and the broad structural or otherdetails.

1.3 Construction schedule of the various components of the work through a bar chart for the next three quarters (or as may be specified), showing the milestones, targeted tasks and upto date progress

1.4 Progress chart of the various components of the work that are planned and achieved, for themonth as well as cumulative upto the month, with reasons for deviations, if any, in a tabularformat.

1.5 Plant and machinery statement, indicating those deployed in the work, and their working status.

1.6 Man-power statement, indicating individually the names of all the staff deployed in the work,along with their designations.

1.7 Financial statement, indicating the broad details of all the running account payments received upto date, such as gross value of work done, advances taken recoveries effected, amounts withheld, net payments, details of cheque payments received, etc.

1.8 A statement showing the extra and substituted items submitted by the contractor, and the payments received against them, items pending for sanction/decision by U.P. Jal Nigam, broad details of the Bank Guarantees, indicating clearly their validity periods, broad details of the insurance policies taken by the contractor, if any, the advances received and adjusted.

1.9 Progress photographs, in colour, of the various items/components of the work done upto date, toindicate visually the actual progress of the work. Quality assurance and quality control tests conducted during the month, with the results thereof.

1.10 Videography at various stages of construction right from the day of start of work to date of completion/occupation, covering all major events, inspections, visits by dignitaries etc.

1.11 All other departmental permissions i.e any type of road crossing, temporary electricity connection, any such type of matter and any damage caused to utilities of other department will be paid by contractor. No extra payment will be given by Jal Nigam.

2. INTERPRETING SPECIFICATIONS:

In interpreting the specifications, the followingorder ofdecreasing importance shallbe followedincaseofcontradictions:

a. Nomenclature ofitemsgivenintheBillofquantitiesinthetender.
b. Specifications
c. Specialconditions
d. Contract&ClausesasperGeneral Conditions of Contract.

e. UPJN/PWD/C.P.W.D. Specificationsasmentioned inclause11under schedule‘F’and MORTHSpecificationswithupto-datecorrection slips.

f. Relevant I.S.Codesorspecification.

g. DirectionsofEngineer-in-chargeshallbeapplicablewherenoneoftheaboveistobe applied.

3. RATES:

3.1 Unless otherwise provided in the Bill of quantities the rate tendered by the contractor shall be allinclusive and shall apply to all heights, lifts, leads and depths to the building and nothings extra shall be payable to him on this account.

3.2 Unless otherwise specified in the Bill of quantities, the rates for all items of work shall be considered as inclusive of pumping out or bailing out of water, if required for which no extra payment will be made. This will include water encountered from any source such as rains, floods, sub soil water table being high and /or due to any other cause whatsoever.

3.3 The tenderer shall abide by the rules and regulations of GST or any other tax etc. Necessary deductions on account of taxes shall be made on the gross value of the work done from the bills of the contractor as per the provisions of above stated Acts. Necessary certificates, if required, for tax deduction at source shall be issued to the contractor by the Engineer in Charge.Howeveracceptability of the certificate by the concerned authority shall not be responsibility of Engineer-in-charge. The decision of the Engineer-in-Charge regarding quantum of tax to be deducted at source shall be final and binding on the contractor.

3.4 The contractor shall comply with proper and legal orders and directions of the local or public authority of municipality and abide by the rules and regulations and pay all fees and charges which he may be liable. Quoted rates shall be considered inclusive of all such fees and charges.

3.5 The rates quoted by the Contractor are deemed to be inclusive of site clearance, setting out work, profile, setting lay out on ground, establishment of reference bench mark(s), installing various signage, taking spot levels, survey with total station, construction of all safety and protection devices, compulsory use of helmet and safety shoes, and other appropriate safety gadgets by workers, imparting continuous training for all the workers, barriers, preparatory works, construction of clean, hygienic and well ventilated workers housings in sufficient numbers as per drawing supplied by Engineer-in-charge, working during monsoon or odd season, working beyond normal hours and any other unforeseen but essential incidental works required to complete this work. Nothing extra shall be payable on this account and no extension of time for completion of work shall be granted on these accounts.

3.6 All ancillary and incidental facilities required for execution of work like labour camp, stores, fabrication yard, offices for Contractor, watch and ward, temporary ramp required to be made for working at the basement level, temporary structure for plants and machineries, water storage tanks, installation and consumption charges of temporary electricity, telephone, water etc. required for execution of the work, liaison and pursuing for obtaining various No Objection Certificates, completion certificates from local bodies etc., protection works, testing facilities / laboratory at site of work, facilities for all field tests and for taking samples etc. during execution or any other activity which is necessary (for execution of work and as directed by Engineer-in-Charge), shall be deemed to be included in rates quoted by the Contractor, for various items in the schedule of quantities. Nothing extra shall be payable on these accounts. Before start of the work, the Contractor shall submit to the Engineer-in-Charge, a site / construction yard layout, specifying areas for construction, site office, positioning of machinery, material yard, cement &other storage, fabrication yard, site laboratory, water tank etc.

3.7 For completing the work in time, the Contractor might be required to work in two or more shifts(including night shifts). No claim whatsoever shall be entertained on this account, not with-standing the fact that the Contractor may have to pay extra amounts for any reason, to thelabourers and other staff engaged directly or indirectly on the work according to the provisions of the labour and other statutory bodies regulations and the agreement entered upon by the Contractor with them.

3.8 All material shall only be brought at site as per programme finalized with the Engineer- in-Charge. Any pre-delivery of the material not required for immediate consumption shall not beaccepted and thus not paid

for.

4. Electric Connection & Supply:

4.1 The contractor shall make his own arrangements for obtaining electric connections, if requiredand make necessary payments directly to U.P. Jal Nigam concerned.

4.2 U.P. Jal Nigam shall in no way be responsible for either any delay in getting electric connectionfor execution of the work or not getting connection at all. No claim of any kind whatsoever onthis account shall be entertained from the contractor.

5. Co-operation & Co-ordination with other agencies:

5.1 The contractor for this work shall plan his work in such a manner so that the work (s) of othercontractor (s) is /are not affected in any way. The work should be planned in a systematic manner so as to ensure proper co-ordination of various disciplines viz. sanitary & water supply, drainage, rain water harvesting, electrical, fire-fighting, information technology, communication &electronics and any other services.

5.2 Conduits for electrical wiring/cables will be laid in such a way that they leave enough space forConcreting and do not adversely affect the structural members. Nothing extra over the agreement rate shall be paid for the same.

5.3 The successful tenderer shall co-ordinate with other contractors and agencies engaged, if any, and exchange freely all technical information so as to make the execution of this works contract smooth. No remuneration should be claimed from U.P. Jal Nigam for such technical cooperation. If any unreasonable hindrance is caused to other agencies and any completed portion of the work has to be dismantled and re-done for want of cooperation and coordination by the successful tenderer during the course of work, such expenditure incurred will be recovered from the successful tenderer if the restoration work to the original condition or specification of the dismantled portion of the work was not undertaken by the successful tenderer himself.

5.4 The Contractor shall take all necessary precautions to prevent any nuisance or inconvenience to the owners, tenants or occupants of the adjacent properties and to the public in general. The Contractor shall take all care, as not to damage any other adjacent property or other services running adjacent to the plot/alignment. If any damage is done, the same shall be made good by the Contractor at his own cost and to the entire satisfaction of the Engineer-in-Charge. The Contractor shall use such methodology and equipments for execution of the work, so as to cause minimum environmental pollution of any kind during construction. Further, the Contractor shall take all precautions to abide by the environmental related restrictions imposed by Pollution Control Board, of State/ honourable NGT.

5.5 Utmost care shall be taken to keep the noise level to the barest minimum so that no disturbance as far as possible is caused to the occupants / users of adjoining buildings. No claim what so ever on account of site constraints mentioned above or any other site constraints, inadequate availability of skilled, semi-skilled or unskilled workers in the near vicinity, non-availability of construction machinery spare parts and any other constraints not specifically stated here, shall be entertained from the Contractor.

5.6 The contractor shall conduct his work, so as not to interfere with or hinder the progress orcompletion of the work being performed by other contractor(s) or by the Engineer-in-Charge andshall as far as possible arrange his work and shall place and dispose off the materials being used or removed so as not to interfere with the operations of other contractors or he shall arrange his work with that of the others in an acceptable and in a proper co-ordinated manner and shall perform it in proper sequence to the complete satisfaction of others.

6. Safety Measures:-

6.1 The contractor shall also provide necessary barricade, informatory boards, lights and flagmen ateither end of the execution area and at such intermediate points as required & as directed by theEngineer-in-charge at no extra cost.

6.2 The contractor shall maintain in good condition all work executed till the completion of the entirework entrusted to the contractor under this contract & nothing extra shall be paid on this account.

6.3 For form work use of solid timber and products involving solid timber shall not be permitted.

6.4 Any damage to work resulting from rains or from any other cause until the work is handed overby contractor after completion of work shall be made good by the contractor at his own cost.

6.5 Any damage made by men, machinery, vehicles (LMVs or HMVs), or any way to the public/private property such as services of electricity, water, telephone, LAN, road and path during execution of the work

shall be repaired/redone by the Agency/Contractor. If contractor fails to repair/redone damage, the work shall be done on his risk as per the direction of the Engineer in charge. No any cost claim shall be entertained on this account.

6.6 All safety equipment such as Safety Helmets, Safety shoes, gloves, Safety belt etc. shall be madeavailable to site Engineers, Supervisors, labourers, masons fitters etc.

7. Handling of Material/Waste :-

7.1 Unserviceable materials shall have to be removed and disposed off to places as decided by theEngineer-in-charge. Scarified rubbish of brick aggregates of WBM etc. shall be spread on the shoulders / on the slope of embankments and suitably compacted for which nothing extra shall be paid.

7.2 The contractor shall take instructions from the Engineer-in-charge for stacking of materials in any place. Double handling of materials or excavated earth if required at any stage, shall have to be done by the contractor at his own cost. No excavated earth or building material shall be stacked on areas where other buildings, roads services of compound walls are to be constructed.

8. The contractor& his work people shall observe all relevant rules regarding security promulgated in which work is to be carried out by the controlling authority of the area.

9. In case of any calamity or injury to any labour/ workmen etc. or loss / wastage of materials due to nature or insurgency, contractor shall have to bear the cost of compensation and no claim to this effect shall be entertained by U.P. Jal Nigam.

10. The contractor shall keep himself ready for execution of any item / items of work / part of the item of work on emergent notice given by the Engineer-in-charge on day to day basis during rainy season at no extra cost.

11. The contractor shall give a performance test of the entire installation (s) as per standing specificationsbefore the work is finally accepted and nothing extra whatsoever shall be payable to the contractor for the test.

12. Some restrictions may be imposed by the administration/ security staff etc. on the working and for movement of labour, materials etc. The contractor shall be bound to follow all such restriction / instructions including issue of identity cards to all persons authorized by him to do work / visit the work site and nothing shall be payable on this account.

13. No claim for idle establishment & labour, machinery &equipments, tools & plants and the like, for anyreason whatsoever, shall be admissible during the execution of work as well as after its completion.

14. CLEANLINESS OF SITE:

14.1 The Contractor shall not stack building material /malba /muck/ rubbish on the land or road of thelocal development authority or on the land owned by the others, as the case may be. So the muck, rubbish etc. shall be removed periodically as directed by the Engineer-in-Charge, from the site of work to the approved dumping grounds as per the local byelaws and regulations of the concerned authorities and all necessary permissions in this regard from the local bodies shall be obtained by the Contractor.

14.2 Nothing extra shall be payable on this account. In case, the Contractor is found stacking thebuilding material / malba as stated above, the Contractor shall be liable to pay the stacking charges / penalty as may be levied by the local body or any other authority and also to face penal action as per the rules, regulations and bye-laws of such body or authority. The Engineer -in-Charge shall be at liberty to recover, such sums due but not paid to the concerned authorities on the above counts, from any sums due to the Contractor including amount of the Security Deposit and performance guarantee in respect of this contract agreement.

14.3 CONDITIONS PRACTICES DURING CONSTRUCTION PHASE:

14.3.1 The contractor shall specify and limit construction activity in pre-planned/designated areas and shall start construction work after securing the approval for the same from the Engineer-in-Charge. This shall include areas of construction, storage of materials, and material and personnel movement.

14.3.2 Preserve and Protect Landscape during Construction:

a. The contractor shall ensure that no trees, existing or otherwise, shall be harmed anddamage to roots. These shall be prevented during trenching, placing backfill, driving or parking heavy equipment, dumping of trash and protected from oil, paint, and other materials detrimental to plant health. These activities shall be restricted to the areas outside of the canopy of the tree, or, from a safe distance from the tree/plant by means of barricading. Trees will not be used for support; their

trunks shall not be damaged by cutting and carving or by nailing posters, advertisements or other material. Lighting of fires or carrying out heat or gas emitting construction activity within the ground, covered by canopy of the tree is not at all permitted.

b. The contractor shall take steps to protect trees or saplings if any identified forpreservation within the construction site using tree guards of approved specification.

c. The contractor shall avoid cut and fill in the root zones, through delineating and fencing the drip line (the spread limit of a canopy projected on the ground) of all the trees or group of trees. The zones of movement of heavy equipment, parking, or excessive foot traffic shall be separated from the fenced plant protection zones.

d. The contractor shall ensure that maintenance activities during construction period shall be performed as needed to ensure that the vegetation remains healthy.

14.3.3 Contractor shall be required to develop and implement a waste management plan, quantifying material diversion goals. He shall establish goals for diversion from disposal in landfills and incinerators, if required, and adopt a construction waste management plan to achieve these goals. A project wide policy of "Nothing leaves the Site" shall be followed.

14.3.4 Contractor shall collect all construction waste generated on site. He may consider at segregating wastes based on their utility and examine means of sending such waste to manufacturing units which use them as raw material or other site which require it for specific purpose. Typical construction debris could be broken bricks, steel bars, broken tiles, spilled concrete and mortar etc.

14.3.5 The contractor shall ensure cleanliness of workplace with regard to the disposal of waste and effluent; provide clean drinking water and latrines and urinals as per applicable provisions. Adequate toilet facilities shall be provided for the workmen within easy access of their place of work. The total no. to be provided shall not be less than 1 per 30 employees in any one shift. Toilet facilities shall be provided from the start of building operations, connection to a sewer shall be made as soon as practicable. Every toilet shall be so constructed that the occupant is sheltered from view and protected from the weather and falling objects. Toilet facilities shall be maintained in a sanitary condition. A sufficient quantity of disinfectant shall be provided and natural or artificial illumination shall also be provided.

14.3.6 The contractor shall ensure that air pollution due to dust/generators is kept to aminimum, preventing any adverse effects on the workers and other people in and around the site. The contractor shall ensure proper screening, covering stockpiles, covering brick and loads of dusty materials, wheel-washing facility, gravel pit, and water spraying. Contractor shall also ensure the following activities to prevent air pollution during construction:

- ✓ Clear vegetation only from areas where work will start right away.
- ✓ Vegetate / mulch areas where vehicles do not ply.
- ✓ Apply gravel / landscaping rock to the areas where mulching / paving is impractical.
- ✓ Identify roads on-site if applicable that would be used for vehicular traffic. Upgradevehicular roads (if these are unpaved) by increasing the surface strength by improving particle size, shape and mineral types that make up the surface & base and add surface gravel to reduce source of dust emission to limit amount of fine particles (smaller than 0.075mm) to 10 - 20%.
- ✓ Water spray, through a simple hose for small projects, to keep dust under control. Fine mists should be used to control fine particulate. However, this should be done with care so as not to waste water. Heavy watering can also create mud, which when tracked onto paved public roadways, must be promptly removed. Also, there must be an adequate supply of clean water nearby to ensure that spray nozzles don't get plugged.
- ✓ Water spraying shall be done on:
  - Any dusty materials before transferring, loading and unloading
  - Area where demolition work is being carried out
  - Any un-paved main haul road
  - Areas where excavation or earth moving activities are to be carried out.
- ✓ The contractor shall ensure that the speed of vehicles within the site is limited to 10km/hr.
- ✓ All material storages should be adequately covered and contained so that they are notexposed to

situations where winds on site could lead to dust / particulate emissions.

- ✓ Spills of dirt or dusty materials will be cleaned up promptly so the spilled material does not become a source of fugitive dust and also to prevent of seepage of pollutant laden water into the ground aquifers. When cleaning up the spill, ensure that the clean-up process does not generate additional dust. Similarly, spilled concrete slurries or liquid wastes should be contained / cleaned up immediately before they can infiltrate into the soil / ground or runoff in nearby areas.
- ✓ Provide hoardings of not less than 3m high along the site boundary, next to a road or other public area at his cost.
- ✓ Provide dust screens, sheeting or netting to scaffold along the perimeter of the building athis cost.
- ✓ Cover stockpiles of dusty material with impervious sheeting at his cost.
- ✓ Cover dusty load on vehicles by impervious sheeting before they leave the site at his cost.

14.3.7 The contractor shall ensure that no construction leachate (e.g. cement slurry etc.), is allowed to percolate into the ground. Adequate precautions will be taken to safeguard against this including reduction of wasteful curing processes, collection, basic filtering and reuse. The contractor shall follow requisite measures for collecting drainage water run-off from construction areas and material storage sites and diverting water flow away from such polluted areas. Temporary drainage channels, perimeter dike/swale, etc. shall be constructed to carry the pollutant-laden water directly to the treatment device or facility (municipal sewer line).

14.3.8 Staging (dividing a construction area into two or more areas to minimize the area of soil that will be exposed at any given time) should be done to separate undisturbed land from land disturbed by construction activity and material storage.

14.3.9 The contractor shall comply with the safety procedures, norms and guidelines (as applicable) as outlined in Volume-2, Part 7 Construction Management Practices and Safety, of National Building Code of India, 2016, Bureau of Indian Standards. A copy of all pertinent regulations and notices concerning accidents, injury and first-aid shall be prominently exhibited at the work site. Depending upon the scope & nature of work, a person qualified in first-aid shall be available at work site to render and direct first-aid to causalities. A telephone may be provided to first-aid assistant with telephone numbers of the hospitals displayed. Complete reports of all accidents and action taken thereon shall be forwarded to the competent authorities.

14.3.10 The contractor shall ensure the following activities for construction workers safety, among other measures at his cost-

- Guarding all parts of dangerous machinery.
- Precautionary signs for working on machinery
- Maintaining hoists and lifts, lifting machines, chains, ropes, and other lifting tackles in good condition.
- Durable and reusable formwork systems to replace timber formwork and ensure that formwork where used is properly maintained.
- Ensuring that walking surfaces or boards at height are of sound construction and are provided with safety rails or belts.
- Provide protective equipment; helmets etc.
- Provide measures to prevent fires. Fire extinguishers and buckets of sand to be provided in the fire-prone area and elsewhere.
- Provide sufficient and suitable light for working during night time.

14.3.11 The storage of material shall be as per standard good practices as specified in Volume-2, Part 7 Construction Management Practices and Safety of National Building Code of India, 2016, Bureau of Indian Standards and shall be to the satisfaction of the Engineer-in-Charge to ensure minimum wastage and to prevent any misuse, damage, inconvenience or accident. Watch and ward of the Contractor's materials shall be his own responsibility. There should be a proper planning of the layout for stacking and

storage of different materials, components and equipments with proper access and proper manoeuvrability of the vehicles carrying the materials. While planning the layout, the requirements of various materials, components and equipments at different stages of construction shall be considered.

14.3.12 The contractor shall provide for adequate number of garbage bins around the construction site and the workers facilities and will be responsible for the proper utilization of these bins for any solid waste generated during the construction. The contractor shall ensure that the site and the workers facilities are kept litter free. Separate bins should be provided for plastic, glass, metal, biological and paper waste and labeledin both Hindi and English with suitable symbols.

14.3.13 The contractor shall prepare and submit 'Spill prevention and control plans' before the start of construction, clearly stating measures to stop the source of the spill, to contain the spill, to dispose the contaminated material and hazardous wastes, and stating designation of personnel trained to prevent and control spills. Hazardous wastes include pesticides, paints, cleaners, and petroleum products.

14.3.13.1 Contractor shall collect & submit the relevant material certificates for materials if directed by the Engineer in charge with high recycled (both post industrial and post-consumer) content, including materials like RMC mix with fly-ash, glass with recycled content, calcium silicate boards etc.

14.3.14 Water use during Construction Contractor should spray curing water on concrete structure and shall not allow free flow of water. Concrete structures should be kept covered with thick cloth / gunny bags and water should be sprayed on them.

14.3.15 The Contractor shall remove from site all rubbish and debris generated by the Works and keep Works clean and tidy throughout the Contract Period. All the serviceable and non-serviceable (malba) material shall be segregated and stored separately. The malbaobtained during construction shall be collected in well formed heaps at properly selected places, keeping in a view safe condition for workmen in the area. Materials which are likely to cause dust nuisance or undue environmental pollution in any other way, shall be removed from the site at the earliest and till then they shall be suitable covered. Glass &steel should be dumped or buried separately to prevent injury. The work of removal of debris should be carried out during day. In case of poor visibility artificial light may be provided.

a. The contractor shall use treated recycled water of appropriate quality standards forconstruction, if available.

15. SITE OFFICE, VEHICLES AND ALLIED FACILITIES:

15.1 The Contractor shall have to provide site office as described in table below, with toilet facilityand one attendant.

15.2 Four wheeled vehicle (not older than one year, with driver, fuel & lubricants, insurance, road taxes, necessary road permits, fitness certificates etc. complete) as mentioned hereunder and as per satisfaction of the Engineer shall be provided for the use of Engineer-in-charge and other supervisory staff.

15.3 In addition the Contractor shall provide Computer and Laser Printer with Operator as describedherein.

15.4 For these items the contractor shall make sufficient provision in his rates. In case contactor fails to provide any of the above the Engineer-in-charge shall be authorized to make arrangement at the cost of contractor and make deductions in payments due to contractor at market rates but in any case not less than the rates mentioned hereunder.

15.5 This/these vehicle(s) subject to the note below shall remain in operation as mentioned in table hereunder. These vehicles and computers shall be returnable to the contractor thereafter.

Note:-In case of delay in completion of project beyond stipulated period not attributable to the Contractor, the requirement of vehicles and computers may be reviewed by the Engineer and at his sole discretion he may reduce their numbers-as he deems fit- keeping in view efficiency of supervision.

Contract Value	Site office	Four-wheeled vehicle (Model not later than one year)	Average monthly run on per quarter basis	Printer Cartage refiling and A4 size paper rim box	Desktop Computer/Laptop with Laser Printer (new) with operator	Monthly Rate of Recovery for each, if not provided (Rs.)	Period for which to be provided
Rs. 1.50 Cr to Rs. 5.00 Cr	One (20 sq./m)	-	-	2 cartage refilling & 5 rim per month	One as per latest specification and to the satisfaction of Engineer	16000.00 for each Desktop and allied facilities	Fixed period of 14 months. Any time during the contract period
More than 5.00 Cr to Rs. 10.00 Cr	One (30 sq./m)	One (TUV300/Bolero/grand Vitara or equivalent) and 1 two wheeler	3000 km	50000	One as per latest specification and to the satisfaction of Engineer	16000.00 for each Desktop and allied facilities	Initial contract period including trial run period and also including extension of time if any.
More than 10.00 Cr to Rs. 25.00 Cr	One (30 sq./m) + One additional (20 sq./m)	One (TUV 300/Bolero/grand Vitara or equivalent) and 1 two wheeler	3000 km	50000	One as per latest specification and to the satisfaction of Engineer	16000.00 for each Desktop and allied facilities	
More than 25.00 Cr to Rs. 50.00 Cr	One (30 sq./m) + One additional (20 sq./m) with attendant	Two MPVs as per requirement of Engineer	3000 km	50000	Two as per latest specification and to the satisfaction of Engineer	16000.00 for each Desktop and allied facilities	
More than 50.00 Cr to Rs. 100.00 Cr	One (30 sq./m) + Two additional (20 sq./m) with attendant	One SUV (Innova or equivalent) + Two MPVs as per requirement of Engineer	3500 km	65000.00 for SUV and Rs. 50000.00 for other Vehicles,	Three + One Laptop as per latest specification and to the satisfaction of Engineer	16000/- for each Desktop and allied facilities and Rs. 3000/ for each Laptop	Initial contract period including trial run period and also including extension of time if any.
More than 100.00 Cr to Rs. 150.00 Cr	One (40 sq./m) + Three additional (30 sq./m)	One SUV (Innova or equivalent) + Three MPVs as per requirement	3500 km	65000.00 for SUV and Rs. 50000.00 for other Vehicles,	Three (Two B/W and one laser colour printer) including consumables such	17500/- for each Desktop and allied facilities and	

	With attendant	of Engineer			as paper, toners etc. + One Laptop as per latest specification and to the satisfaction of Engineer	Rs. 3000/ for each Laptop	
		Two motorcycle of not less than 150 cc engine capacity with fuel, insurance, taxes etc. complete	2000 km	10000.00			
More than 150.00 Cr	One (40 sq./m) + Three additional (30 sq./m) with attendant	One SUV (Innova or equivalent) + Three MPVs as per requirement of Engineer	3500 km	65000.00 for SUV and Rs. 50000.00 for other Vehicles,	Four (Three B/W and one colour laser printer) including consumables such a paper, toners etc. + Two Laptops as per latest specification and to the satisfaction of Engineer		Initial contract period including trial run period and also including extension of time if any.
		Three motorcycle of not less than 150 cc engine capacity with fuel, insurance, taxes etc. complete	2000 km	10000.00			

16. Safety Measures to be followed:

16.1 Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used, an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well, suitable footholds and hand-hold shall be provided on the ladder and the ladder shall be given an inclination not steeper than 1/4 to 1 (1/4 horizontal and 1 vertical.)

16.2 Scaffolding of staging more than 3.6 m (12ft.) above the ground or floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached or bolted, braced and otherwise secured at least 90 cm. (3ft.) high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

16.3 Working platforms, gangways and stairways should be so constructed that they shouldnot sag unduly or unequally, and if the height of the platform or the gangway or thestairway is more than 3.6 m (12ft.) above ground level or floor level, they should beclosely boarded, should have adequate width and should be suitably fastened.

16.4 Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of person or materials by providing suitable fencing or railing whose minimum height shall be 90 cm. (3ft.)

16.5 Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9m. (30ft.) in length while the width between side rails in rung ladder shall in no case be less than 29 cm. for ladder up to and including 3 m. (10 ft.) in length. For longer ladders, this width should be increased at least 1/4 for each additional 30 cm. (1 foot) of length. Uniform step spacing of not more than 30 cm shall be kept. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites or work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The contractor shall provide all necessary fencing and lights to protect the public from accident and shall be bound to bear the expenses of defense of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit; action or proceedings to any such person or which may, with the consent of the contractor, be paid to compensate any claim by any such person.

16.6 Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following standards or conditions:-

16.6.1

16.6.1.1 These shall be of good mechanical construction, sound materials and adequate strength and free from patent defects and shall be kept repaired and in good working order.

16.6.1.2 Every rope used in hoisting or lowering materials or as a means of suspensionshall be of durable quality and adequate strength, and free from patent defects.

16.6.1.3 Use of durable and reusable formwork systems to replace timber formwork bandensure that formwork where used is properly maintained.

16.6.2 Every crane driver or hoisting appliance operator shall be properly qualified and noperson under the age of 21 years should be in charge of any hoisting machine including any scaffolding winch or give signals to operator.

16.6.3 In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or as means of suspension, the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load. In case of a hoisting machine having a variable safe working load each safe working load and the condition under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for

the purpose of testing.

16.6.4 The contractors shall notify the safe working load of the machine to the Engineer whenever he brings any machinery to site of work and get it verified by Engineer.

16.7 Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards. Hoisting appliances should be provided with such means as will reduce to the minimum the risk of accidental descent of the load. Adequate precautions should be taken to reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energized, insulating mats, wearing apparel, such as gloves, sleeves and boots as may be necessary should be provided. The worker should not wear any rings, watches and carry keys or other materials which are good conductors of electricity.

16.8 These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at work spot. The person responsible for compliance of the safety code shall be named therein by the contractor.

16.9 To ensure effective enforcement of the rules and regulations relating to safetyprecautions the arrangements made by the contractor shall be open to inspection by the Labour Officer or Engineer or their representatives.

16.10 Notwithstanding the above clauses as above there is nothing in these to exempt the contractor from the operations of any other Act or Rule in force in the Republic of India.

17. FIRST-AID FACILITIES

17.1 At every work place, there shall be provided and maintained, so as to be easily accessibleduring working hours, first-aid boxes at the rate of not less than one box for 150 contract labour or part thereof ordinarily employed.

17.2 The first-aid box shall be distinctly marked with a red cross on white back ground andshall contain the following equipment:-

17.2.1 For work places in which the number of contract labour employed does not exceed 50-Each first-aid box shall contain the following equipments:-

1. 6 small sterilised dressings.
2. 3 medium size sterilised dressings.
3. 3 large size sterilised dressings.
4. 3 large sterilised burn dressings.
5. 1 (30 ml.) bottle containing a two per cent alcoholic solution of iodine.
6. 1 (30 ml.) bottle containing salvolatile having the dose and mode ofadministration indicated on the label.
7. 1 snakebite lancet.
8. 1 (30 gms.) bottle of potassium permanganate crystals.
9. 1 pair scissors.
10. 1 copy of the first-aid leaflet issued by the Director General, Factory AdviceService and Labour Institutes, U.P. Jal Nigam of India.
11. 1 bottle containing 100 tablets (each of 5 gms.) of aspirin.
12. Ointment for burns.
13. A bottle of suitable surgical antiseptic solution.

17.2.2 For work places in which the number of contract labour exceed 50. Each first-aid box shall contain the following equipments.

1. 12 small sterilised dressings.
2. 6 medium size sterilised dressings.
3. 6 large size sterilised dressings.
4. 6 large size sterilised burn dressings.
5. 6 (15 gms.) packets sterilised cotton wool.
6. 1 (60 ml.) bottle containing a two per cent alcoholic solution iodine.

7. 1 (60 ml.) bottle containing salvolatile having the dose and mode ofadministration indicated on the label.
8. 1 roll of adhesive plaster.
9. 1 snake bite lancet.
10. 1 (30 gms.) bottle of potassium permanganate crystals.
11. 1 pair scissors.
12. 1 copy of the first-aid leaflet issued by the Director General Factory Advice Service and Labour Institutes /Department of India.
13. A bottle containing 100 tablets (each of 5 gms.) of aspirin.
14. Ointment for burns.
15. A bottle of suitable surgical antiseptic solution.

17.3 Adequate arrangements shall be made for immediate recoupment of the equipment whennecessary.

17.4 Nothing except the prescribed contents shall be kept in the First-aid box.

17.5 The first-aid box shall be kept in charge of a responsible person who shall always bereadily available during the working hours of the work place.

17.6 A person in charge of the First-aid box shall be a person trained in First-aid treatment in the work places where the number of contract labour employed is 150 or more.

17.7 In work places where the number of contract labour employed is 500 or more andhospital facilities are not available within easy distance from the works. First-aid posts shall be established and run by a trained compounder. The compounder shall be on duty and shall be available at all hours when the workers are at work.

17.8 Where work places are situated in places which are not towns or cities, a suitable motor transport shall be kept readily available to carry injured person or person suddenly taken ill to the nearest hospital.

18. Minimum Quality Assurance Plan:

A Quality Assurance plan will be submitted by the contractor both in respect of incorporating details as given below for the approval of Engineer-in-Charge:

1. Number of required tests and frequency of testing as indicated in the mentioned in clause-11under schedule 'F' & Provisions of BIS Code and Standard Practices shall be followed as perdirections of the Engineer-in-Charge.
2. Machinery and other Tool & Plants required to be deployed at site by the contractor. Time schedule by which each machinery & Tool & Plants is to be brought at site shall be indicated.
3. A field laboratory to be setup by the contractor at site of work as per direction of the Engineer-in-Charge. All the testing equipments required shall be arranged by the contractor and shall be clearly mentioned.
4. Maintenance of Register of Tests -
   i. All the registers of tests carried out at Construction Site or in outside laboratories shallbe maintained by the contractor in a register of formats suggested by Engineer-in-charge.
   ii. All Samples of materials including Cement Concrete Cubes shall be taken jointly with Contractor by Junior Engineer. All the necessary assistance shall be provided by the contractor. Cost of sample materials is to be borne by the contractor and he shall be responsible for safe custody of samples to be tested at site.
   iii. All the test in field lab setup at Construction Site shall be carried out by the Engineering Staff deployed by the contractor which shall be 100% witnessed by Junior Engineer (JE). At least 10% of the tests are to be witnessed by the Assistant Engineer (AE).
   iv. All the entries in the registers will be made by the designated Engineering Staff of the contractor and same should be regularly reviewed by JE/AE/EE.
   v. Contractor shall be responsible for safe custody of all the test registers.
5. U.P. Jal Nigam (Urban) may require the Contractor to submit a copy of all test registers and other records along with each alternate Running Account Bill and Final Bill.
6. Minimum QA plan may vary work to work basis depending upon nature and volume of work.

SECTION – 5

SPECIFICATIONS

SPECIFICATIONS: (CIVIL WORKS)

DETAILED SPECIFICATIONS FOR CIVIL WORKS

1. EARTH WORK

1.1 GENERAL

The conditions/specifications laid down here under will hold good whether the excavation is to be carried out over areas for levelling foundations of structures, trenches for pipes or cables or any other type of work which involves earth work like the levelling of forming/embankments etc. as per U.P. Jal Nigam / UP PWD specifications.

a. Earthwork in excavation includes site-cleaning activities like removal of shrubs, loose stones, rubbish of all kinds, interfering with the works and with complete removal of roots.

b. The products of the above clearing operations shall be removed from the site, dumped, stacked at a place or places, burnt or otherwise disposed of as directed by the Engineer-in-Charge within the compound.

c. A permanent base line and cross lines shall be established to serve as reference grid using MS plates, pegs, and pins set in concrete or brick masonry pillars where they will be free from disturbances.

d. A permanent bench marks or marks as required necessary for the works connected to the nearest GTS benchmark shall be established for reference.

e. Excavation shall be carried out in all types of soil like top soil, silt, sand, gravel, soft moorrum, clay, kankar, hard materials like disintegrated rock shale which can be removed by picks, crowbars and shovels. Soil/earth may contain boulders. Loosening of rocks include the other methods of excavation other than blasting such as chiseling, wedging line drilling to avoid shattering of rocks. The Engineer-in-Charge shall decide what method shall be adopted for removal of the hard rock.

f. Excavation, whose sides are required to be maintained at a steeper slope than the stable slopes, will be required to be properly shored and strutted failing which the contractor will be required to execute the work by open cutting by the approval of Engineer-in-Charge.

g. Negligence on account of this leading to any mishap will be entirely the responsibility of the contractor.

1.2 DRAINAGE IN THE VICINITY OF EXCAVATION

i. The contractor shall control the drainage in the vicinity of the Excavation so that the surface of the ground will be properly sloped to prevent surface water running into excavated areas during construction. Arrangements shall be made for preventing rain and other extraneous liquids entering the excavated parts. Seepage water shall be directed to flow away from the trenches by gravity. If any pumping is required to keep the trench and the exposed areas dry for further work the same shall be done by the contractor at his own expenses.

ii. The rates quoted by the contractor shall be deemed to be inclusive of all the above costs or charges for stipulations stated above.

iii. Excavated material shall not be deposited within 1.5 meters from the top edge of the excavation.

iv. The contractor shall remove the excavated material to spoil heaps on the site or transport the same to a place as directed by the Engineer-in-Charge.

v. If the bottom of the excavation is left exposed by the contractor and in the opinion of the Engineer-in-Charge it has become deleteriously affected by atmospheric changes or affected by water then the contractor shall remove at his own cost such portions of the affected foundations and shall make good by filling with lean concrete or with compacted sand as directed by the Engineer-in-Charge.

vi. Where Excavation is made in excess of the depths required as shown in the drawings or as directed by the Engineer-in-Charge the contractor shall at his own expense fill up to the required level with lean concrete or well compacted sand as decided by the Engineer-in-Charge.

vii. Loose, soft or bad soil encountered in Excavation at the required depth on Engineer-in-Charge's directions shall be excavated to the firm bed and the difference of levels between the required level and the firm bed shall be filled up or dealt with as directed by the Engineer-in-Charge.

viii. Any obstacle encountered during excavation shall be reported immediately to the Engineer-in-Charge and shall be dealt with as instructed by him. Same shall be applicable for any antiques / treasure found during excavation.

ix. Any public utility services/facilities like water supply lines, gas supply line, sewers, telephone/electric cables poles etc. met with during Excavation shall not be damaged and no disruption is caused to the utility service on account of damages caused by the contractor. Such facilities shall be properly supported in their original positions by giving signs, suspension beams etc. at contractor's own expenses. If damaged shall be repaired by the contractor at his own expenses.

x. The contractor shall not undertake any concreting or constructing work of any nature on the excavated surfaces until approval for the same is given by the Engineer-in-Charge.

xi. The contractor shall be solely responsible for the protection of adjoining properties from damages that may be on account of excavation close to the properties whether the property belongs to government or to a private party.

xii. The contractor shall make all arrangements for proper warnings like providing fences, danger flags, barricading, night warning lights, watch and ward etc, to caution the public as well as the labours engaged by him about the dangers that may be involved by excavation of trenches, pits, of Foundations etc. Safety code for excavation work IS:3764-1992 shall be rigidly followed unless instructed otherwise by the Engineer-in-Charge.

xiii. Any useful material obtained during excavation shall be stacked as directed by the Engineer-in-Charge and will be the property of the department. The decision of the Engineer-in-Charge in this regard shall be final and binding on the contractor.

xiv. Any material used by the contractor out of the excavated stuff in lieu of his own materials shall be charged to the contractor at the market rates.

xv. The rates quoted shall include back filling of excavated material and disposal of surplus earth as directed by the Engineer-in-Charge.

1.3 EXCAVATION IN TRENCHES AND CABLE DUCTS

i. Excavation as required in trenches, cable ducts, for manholes, other overflow structures, cross drainage works, extra depths for joints of pipes shall be carried out as shown in the drawings / directed by the Engineer-in-Charge.

ii. For deep foundations necessary shoring and strutting shall be executed as directed by the Engineer-in-charge. If additional slopes are to be provided, where vertical cuts are not possible, the same shall be executed without any additional cost. The rates quoted shall be deemed to be inclusive of all such extra work.

iii. The trench shall be kept perfectly dry by preventing the extraneous water entering the pits and also wherever necessary by pumping at the cost of the contractor. No additional cost of dewatering shall be payable.

iv. The trenches after laying, jointing and testing of pipes/cables are to be back filled. The trenches shall be filled with the excavated material, if found suitable, as directed by the Engineer-in-Charge.

v. All surplus soil/earth shall be transported and disposed of as directed by the Engineer-in-Charge. Boulders, sharp objects, brickbats, roots of trees, rubbish, rubble etc. shall not be used for back filling. The back filling shall be done very carefully so as not to damage the pipes / cables or disturb the alignment levels of the pipes /

cables. The back filling shall be done in layers on both sides of the pipes watered, consolidated by ramming to a dense layer. The thickness of each layer shall not be more than 15 cms. Special care shall be taken to avoid unequal pressures and not to disturb the pipe.

vi. In case the excavated material falls short of requirement the back fill, soil/earth shall be taken from borrow pits approved by the Engineer-in-Charge. The rates quoted by the contractor shall be deemed to be inclusive of all such works.

vii. Sight rails and boning rods are to be used at regular intervals as directed by the Engineer-in-Charge to excavate the trenches true to line and grade.

1.4 BACK FILLING /EARTH FILLING

i. Back filling of earth around liquid retaining structures and pipes shall be done only after the water-tightness test is done to the satisfaction of the Engineer-in-Charge. Selected earth from the excavated earth shall be used for back filling / embankment.

ii. Care shall be taken to see that unsuitable soil/earth does not get mixed up with the material proposed to be used for filling.

iii. Regarding the soil/earth to be used for back filling the contractor shall have the prior approval of the Engineer-in-Charge.

iv. Backfill shall be placed in successive horizontal layers of loose material not more than 15 cm thick. The material shall be brought to within + or - 2% of the optimum moisture content as described in IS:2720 (Part VIII) after adjusting the moisture content, the layers shall be thoroughly compacted with such equipment as may be required to obtain a density equal to or greater than 95% of maximum laboratory dry density of the soil.

v. Successive layers of filling shall not be placed until the layer under construction has been thoroughly compacted to satisfy the requirements laid down in the requirements.

1.5 FILLING AND EMBANKMENT

i. The area where filling or embankment is to be carried out shall be cleared from loose material and the virgin soil shall be exposed. All shrubs and vegetation with roots are cleared. All soft patches shall be removed and filled with selected soil/earth and consolidated. Exposed soil/earth shall be consolidated properly to obtain 95% of maximum laboratory dry density of the soil.

ii. Approved filling material shall be uniformly spread in layers not exceeding 20 cm in loose depth. All clods, lumps, etc shall be broken before consolidation.

iii. Successive layers of filling shall not be placed until the layer under construction has been thoroughly compacted to satisfy the requirements laid down in these specifications.

iv. The contractor shall give the samples of the earth he proposes to use for back filling for testing, if required or directed by the Engineer-in-Charge along with the following characteristics of the soil/earth.

v. Only earth having plasticity index less than 20 shall be used.

vi. Soil/earth having laboratory maximum dry density of less than 1500 kg per cubic meter shall not be used.

vii. If the layer fails to meet the required density it shall be reworked or the materials shall be replaced and method of compaction altered as directed by the Engineer-in-Charge to obtain the required density.

viii. If any test indicates less than the specified degree of compaction the Engineer-in-Charge may require all the fill placed; subsequent to the latest successfully tests to be removed and compacted and compaction procedure to be done once again to obtain satisfactory density.

ix. The contractor shall perform all necessary tests to determine optimum moisture content and the degree of compaction. He shall furnish the results to the Engineer-in-Charge.

x. Prior to rolling, the moisture content of the material shall be brought to within +2% of the optimum moisture content as described in IS-2720 (part VIII). The moisture content shall preferably be on the wet side for potentially expansive soil/earth. After adjusting the moisture content as described in this clause, the layers shall be thoroughly compacted by means of rollers till 95% of maximum laboratory dry density is obtained.

xiii. If the layer fails to meet the required density it shall be reworked or the materials shall be replaced and method of compaction altered as directed by the Engineer-in-Charge to obtain the required density.

xiv. The embankment shall be finished to the alignment levels and grades, cross sections, dimensions shown in the drawings or as directed.

xv. If sand filling is specified in the tender for filling the trenches, plinth or foundations the sand used shall be hard, free from inorganic materials and deleterious materials and approved by the Engineer-in-Charge. Filling shall be carried out in layers not exceeding 15 cm in loose depth and flooded and tamped till it meets the approval of the Engineer-in-Charge.

x. The contractor shall perform all necessary tests to determine optimum moisture content and the degree of compaction and shall furnish the results to the Engineer-in-Charge.

Important Note

1. The bottom of Excavation shall be trimmed to the required levels and when carried below such levels, by error, shall be brought to level by filling with lean concrete of grade 1:4:8 or as specified at the contractor's cost and nothing extra shall be paid to the contractor on this account.

2. The contractor shall be responsible for assumptions and conclusions that he may make regarding the nature of materials to be excavated and the difficulty in making and maintaining the required Excavation and performing the work required as shown on the drawing and in accordance with these specifications. Cofferdams, sheeting, shoring, braking, draining, dewatering, etc. shall be furnished and installed as required and the cost thereof shall be included in the rate quoted for the item of excavation. The contractor shall be held responsible for any damage to any part of the work and property caused by collapse of sides of Excavation. Materials may be salvaged if it can be done with safety for the work and structures, as approved by the Engineer-in-Charge. However, no extra claim shall be entertained for material not salvaged or any other damage to contractor's property as a result of the collapse. He shall not be entitled to any claim for re-doing the excavation as a result of the same.

3. The excavation for foundations shall be carried out carefully, creating least disturbance to the founding stratum. The founding stratum should be blended by the concrete layer immediately after exposure so that it does not lose its strength on exposure to air and water.

4. Where excavation requires bracing, sheeting, or shoring etc, the contractor shall submit to the Engineer-in-Charge, drawings showing arrangement and details of proposed installation, and shall not proceed until he has received approval from the Engineer-in-Charge.

5. The contractor shall have to constantly pump out the water collected in pits due to rainwater, springs etc. and maintain dry working conditions.

6. For the purpose of excavation in earthwork, all types of soil including kankar, moorrum, single and boulders without binding matrix are included.

7. All excavated material obtained as a result of over excavation for which payment shall not be made, and that shall also be transported and disposed off as directed and at places shown by the Engineer-in-Charge, at no extra cost to the department within plot boundary.

8. All excavated materials obtained from excavation shall remain in the department's property. The useful portion as decided by the Engineer-in-Charge, shall be separated from the useless ones and deposited in regular stacks at places indicated and as directed by the Engineer-in-Charge.

9. In no case the excavated soil shall be stacked up to a distance of 1.5 m from the edge of excavation or one-half the depth of excavation whichever is more.

10. IS Codes : Some of the important relevant applicable codes for this section are

IS: 1200 (Part-I)-Method of measurement of building and civil engineering works and earthwork

IS: 3764 - Safety -code for excavation work

IS: 4701 - Code of practice for earthwork on canals

2. PLAIN CEMENT CONCRETE

General

Aggregate shall be of inert materials and shall be clean, dense, hard, sound durable, non-absorbent and capable of developing good bond with mortar. Coarse aggregate shall be of hard broken stone or granite or similar stone free from dust dirt and other foreign matters. The stone ballast shall conform to U.P. Jal Nigam, UP PWD specifications.

Fine aggregate shall be of coarse sand consisting of hard, sharp and angular grains and shall pass through screen of 4.75 mm IS Sieve. Sand shall be of standard specifications, clean and free from dust, dirt and organic matters. Fine aggregate may also be crushed stone.

Ordinary Portland cement of 43 grades as per IS: 8112 shall be used. It shall have the required tensile and compressive stresses and fineness. Water shall be clean and free from alkaline and acid matters and suitable for drinking purposes.

The proportion of concrete shall be 1:1.5:3 (Cement: Fine Aggregate: Coarse Aggregate) by unless otherwise specified. Minimum compressive strength of concrete of 1:1.5:3 shall be as per IS: 456-2000.

Stone aggregate sand and cement shall be mixed as per UP Jal Nigam, UP PWD specifications. All materials shall be dry. If damp sand is used, compensation shall be made by adding additional sand to the extent required for the bulking of damp sand.

Appropriate quantity of water required for cement may be taken as specified in IS:456-2000. For concrete compacted by mechanical vibrations the quantity of water shall be reduced by 20%.

Mixing shall be of machine mixing type. Hand mixing shall not be permitted.

Machine Mixing: Stone ballast, sand and cement shall be put into the cement concrete mixer to have the required proportion. For concrete of 1:2:4 proportion, first four boxes of stone ballast, then two boxes of sand and then one bag of cement shall be put into the C.C. Mixer, the machine shall then be revolved to mix materials dry and then water shall be added gradually to the required quantity, 25 to 30 litres per bag of cement to have the required water cement ratio. The mixing shall be thorough to have a plastic mix of uniform color. It requires 1.5 to 2 minutes rotation for thorough mixing. Mixed concrete shall be unloaded on a masonry platform or on iron sheet. Output of concrete mixer is 15 to 20 mixes per hour.

Regular slump test shall be carried out to control the addition of water and to maintain the required consistency.

Formwork, centering and shuttering shall be provided as required, as per standard specifications before laying concrete to continue to support or to keep the concrete in position.

Concrete shall be laid gently (not thrown) in layers not exceeding 15 cm and with mechanical vibrating machine until a dense concrete is obtained. Over vibration will separate coarse aggregate from concrete and shall be avoided. After removal of the formwork in due time the concrete surface shall be free from honey combing, air holes or any other defect.

Concrete shall be laid continuously. If laying is suspended for rest or for the following day the end shall be shuttered and vibrated to achieve dense concrete and made rough after de-shuttering for further jointing. When the work is resumed, the previous portion shall be roughened, cleaned and watered and a grout of neat cement shall be applied and the fresh concrete shall be laid. For successive layer the upper layer shall be laid before the lower has set.

After about 2 hours laying when concrete has begun to harden, it shall be kept damp by covering with wet gunny bags or wet sand for 24 hours, and then cured by flooding with water, making mud walls 7.5 cm high or by covering with wet sand or earth and kept damp continuously for 15 days. If specified, curing may be done by covering concrete with special type of waterproof paper as to prevent water escaping or evaporating.

Plain cement concrete shall be provided for leveling courses, foundations, pipe bedding or at other places wherever indicated in the drawings/directed by the Engineer-in-Charge. Grade and thickness of all PCC works shall be as mentioned in the drawings.

Proportion of the concrete, size of the aggregate shall be as specified in the drawings and technical specifications approved by Engineer-in-Charge.

While placing concrete directly on the soil for foundations etc. all the loose material shall be removed. The surfaces shall be trimmed and well consolidated.

The material specifications, mixing, placing of concrete compaction, curing, removal of the form work shall all be done as specified for reinforced cement concrete section of this tender document. The clauses provided therein shall also equally apply for this item of work to the extent relevant.

The rates quoted shall include supply of material, labor, tools and plant, water, mixing platforms, curing, supplying, erecting and dismantling of all form works as required.

Testing and Acceptance Criteria of Concrete

The sampling of concrete making the test specimens, curing and testing procedures etc. shall be in accordance with **IS:1199, IS: 3085** and **IS:516,** the size of specimen being 15 cm cubes. Normally only compression tests shall be performed in accordance with **IS:516.**

For each grade of concrete and for each 8 hours of work or portion thereof the following samples shall be taken.

At least six specimens shall be taken from the first 15.0 Cum or part thereof and three of these shall be tested at 7 days and the remaining at 28 days. Four additional specimens shall be taken from each additional 15.0 Cum of concrete or portion thereof of which 2 specimens shall be tested at 7 days and the remaining at 28 days.

To control the consistency of concrete from every mixing plant slump tests, and/or compacting factor tests in accordance with **IS: 1199** shall be carried out by the contractor every two hours or as directed by the Engineer-in-Charge. Slumps corresponding to the test specimens shall be recorded for reference. The acceptance criteria of concrete shall be in accordance with **IS: 456-2000.**

Concrete work found unsuitable for acceptance shall have to be dismantled and replacement is to be done as per specifications by the contractor. No payment for the dismantled concrete, the relevant formwork and reinforcement embedded fixtures etc. shall be paid.

In the course of dismantling if any damage is done to, the embedded items or adjacent structures the same shall be made good free of charge by the contractor to the satisfaction of the Engineer-in-Charge.

3. BRICK MASONRY AND PLASTERING

3.1 Brick Masonry

General

All bricks shall be of class designation 10 or best locally available approved by Engineer-in-Charge made of good brick earth thoroughly burnt, and shall be of deep cherry red or copper color. Bricks shall be regular in shape and their edges shall be sharp and shall emit clear ringing sound on being struck and shall be free from cracks, chips, flaws and lumps of any kind. Bricks shall not absorb water more than one sixth .of their weight after one hour of soaking by immersing the water. Bricks shall have a minimum crushing strength of 105 kg/cm² (10.5 N/mm²).

Bricks shall be fully soaked in clean water by submerging in a tank for a period of 12 hours immediately before use. Soaking shall be continued till air bubbling is ceased.

Bricks shall be well bonded and laid in English bond unless otherwise specified. Every course shall be truly horizontal and wall shall be truly in plumb. Vertical joints of consecutive course shall not come directly over one another; vertical joints in alternate course shall come directly over one another. No damaged or broken bricks shall be used. Closers shall be of clean-cut bricks and shall be placed near the ends of walls but not at the other edge. Selected best-shaped bricks shall be used for face work. Mortar joints shall not exceed 6 mm in thickness and joints shall be fully filled with mortar. Bricks shall be laid with frogs upwards except in the top course where frogs shall be placed downward. Brickwork shall be carried out not more than 1.2 m height at a time. When one part of the wall has to be delayed, stepping shall be left at an angle of 45º. Corbelling or projections were made shall not be more, than X brick projections in one course. All joints shall be raked and faces of wall cleaned at the end of each day's work.

These specifications deal with all types of brickwork required for buildings, manholes, drains, retaining walls or any construction made out of bricks.

3.1.1 Materials

3.1.1.1 Bricks

Bricks used for the construction of brick masonry shall be hard, rectangular in shape and size and well burnt of uniform deep red, cherry or copper color and shall confirm to IS: 1077-1986.

The bricks shall be brought from approved brick kilns. The bricks shall be free from cracks, chippings, flaws, stones or lumps of any kind. The bricks shall not show any signs of efflorescence and shall be homogeneous in texture.

They shall emit a clear metallic ringing sound on being struck and shall have a minimum compressive strength of 10.5 N/mm2 equivalent to 105 kg/cm^2.

They shall not absorb more than 20% of its dry weight when soaked in cold water for 24 hours or otherwise specified in the Indian Standard Specification.

3.1.1.2 Mortar

For cement mortar fresh Portland cement of standard specifications shall be used. Sand shall be sharp, clean and free from organic and foreign matters. For rich mortar coarse or medium sand shall be used and for weak mortar local fine sand may be used. Materials of mortar shall be measured to have the required proportion with measuring box and first mixed dry to have a uniform color in a clean masonry platform and then mixed by adding clean water slowly and gradually to have workable consistency and mixed thoroughly by turning at least three times. Fresh mixed mortar shall be used, old and stale mortar shall not be used and mortar for an hour work only shall be mixed with water so that the mortar may be used before setting starts.

Coarse sand is mixed with the required quantity of cement for the preparation of the mortar. Mortar shall be prepared in accordance with **IS: 2250-1981.** The sand used for the masonry mortar shall meet the requirements as specified in **IS: 2116-1980.** For masonry mortars, sand and cement of required proportions are mixed in small quantities in a dry state first and then water is added to make the mortar of required consistency suitable for the type of work for which it is required as directed by the Engineer-in-Charge. No left over mortar shall be used and therefore only that much quantity of mortar that can be consumed within 30 minutes shall be mixed in batches.

3.1.1.3 Sand for Brick Masonry

Table 3.1: Grading of sand for use in Masonry Mortar

IS Sieve Designation	Percentage passing by mass

4.75 mm	100
2.36 mm	90 to 100
1.18 mm	70 to 100
600 micron	40 to 100
300 micron	5 to 70
150 Micron	0 to 15

3.1.2 Construction

The brick masonry shall be constructed as per the Indian Standard Code of Practice for Brick Work **IS: 2212-1962.** The thickness of the joints shall not be thicker than those specified in Para 5.4 of the above Code of Practice.

The bricks shall be laid frogs upwards. While laying the bricks they shall be thoroughly bedded and flushed in mortar and well tapped into position with wooden mallets and superfluous mortar shall be removed.

No part of the structure shall be raised more than one meter above than the rest of the work. In case it is unavoidable the brickwork shall be raked back at an angle of not more than 45 degrees so as to maintain a uniform and effectual bond, but raking shall not start within 60 cm from a corner.

In case of construction of buttresses, counter-forts, returns they are built course by course carefully bound into the main walls.

At all junctions of walls the bricks at alternate courses, shall be carried into each of the respective walls so as to thoroughly unite both the walls together. The brickwork shall not be raised more than 14 courses per day.

All the beds and joints shall be normal to the pressures applied upon them Le horizontal in vertical walls, radial In arches and at right angles to the face in battered retaining walls.

Vertical joints in alternate courses shall come directly one over the other and shall be truly vertical. Care shall be taken to ensure that all the joints are fully fitted up with mortar, well flushed up where no pointing is proposed, nearly struck as the work proceeds. The joints in faces which are plastered or painted shall be squarely raked out to a depth not less than 12 mm while the mortar is still green. The raked joints shall be well brushed to remove the loose particles and the surfaces shall be cleaned with a wire brush so as to remove any splashes of mortar sticking to the surfaces during the construction.

All iron fixtures, pipes, bolts, conduits, sleeves, holdfasts etc. which are required to built into the walls shall be embedded in cement mortar or cement concrete as shown in the drawings/indicated in the specifications/directed during the execution by the Engineer in-Charge as the work proceeds and no holes be left for fixing them at a later date unless authorized by the Engineer-in-Charge.

3.1.2.1 Curing

Fresh work shall be protected from rain by covering the work suitably. Masonry work as it progresses shall be thoroughly kept wet by watering on all the faces for at least 14 (Fourteen) days after completion of the parts of the work. Proper watering cans, flexible pipes, nozzles shall be used for the purpose in case of fat lime mortar curing shall start two days after construction of masonry and shall continue for seven days. No additional payment is admissible for curing and the rates quoted are deemed to be inclusive of the cost of curing.

3.1.2.2 Scaffolding

Double scaffolding sufficiently strong so as to withstand all loads that are likely to come upon it and having two sets of vertical supports shall be provided. Where two sets of vertical supports are not possible the inner end of the horizontal supporting pole shall rest in a hole provided in a header course only. Only one header for each pole shall be

left out. Such holes however shall not be permitted in pillars less one meter in width or immediately near the skew backs of arches. Such holes shall be filled up immediately after removal of the scaffoldings. Safety Code for Scaffolds and Ladders, **IS: 3696-1987** (Parts I and II) shall be followed.

3.2 Plastering

Cement mortar used for plastering shall be of the mix proportions and thickness as specified on the drawings or bill of quantities or particular specifications for the various different parts of the works. The materials used i.e. cement, sand and water shall be of the same quality and of the same specifications as indicated for plain and reinforced cement concrete works according to the specifications and approved by the Engineer-in-Charge. Sand further shall meet the specifications as laid down in **IS: 1542-1977** Specification for sand for plaster.

The sand for preparation of mortar for plastering shall confirm to the following gradation shown in **Table 3.2**

TABLE 3.2: GRADING OF FINE AGGREGATES

Percentage by weight passing IS Sieve		
IS Sieve Designation	Class –A	Class-B
4.75 mm	100	100
2.36 mm	90 to 100	90 to 100
1.18 mm	70 to 100	70 to 100
600 Microns	40 to 85	40 to 95
300 Microns	50 to 50	10 to 65
150 Microns	0 to 10	0 to 15

For the purpose of indicating the suitability for use, the sand is classified as Class A and Class B in accordance with the limits of grading. Class A sand shall be used generally for plastering and when it is not available, Class B sand may be used with the approval of Engineer-in-Charge.

The procurement of sand for Mortar for plastering and pointing shall confirm to be specifications given in Table 3.2.

Surface that are to be applied with plaster shall be thoroughly cleaned to remove dust, dirt, loose particle, oil, soil, salts etc, that may be sticking to the surfaces. The surfaces shall be washed, clean and watered properly for 4 hours before applying plaster. Plaster shall not, in any case, be thinner than specified. It shall have uniform specified thickness. When smooth finishing is required the cement plastering shall be floated over with neat cement within 15 minutes after application of the last coat of plastering. The plaster shall be protected from the sun and rain by such means as the Engineer-in-Charge may approve.

Wherever scaffolds are necessary for plastering they shall be provided as specified for scaffolds under clause **3.2.2.** Stage scaffolding shall be provided for ceiling plaster.

To ensure even thickness and true surface, patches of plaster about 15 cm x 15 cm shall be first applied both horizontally and vertically 2.0 m apart. Plastering shall be done from top of bottom and care shall be taken to avoid joints on continuous surface.

In case any other finish like rough cast finish or dry dash finish is specified in the drawings the small shall be provided as directed by the Engineer-in-Charge.

Surface which is to be plastered shall be roughened while they are still green or raked so as to give proper bond between the surface and plaster.

All corners junctions shall be truly vertical or horizontal as the case may be and carefully finished. Rounding or chamfering of corners shall be carried out with proper templates to the required size and shapes.

The work shall be tested frequently with a straight edge and plumb bob. At the end of the day the plaster shall be left cut clean to line. When the next day plastering is started the edge of the old work shall be scrapped, cleaned and wetted with cement slurry. At the end of the day the plastering shall be closed on the body of the wall and not nearer than 15 cm to any corner.

4. REINFORCED CEMENT CONCRETE AND ALLIED WORKS

GENERAL

In general RCC work is to be executed as per IS: 456-2000. The water storage tanks/reservoirs shall be followed by IS: 3370 Part I to IV. Steel reinforcement bars shall be of High Yield Strength Deformed (HYSD) steel bars as per **IS: 1786** and shall be free from corrosion, loose rust scales, oil, grease, paint, etc. Wire mesh or fabric shall be in accordance with **IS: 1566.** The steel bar shall be capable of being bent without fracture. Bars shall be bent accurately and placed in position as per design and drawing and bound together tight with 20 SWG annealed steel wire @ 10 kg/ton of reinforcement at their point of intersection.

Formwork and shuttering shall be made with steel plate close and tight to prevent leakage of mortar, with necessary props, bracings and wedges, sufficiently strong and stable and should not yield on laying concrete and made in such a way that they can be slackened and removed gradually without disturbing the concrete. For slab and beam small chamber should be given in centering, 1 cm per 2.5 m with a maximum of 4 cm. Centering should not be removed before 14 days in general (4 days for RCC columns, 10 days for roof slab, and 14 days for beams).

The grade of concrete to be used shall be as mentioned in specifications/shown on drawings.

Table - 4.1 Minimum compressive strength of 15 cm cubes at 7 and 28 days after mixing, conducted in accordance with IS: 516

Class	**Preliminary Test N/mm^2**		**Work Test N/mm^2**		**Maximum size of Aggregate mm**	**Locations for Use**
	At 7 days	**At 28 days**	**At 7 days**	**At 28 days**		
M40	33.50	50.00	27.00	40.00	20	As indicated in the specifications or as required
M35	30.00	44.00	23.50	35.00	20	
M30	25.00	38.00	20.00	30.00	20	
M25	22.00	32.00	17.00	25.00	20	
M20	17.50	26.00	13.50	20.00	20	
M15	13.50	20.00	10.00	15.00	20	

The coarse aggregate shall usually be 20 mm to 6mm gauge unless otherwise specified. For heavily reinforced concrete members as in the case of ribs of main beams the maximum size of aggregate should usually be restricted to 5 mm less than the minimum clear distance between the main bars or 5 mm less than the minimum cover to the reinforcement whichever is smaller.

Before laying the concrete, the shuttering shall be clean, free from dust, dirt and other foreign matters. The concrete shall be deposited (not dropped) in its final position. In case of columns and wall, it is desirable to place concrete in full height if practical so as to avoid construction joints but the progress of concreting in the vertical direction shall be restricted to 1.2 meter. Care should be taken that the time between mixing and placing of concrete shall not exceed 20 minutes so that the initial setting process is not interfered with. During the winters concreting shall not be done if the temperature falls below 4ºC.

Concrete shall be compacted by mechanical vibrating machine until a dense concrete is obtained. The vibration shall continue during the entire period of placing concrete. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to the dry mixture. Over-vibration which will separate coarse aggregate from concrete shall be avoided. After removal of the form work in due time, the concrete surface shall be free from honey combing, air holes or any other defect.

Concrete shall be laid continuously, if laying is suspended for rest or for the following day the end shall be shuttered and vibrated to achieve dense concrete and made rough after de-shuttering for further jointing. When the work is resumed, the pervious portion shall be roughened, cleaned and watered and a grout of neat cement shall be applied and the fresh concrete shall be laid. For successive layer the upper layer shall be laid before the lower has set.

Pre-cast concrete shall be provided with lifting device.

4.1.1 Standards

Following Indian Standards as revised most recently along with amendments will be followed for the works included in the contract.

IS:8112	Ordinary, Portland cement
IS:383	Coarse and fine aggregates from natural sources for concrete
IS:445	Portland slag cement
IS:456-2000	Code of practice for plaint and reinforced concrete
IS:516	Method of test for strength of concrete
IS:1199	Methods of sampling and analysis of concrete
IS:2386	Methods of test for aggregates for concrete (Part I to VI)
IS:3414	Code of practice design and installation of expansion and contraction joints in building.
IS:3370 Part- I to IV	Code of practice for concrete structures for the storage of liquids

Standards on special subjects have been mentioned elsewhere in this para and also shall be followed.

4.2 Forms, false work or Shuttering

4.2.1 Definitions

"Forms, formwork or shuttering" shall include all temporary moulds for forming the concrete to the required shape, together with any special lining that may be required to produce the concrete finish specified.

"False work or centering" shall consist of furnishing, placing and removal of all temporary construction such as forming, props and struts required for the support of forms.

4.2.2 Materials

Steel shuttering shall be provided as directed by the Engineer-in-Charge.

4.2.3 Forms

All forms shall be of mild steel approved by the Engineer-in-Charge and shall be fabricated and prepared water tight and of sufficient rigidly to prevent distortion due to the pressure of the concrete and other incidental loads incident to the construction operations.

All form shall be set and maintained true to the line designated until the concrete is sufficiently hardened. Forms shall remain in place for periods which shall be specified hereinafter. When forms appear to be unsatisfactory in any way,

either before or during the placing of concrete, the Engineer-in-Charge shall order to stop the work until the defects have been corrected.

Formwork shall be true to line and braced and strutted to prevent deformation under the weight and pressure of the unset concrete, constructional load, wind and other forces. The deflection shall not exceed 3 mm. Beam bottom shall be erected with an upward chamber of 2 mm per meter of the span. The form work for a column may be erected.

One side shall be left open and shall be built up in sections as placing of the concrete proceeds. Before placing the concrete, bolts and fixtures shall be in .position, and cores and other devices, used for forming openings, holes, chases, recesses and other cavities shall be filled to the formwork. No holes shall be cut in any concrete unless approved. Approved mould oil or other material shall be applied to faces of formwork in contact with unset concrete to prevent adherence of the non-staying concrete. Such coating shall be insoluble in water, non-staying and non-detrimental to the concrete and shall not be flaky or removed by wash water.

4.2.4 Tolerance in finished concrete

(As per IS code 456-2000)

The form work shall be so made as to produce a finished concrete true to shape, lines, level, plumb and dimensions as shown in the drawing subject to the following tolerances, unless otherwise specified in drawings or directed by the Engineer-in-Charge.

For

Deviation from specified

Dimensions of cross-section of columns

And beams	=	-6mm
		+12mm

b. Deviations of dimension of footings

(See Note)

Dimensions in plane	=	-12mm
		+50mm
Eccentricity	=	0.02 times the width of footing in the direction
		of deviation but not more than 50 mm
Thickness	=	± 0.05 times the specified thickness

Note: Tolerances applied to concrete dimensions only, not to positioning of vertical reinforcing steel or dowels.

4.2.5 False work and Centering

Detailed plans for false work or centering shall be supplied by the contractor if specifically asked for by the Engineer-in-Charge at least 14 days in advance of the time the contractor begins construction of the false work. Notwithstanding the approval by the Engineer-in-Charge of any designs for false work submitted by the contractor, the contractor shall be solely responsible for the strength, safety and adequacy of the false work or centering.

All false work shall be designed and constructed to provide the necessary rigidity and to support the loads from the weight of green concrete and shuttering and incidental construction loads.

False work or catering shall be founded upon a solid footing safe against undermining and protected from softening.

False work which cannot be founded on satisfactory footing shall be supported on piling which shall be spaced, driven and removed in a manner approved by the Engineer-in-Charge. The Engineer-in-Charge may require the contractor to

employ screw jacks or hardwood wedges to make up any settlement in the formwork either before or during the placing of concrete. Props of the upper storey shall be placed directly over those in the storey immediately below.

False work shall be set to give the finished structure the required grade and camber specified on the plans.

4.2.6 Formwork and Construction Joints

Where permanent or temporary joints are to be made in horizontal or inclined members, stout stopping off boards shall be securely fixed across the mould to form a watertight joint. The form of the permanent construction joint shall be as shown on the drawings. Temporary construction joints shall have blocks of timber at least 75 mm thick, slightly tapered to facilitate withdrawal and securely fixed to the face of the stopping off board. The area of the key or keys so formed shall be at least 30% the area of the member. The blocks shall be kept back at least 50 mm from the exposed face of the concrete.

Where reinforcement passes through the face of a construction joint the stopping off board shall be drilled so that the bars can pass through, or the board shall be made in sections which a half round indentation in the joint faces for each bar so that when laced, the board is a neat and accurate fit and no grout leaks from the concrete through the bar holes or joints.

4.2.7 Removal of Forms and False work

In the determination of the time for the removal of forms, false work and housing, consideration shall be given to the location and character of the structure, the weather and other conditions influencing the settings of the concrete and the materials used in the mix.

MS shuttering/formwork and scaffolding should be of standard reputed make to ensure better quality of concrete finish.

Forms shall be removed in such a manner as not to injure the concrete and no formwork shall be removed before the concrete has sufficiently set and hardened. The minimum periods which shall elapse between the placing and compacting of normal Portland cement concrete for the various parts of the structures are given in the following table, but compliance with these requirements shall not relieve the contractor of the obligation to delay the removal of the forms if the concrete has not set sufficiently hard.

Forms shall not be struck until the concrete has reached strength at least twice the stress to which the concrete may be subject at the time of removal of formwork. In normal circumstance, generally where the temperatures are above 20ºC and where ordinary Portland cement is used, form may generally be removed after the expiry of the following periods, according to the Clause 10.3, **IS: 456-2000.**

Table 4.2: Removal of the Forms

a.	Walls columns and vertical faces of all structural members	24 to 48 hours as may be decided by the engineer-in-charge
b.	Slabs (Props left under)	3 days
c.	Beam soffit (props left under)	7 days
d.	Removal of props under slabs 1. Spanning up to 4.5m 2. Spanning above 4.5 m	 7 days 14 days
e.	Removal of props under beams and arches	

	1. Spanning up to 4.5m 2. Spanning above 4.5 m	14 days 21 days

Where sulphates resistant cement is used, manufacturer's instructions are to be followed.

The Engineer-in-Charge may modify these requirements taking into account the type of cement and method of compaction used, and contractor shall obtain the Engineer-in-Charge's written approval for any decrease in time of stripping of the formwork given above. The contractor shall notify the Engineer-in-Charge when he proposes to stripe of any formwork and no formwork shall be struck except in the presence of the Engineer-in-Charge or his representative.

4.2.8 Reuse of Forms

Only mild steel formwork of best quality as per approved vendor list given by Engineer-in-Charge shall be used for concreting purpose. These shuttering shall not be reused unless it is properly scraped cleaned and repaired, so that it gives a plane, even, fair and dense concrete surface.

4.2.9 Cleaning and treatment of Forms

All forms shall be thoroughly cleaned of old concrete, wood shavings, sawdust, dirt and dust sticking to them before these is fixed in position. All rubbish, loose concrete, chippings, shavings, saw dust etc. should be scrupulously removed from the interior of the forms before concrete is poured. Wire brushes, brooms, compressed air jet and/or water jet etc. shall be kept handy for cleaning, if directed by the Engineer-In-Charge.

4.3 Materials for Concrete

4.3.1 Water

Water used for cement concrete mortar, plaster, grout, curing or washing of sand shall be clear and free from injurious amount of Oil, Acid, Alkali, Organic matter or other harmful substances in such amounts that may impair the strength or durability of the structure.

Potable water shall generally be considered satisfactory for mixing and curing concrete. In case of doubt regarding development of strength, the suitability of water for making concrete shall be ascertained by compressive strength and initial setting time specified in the IS: 456 Code of Practice for Plain and Reinforced concrete. The Engineer-in-Charge may require the contractor to get the water tested from an approved laboratory at his own expense and in case the water contains any salts for an excess of acid, alkali, any injurious substances etc., the Engineer-in-Charge may refuse its use. And the contractor shall be required to arrange suitable water at his own cost.

4.3.2 Aggregate

General

Coarse and Fine Aggregates for concrete shall confirm in all respect to PWD Specifications / **IS: 383** Specifications for Coarse and Fine Aggregates from Natural Sources for Concrete. Aggregates shall be obtained from a source known to produce satisfactory material for concrete. Aggregates shall consist of naturally occurring sand and gravel or stone, crushed or uncrushed or a combination thereof. They shall be chemically inert, hard strong, dense, durable, clean and free from veins and adherent coatings and of limited porosity. Flaky and elongated pieces shall not be used. Whenever required by the Engineer-in-Charge the aggregates shall be washed by the Contractor before use in the work.The source of aggregates shall be approved by the Engineer-in-Charge and shall not be changed during the course of the job without his approval. Rejected aggregates shall be promptly removed from the work site by the contractor at his own expense.

4.3.2.1 Deleterious Materials

Aggregates shall not contain any harmful material, such as iron pyrites, coal, mica, shale or similar laminated materials, clay, alkali, soft fragments, sea shells, organic impurities etc, in such quantities as to affect the strength or durability of the concrete and in addition to the above, for reinforced concrete, any material which might cause corrosion of the reinforcement. Aggregates which are chemically reactive with the alkalis of cement shall not be used.

The maximum quantities of deleterious materials in the aggregate, shall be in accordance with **IS: 2386** (Part II). Methods of Test for Aggregates for Concrete, shall not exceed the limit given in Table I of **IS: 383.**

The sum of the percentages of all deleterious materials shall not exceed five. Deleterious materials also include material passing **75** micron IS sieve.

4.3.2.2 Coarse Aggregates

Coarse aggregate is aggregate most of which is retained on 4.75 mm IS: sieve. Coarse aggregate for concrete shall conform to **IS: 383**.

These may be obtained from crushed or uncrushed gravel or stone and shall be clean and free from elongated, Flaky or laminated pieces, adhering coatings, clay lumps, coal residue, clinkers, slag, alkali, mica, organic matter or other deleterious matter. Coarse aggregate shall be either in single size or graded, in both cases the grading shall be within the following limits.

Table 4.3: Grading of Coarse Aggregates

IS Sieve size (mm)	Percentage Passing For Single Sized Aggregate of Normal Size					Percentage Passing for Graded Aggregate of Normal Size			
	40mm	20mm	16mm	12.5mm	10mm	40mm	20mm	16mm	12.5mm
63	100	-	-	-	-	100	-	-	-
40	85-100	100	-	-	-	95-100	100	-	-
20	0-20	85-100	100	-	-	30-70	95-100	100	-
16	-	-	85-100	100	-	-	-	90-100	-
12.5	-	-	-	85-100	100	-	-	-	90-100
10	0-5	0-20	0-30	0-45	85-100	10-35	25-35	30-70	40-85
4.75	-	0-5	0-5	0-10	0-20	0-5	0-10	0-10	0-10
2-36	-	-	-	-	0-5	-	-	-	-

The Engineer-in-Charge may allow graded aggregates to be used provided they satisfy the requirements and Table IV of **IS: 383.**

4.3.2.3 Fine Aggregates

Fine aggregates is aggregate most of which passes 4.75 mm IS sieve but not more than 10% passes through 150 micron IS Sieve. These shall comply with the requirements of grading zones I, II and 1II as given in Table III of 15:383. Fine aggregate conforming to grading zone IV shall not be normally used in reinforced concrete unless tests have been made by the contractor to ascertain the suitability of the proposed mix proportions and approved by the Engineer-in-Charge.

As per IS: 383 Table is given below:

Table 4.4: Grading of Aggregates

IS: Sieve Designation	Grading Zone-I	Grading Zone-II	Grading Zone-III	Grading Zone-IV
10 mm	100	100	100	100
4.75 mm	90-100	90-100	90-100	95-100
2.36 mm	60-95	75-100	85-100	95-100
1.18 mm	30-70	5-90	75-100	90-100
600 microns	15-34	35-59	60-79	80-100
300 microns	5-20	8-30	12-40	15-50
150 microns	0-10	0-10	0-10	0-15

Note: To use the sand falling in Zone -IV, IS: 383 shall be followed.

Fine aggregates shall consist of natural sand resulting from natural disintegration of rock and which has been deposited by streams or glacial agencies, or crushed stone sand or crushed gravel sand.

4.3.2.4 Sampling and Testing

Sampling and testing shall be carried out by the contractor, at the contractor's expense, in accordance with:

IS: 516 METHOD OF TEST FOR STRENGTH OF CONCRETE

IS: 2386 Methods of Test for Aggregates for concrete

4.3.2.5 Storage of Aggregates

The contractor shall at all times maintain at the site of work such quantities of aggregates as are considered by the Engineer-in-Charge to be sufficient to ensure continuity of work.

Each type and grade of aggregate shall be stored separately on hard firm ground having sufficient slope to provide adequate drainage to rain water.

Any aggregate delivered to site in a wet condition or becoming wet at site due to rain shall be kept in storage for at least **24** hours to obtain adequate drainage, before it is used for concreting, or the water content of mix must be suitably adjusted as directed by Engineer-in-Charge.

4.3.3 Cement

4.3.3.1 General

The cement used shall be ordinary Portland cement conforming to IS: 8112 or as specified in the particular specifications/drawings or as directed by the Engineer-in-charge.

4.3.3.2 Storage on the site

The cement shall be stored in a suitable weatherproof building and in such a manner as to permit easy access for proper inspection and counting. The cement shall be stored in such a manner as to prevent deterioration. Cement of different types and brands shall be kept in separate stacks and marked accordingly. Cement older than two months shall not be used on site.

All cement stored on the site shall be arranged in batches, and used in the same order as received from the manufacturer. A cement register shall be maintained at site in which all entries shall be completed day to day, showing the quantities received date of receipt, source of receipt, type of cement etc, and also the daily cement consumption on

site. This register shall be accessible to the Engineer-in-charge for his certification. The room, in which cement shall be kept, shall be locked double; one of UPJN and another of contractor.

4.3.3.3 Rejection of Cement

The Engineer-in-charge may reject any cement as a result of any tests, thereof, notwithstanding the manufacturer's certificate. He may also reject cement, which has deteriorated owing to inadequate protection during storage from moisture or due to intrusion of foreign matter or other causes. Any such cement which is considered defective by the Engineer-in-Charge shall not be used, and shall be promptly removed from the site of the work by the contractor at his own expense.

Approved Vendor: Birla cement, ACC Cement, Ambuja, Ultratech Cement etc. as directed by engineer in charge.

4.3.4 Other Materials

All materials including admixtures, joint filters and joint sealants not fully specified herein and which may be used in the work shall be of quality approved by the Engineer-in-Charge and he shall have the right to determine whether all or any of the materials offered or delivered for use in the works are suitable for the purpose. Contractor shall give the samples of materials to the Engineer-in-Charge and shall get them approved before procurement and use.

4.3.5 Reinforcement

All reinforcement shall be clean and free from pitting, loose mill scales, dust and coats of paints, oil or other coating which may destroy or reduce the bond.

4.3.5.1 Welded Joints

Welding of joints in reinforcement for bars of 28 mm dia and below shall not be allowed. However, in case of using welded joints for bars 32 mm and above the approval of the Engineer-in-Charge shall be obtained. The Engineer-in-Charge may require the Contractor, prior to the use of welded joints to have tests carried out at the contractor's expense to prove that the joints are of the full strength of the bars connected. The welding of the reinforcement shall be done in accordance with the recommendation of **IS: 2751** code of practice for welding of mild steel bars for reinforced concrete construction. Special precautions are required in the welding of cold worked reinforcing bars. No extra payment for welded joints shall be made to the contractor unless specifically mentioned in the schedule of rates or bill of quantities and approved by the Engineer-in-Charge. Tack welding may be permitted by the Engineer-in-Charge under certain conditions for fixing reinforcements.

4.3.5.2 Reinforcement Splices

Laps & anchorage length of reinforcing bars shall be in accordance with IS: 456, unless otherwise specified. If the bars in a lap are not of the same diameter, the smaller dia will guide the lap lengths. Laps shall be staggered as far as practicable and as directed by Engineer-in-Charge and not more than 50% of the bars shall be lapped at a particular section. Mechanical connections, for splicing reinforcement bars in congested locations may be used by the contractor, only if approved by the Engineer-in-Charge. Reinforcement bars shall not be lapped unless the length required exceeds the maximum available lengths of the bars at site.

Unless otherwise specified the splices shall be wired contact lap splices as per the relevant standards. No splicing of vertical bars shall be allowed except at specified or approved horizontal construction joints. Splices in horizontal bars shall be lapped with at least one continuous bar between adjacent splices. The minimum spacing of splices in anyone run of bar shall be 6.0 m with splices in adjacent bars offset at least 3.0 m where walls or slab contain two layers of reinforcement, splices in opposite layer shall be offset by at least 1.50m.

4.3.5.3 Fabrication and placement

Bars shall be pre fabricated accurately to dimensions, forms and shapes, bending procedure shall be approved by the Engineer-In-Charge. Placing and typing of reinforcement shall conform to IS: 2502-1963 Code of practice for bending and fixing of bars for concrete reinforcement. Bar bending schedules for the reinforced concrete works shown on the drawings shall be prepared by the contractors and furnished to the Engineer-in-Charge at least two weeks before the commencement of bending. Dimensions shown as furnished by the contractor's shall be his responsibility and approval of the schedule shall not constitute the approval of the dimensions thereon.

4.3.5.4 Field Control

The contractor shall appoint a qualified Engineer experienced in reinforcement cutting, bending and placing the same correctly, binding and cleaning before pouring the concrete. The reinforcement shall be continuously kept in correct position during connections.

4.3.5.5 Steel Reinforcement

The reinforcement shall be High Yield Strength Deformed (HYSD) bars. Grade Fe-500 conforming to **IS: 1786-1985** shall be used unless otherwise specified.

Placement of reinforcement should be as per IS: 456 Clause 11.3.

Approved Vendors: SAIL, RashtriyaIspat Nigam Limited, Tata steel formerly TISCO, Jindal, Shyam Steel or as fixed by the Engineer.

4.3.5.6 Structural Steel

Structural steel shall conform to **IS: 226** and **IS: 2062**.

Electrodes for welding shall conform to IS: 814 or IS: 815 or equivalent.

All bolts and nuts shall conform to IS: 1367. Stainless steel nuts and bolts shall be of SS 307 type. All materials shall be of new and unused stocks. Manufacturer's test certificate shall be made available to the Engineer-in-charge when called for.

4.3.5.7 Storage

The steel reinforcement and structural steel shall be stored in steel yard in such a way as to prevent deterioration and corrosion, preferably at least 150 mm above ground by supporting on wooden or concrete sleepers at contractor's expenses.

4.4 Proportioning of Concrete

The determination of the water-cement ratio and proportions of the aggregates to obtain the required strength shall be made from preliminary tests by designing the concrete mix as per provisions laid down in IS: 456-2000 & IS: 10262. Design mix shall be admissible only if contractor is able to manage the quality control of design mix e.g. weighbridge, proper water measuring device etc. and designing the concrete mix as and when source of any of the consistent of concrete is changed. If contractor fails to comply with the requirements of design mix concrete, he shall have to follow the nominal mix as tabulated below:

Table- 4.5 Recommended Water-Cement Ratio (As per IS: 456-2000)

Grade of Concrete	Nominal Mix of Concrete	Quantity of Water per 50 Kg. of cement (Max)
M 5	1:5:10	60 litres
M 7.5	1:4:8	45 litres
M 10	1:3:6	34 litres
M 15	1:2:4	32 litres

M 20	1:1.5:3	30 litres
M-25	1:1:2	26 litres

Cube tests shall be carried out by the contractor on the trail mixes before the actual concreting operation starts. Based on the strength of the concrete mix sanction for its use has to be obtained from Engineer-in-charge.

If during the execution of the works it is found necessary to revise the mix because of the cube tests lower strengths than the required one due to inconsistency of quality of material or otherwise, the Engineer-in-charge shall ask for fresh trial mixes to be made by the contractor. No extra claim shall be entertained due to such change in mix variations, as it is the contractor's responsibility to produce the concrete of the required grade.

Where the weight of cement is determined by accepting the manufacturer's weight per bag, a reasonable number of bags should be weighed separately to check the next weight. Proper control of mixing water is deemed to be of paramount importance. If mixers with automatic addition of water are used water should be either measured by volume in calibrated buckets, tins or weighed. All measuring equipment shall be maintained in a clean serviceable condition and their accuracy periodically checked and certified and the Engineer-in-Charge's approval obtained.

The Engineer-in-Charge may require the contractor to carry out moisture content tests in both fine and coarse aggregates. The amount of the added water shall then be adjusted to compensate for any observed variations in the moisture contents. For the determination of moisture content **IS: 2386** shall be referred to.

4.5 Mixing of Concrete

The mixing of concrete shall be strictly carried out in an approved type of mechanical concrete mixer. The mixing equipment shall be capable of combining the aggregates, cement and water within the specified time into a thoroughly mixed and uniform mass, and of discharging the mixture without segregation. The entire batch shall be discharged before recharging. Mixing periods shall be measured from the time when all of the solid materials are in the mixing time has elapsed. The mixing time in no case shall be less than two minutes. The mixer speed shall not be less than 14 and not more than 20 revolutions per minute.

Mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in color and consistency. Hand mixing of concrete shall not be permitted at all.

4.6 Grades of Concrete

The different grades of concrete shall conform to the strength as required by **IS: 456-2000**. Standard deviation shall be calculated as stated in clause 14.5 of **IS: 456-2000.** The acceptable criteria for concrete shall be as stated in clause 15 of **IS: 456-2000.**

The assumed standard deviations as given in table 6 of 18:456-2000 have to be followed and are given below:

Table 4.6: Assumed Standard Deviation

Grade of Concrete	**Assumed standard Deviation N/mm^2**
M 10	2.3
M 15	3.5
M 20	4.6
M 25	5.3

In order to get a quick idea of quality of concrete, the optional tests are conducted as stipulated in 14.1.1 of **IS: 456-2000** and the results are analyzed according to table 5 of **IS: 456-2000**

4.6.1 Concrete

In general design mix concrete shall be used conforming to **IS: 456-2000.** Nominal Mix concrete batching by volume can only be allowed if the contractor is not able to adhere to the quality control provisions of the design mix with prior approval from Engineer on in writing request of the contractor mentioning reasons, for which no extra payment shall be made.

The mix proportions for all grades of nominal mix concrete shall be provided corresponding to the values specified in Table -4.7 below, for respective grades of concrete.

Table - 4.7 Characteristics Compressive strength of Concrete

Grade Designation	Proportion of cement : fine aggregate: coarse aggregate	Specified characteristic compressive strength at 28 days (N/mm2)
M 15	1:2:4	15
M 20	1:1.5:3	20
M 25	1:1:2	25

The maximum water-cement ratio for all concrete works shall be as specified in **IS: 456-2000** and required by the Engineer-in-Charge.

To keep the water cement ratio to the designed value, allowance shall be made for the moisture contents in both fine and coarse aggregates and determination of the same shall be made as frequently as directed by the Engineer-in-charge. The determination of moisture contents shall be according to **IS: 2386** (Part III).

4.6.1.1 Controlled concrete-

Controlled concrete shall be used on all concreting works except where specified otherwise.

The mix proportions for all grades of concrete shall be designed to obtain strengths corresponding to the values specified in Table 4.7.1 below for respective grades of concrete.

Table –4.7.1

Grade of Concrete	Specified characteristic compressive strength at 28 days [N/mm^2]
M 15	15
M20	20
M25	25
M30	30

The maximum water cement ratio for all controlled concrete works shall be as specified in IS: 456-2000 and preliminary tests as specified in the IS codes and required by the Engineer shall be carried out, sufficiently ahead of the actual commencement of the work with different grades of concrete, made from representative sample of aggregates and cement expected to be used on the job to ascertain the ratios by weight of cement, of total quantity of fine and coarse aggregates and the water cement ratio required to produce a concrete of specified strength and desired workability.

The minimum cement content for each grade of concrete shall be as per Table-4.7.2 below. If the requirement of cement is found to be more than that specified below then such excess quantities of cement shall be used and for which no extra payment shall be made.

Table – 4.7.2: Minimum Cement Content in Concrete

Grade of Concrete	Minimum cement content as per IS: 456 in kg./ cu. m of finished Concrete
M 15	310
M20	360

M25	410
M30	500

At least 4 (four) trial batches are to be made and 7 (seven) test cubes taken for each batch noting the slump on each mix. These cubes shall then be properly cured and two cubes for each mix shall be tested in a testing laboratory approved by the Engineer at 7 (seven) days and others at 28 (twenty eight) days for obtaining the ultimate compressive strength. The test reports shall be submitted to the Engineer. The cost of mix design and testing shall be borne by the contractor.

On the basis of the preliminary test reports for trial mix, a proportion of mix by weight and water cement ratio will be approved by the Engineer, which shall be expected to give the required strength, consistency and workability and the proportions so decided for different grades of concrete shall be adhered to, during all concreting operations. If however, at any time the Engineer feels that the quality of material being used has been changed from those used for preliminary mix design, the contractor shall have to run similar trial mixes to ascertain the mix proportions and consistency.

The mix once approved must not be varied without prior approval of the Engineer. However, should the contractor anticipate any change in the quality of future supply of materials than that used for preliminary mix design, he shall inform the same to Engineer and bring fresh samples sufficiently ahead to carry out fresh trial mixes.

To keep the water cement ratio to the designed value, allowance shall be made for the moisture contents in both fine and coarse aggregates and determination of the same shall be made as frequently as directed by the Engineer. The determination of moisture contents shall be according to IS: 2386 (Part III).

4.6.2 Strength Requirements

Where Ordinary Portland cement conforming to **IS: 269** is used the compressive strength requirements for various grades of concrete shall be as shown in Table -2 of IS: 456 -2000 where rapid hardening Portland cement is used the 28 days compressive strength requirements specified in Table-2 shall be met in 7 days. The strength requirements specified in Table-2 as previously given shall apply to both controlled concrete and ordinary concrete.

Other requirements of concrete strength as may be desired by the Engineer-in-Charge shall be in accordance with India Standard **IS: 456-2000.** The acceptance of strength of concrete shall be as per clause 14 “Sampling and Strength Test of Concrete” and clause. 15 “Acceptance Criteria” of **IS: 456-2000** subject to stipulations and/or modifications stated elsewhere in this specification. if any.

Concrete work found unsuitable for acceptance shall have to be dismantled and replaced to the satisfaction of the Engineer-in-charge by the contractor free of cost to the Department. No payment for the dismantled concrete, the relevant formwork and reinforcement, embedded fixtures, etc. washed in the dismantled portion shall be made. In the course of dismantling if any damage is done to the embedded items or adjacent structures, the same shall also be made good free of charge by the contractor to the satisfaction of the Engineer-in-charge. If the water quantity has to be increased in special cases, cement also be increased proportionately to keep the ratio of water to cement same as adopted in trial mix design for each grade of concrete. No extra payment for the additional cement shall be made.

4.6.3 Workability

The workability of concrete shall be checked at frequent intervals by slump test. Where facilities exist and if required by the Engineer-in-Charge, alternatively the Compacting Factor test in accordance with IS: 1199 shall be carried out. The degree of workability necessary to allow the concrete to be well consolidated and to be worked into the corners of formwork and round the reinforcement to give the required surface finish shall depend on the type and nature of the structure and shall be based on experience and tests. The limits of consistency for structures are as specified in Table 4.8 below:

Table 4.8: Limits of Consistency (as per IS: 456:2000)

Placing Conditions	Degree of Workability	Values of Workability
Concreting of shallow sections with vibration	Very low	20-10 seconds, vee-bee time or 0.75- 0.60 compacting factor
Concreting of lightly reinforced sections with vibration	Low	10-05 seconds, vee-bee time or 0.80 - 0.85 compacting factor
Concreting of lightly reinforced sections without vibration or heavily reinforced section with vibration	Medium	05-02 seconds, vee-bee time or 0.85 - 0.92 compacting factor or 25-75mm, slump for 20mm aggregate
Concreting of heavily reinforced sections with vibration	High	Above 0.92 compacting factor or 75-125 mm slump or 20 mm *aggregate

* For smaller aggregate the values shall be lower.

4.7 Workmanship

All workmanship shall be according to the latest relevant standards. Before starting a pour the contractor shall obtain the approval of the Engineer-in-Charge or his representative in a "Pour Card" maintained for this purpose. He shall obtain complete instructions about the material and proportion to be used, slump, workability, quantity of water per unit of cement, number of test cubes to be taken, finishing to be done, any admixture to be added, etc.

4.8 Transportation and Pouring

The concrete mixer shall be as close to the place of concreting as possible but not as close as to produce vibration and disturbance to the shuttering and reinforcements. It shall be located at such a position that time lapse for transportation of unloaded concrete mix from the mixer to the place of deposition of concrete is minimum.

When there is a difference in level between the unloading platforms of concrete from the mixer to the actual place of deposition of concrete, the concrete shall be transported manually as by means of builders' hoist/crane or concrete pump to the actual level of concreting, depending on requirement as approved by Engineer-in-charge.

Chutes for transporting the concrete shall not normally be used. The Engineer-in-Charge's written permission shall be taken for transporting by means of chutes. If use of chutes is permitted then the concrete shall be again thoroughly mixed by using spades manually before placing the concrete in the moulds/shuttering to avoid segregation of concrete. It shall be ensured that initial setting of the concrete shall not take place and the mix of the concrete is as good as that of freshly poured concrete delivered directly into the moulds/shuttering. It shall be ensured that the drop of concrete is not from an excessive height and that the vibration and

deposition of concrete are simultaneously carried out.

Before placing concrete, all equipment for mixing and transporting the concrete shall be cleaned and all debris shall be removed from the place to be occupied by the concrete. All form and soil surface shall be finished to desired levels and shall be thoroughly wetted immediately prior to placing of concrete.

No concrete shall be placed until the Engineer-in-Charge has approved the excavation formwork and the reinforcement. The competent formwork maker and steel fixer shall be in attendance during concreting operation.

To ensure bond and water tightness between old concrete surface and the concrete to be place HDPE water stops of approved make and size 150 mm wide, 10 mm thick should be used. The bonding of old and new concrete shall be done by applying cement slurry after thoroughly watering the old concrete surface and. removing all loose particles.

In specified cases, with approval of Engineer-in-charge the surface shall be cleaned and roughened by initial green cut by wire brushes or chipping. The initial green cutting may be done after 6 hours of placing concrete in order to facilitate the work. The old concrete walls/members shall be given a shear of 50 x 65 mm deep. This key shall also be thoroughly cleaned with wire brush in green stage before next lift pouring to avoid percolation of works.

4.7.1Special methods of Concreting

Should be contractor propose to use the special methods of concreting not included in this specification, such as pumping concrete or using vacuum moulds he shall obtain the Engineer's approval before commencing work and comply with any subsequent specifications made by the Engineer for this special methods of concreting. Contractor is advised to use modern techniques in adapting methods of laying/finishing concrete in raft/wall etc., e.g. in raft, use of any other acceptable and proven method will be welcomed. The contractor may elaborate same on while quoting the offer.

4.8.1 Placing of concrete in slabs and beams

Concrete in slabs shall be placed in one continuous operation for each span unless otherwise directed. Longitudinal construction joints, if required by reason of the width to be placed shall be located as shown on the drawings or as directed by the Engineer-in-Charge.

Concrete in the stem and slab of T -beam shall be placed in one continuous operation and shall be deposited uniformly for the full length of the beam and brought up evenly in horizontal layers.

Where the size of the member is such that it cannot be made in one pour, transverse vertical construction joints shall preferably be located within the area of contra flexure. For continuous spans, where required by design considerations the concrete placing sequence shall be approved by the Engineer-in-Charge.

4.8.2 Concreting floors

Concreting in floor shall be done in a chess board pattern, allowing sufficient time to elapse before the adjacent band in cast. The panel size is restricted to 7.5m in reinforced concrete slab.

Concreting shall not be started unless the electrical conduits or any other piping Puddle Collars wherever required or laid by the concerned agency. The civil contractor shall afford all the facilities and maintain co-ordination of work with other agencies engaged in electrical and such other works as directed by the Engineer-in-Charge.

Where concrete is placed on soil it shall be placed only on firm undisturbed ground. Any concrete that is placed on a well compacted fill shall have the prior approval of the Engineer-in-Charge. Concrete shall not be placed in standing water, on sub-grade or in foundation Excavation.

4.9 Compaction

Concrete during and immediately after depositing shall be thoroughly compacted. The compaction shall be done by mechanical vibration subject to the following provisions:

a. The vibration shall be internal unless special authorization of other methods is given by the Engineer-in-charge or as provided herein.

b. Vibrators shall be of type and design approved by the Engineer-in-charge. They shall be capable of transmitting vibration to the concrete at frequencies of not less than 4,500 impulses per minute.

c. The intensity of vibration shall be such as to visibly affect a mass of concrete of 25 mm slump over a radius of at least 0.5m

d. The contractor shall provide a sufficiently number of vibrators to properly compact each batch immediately after it is placed in the forms.

e. Vibrators shall be manipulated so as to the thoroughly work the concrete around the reinforcement and embedded fixtures, and into the corners and angles of the forms.

Application of vibration shall be at points uniformly spaced and not further apart than twice the radius over which the vibration is visibly effective.

f. Vibration shall not be applied directly or through the reinforcement to sections or layers of concrete which have hardened to the degree that the concrete ceases to be plastic under vibration. It shall not be used to make

concrete flow in forms over distances so great as to cause segregation and vibrators shall not be used to transport concrete in the forms.

g. Vibration shall be supplemented by such rodding/ spading as necessary to ensure smooth surface and dense concrete along form surfaces and in corners and locations impossible to reach with the vibrators.

The whole process starting from the mixing of concrete to the placing and compaction shall not take more than 20 minutes and the process shall be completed before the initial setting takes place.

4.10 Curing

Curing shall be accomplished in accordance with **IS: 456-2000** by keeping the concrete covered with a layer of sacking canvas, Hessian or similar absorbent materials and kept constantly wet for at least fourteen days from the date of placing of concrete unless otherwise specified. The approval of the Engineer-in-Charge shall be obtained for the method of curing the contractor proposes to use on the work. In very hot weather precautions shall be taken to see that temperature of wet concrete does not exceed 38ºC while placing.

Heavy loads shall not be placed on or moved across over the floor slabs until curing is complete. Care shall be taken to prevent floor surface from being marred during curing period. Freshly laid concrete form work shall not be jarred. Concrete placed in trenches or Excavation shall be protected from falling earth during and after placing.

4.11 Consistency

The consistency of concrete shall be frequently checked by means of a slump test performed as per the relevant Indian Standard by the Engineer-in-Charge. The maximum and minimum slump for each class of concrete shall be as directed by the Engineer-in-Charge, and any concrete as represented by the slump test which fails to comply with these directions shall be removed from the site and disposal off at the contractors cost.

4.12 Finishing Of Concrete

On striking the formwork, all blowholes and honeycombing observed shall be brought to the notice of Engineer-in-Charge. The Engineer-in-Charge may, at his discretion allow such honeycombing or blowholes to be rectified by necessary chippings and packing or grouting with concrete or cement mortar. If mortar is used, it shall be 1:2 mix or as specified by Engineer-in-Charge. However, if honey combing or blowholes are of such extent as being undesirable, the Engineer-in-Charge may reject the work totally and his decision shall be binding. No extra payment shall be made for rectifying these defects. All burrs and uneven faces shall be rubbed smooth with the help of carborundum stone.

The surface of non-shuttered faces shall be smoothened with a wooden float to give a finish equal to that of the rubbed down shuttered faces. Concealed concrete faces shall be left as from the shuttering except that honeycombed surface shall be made good as detailed above. The top faces of slabs not intended to be surfaced shall be leveled and floated to a smooth finish at the levels or falls shown on the drawings or elsewhere. The floating shall not be executed to the extent of bringing excess fine material to the surface.

The top faces of slabs intended to be covered with screed, granolithic or similar faces shall be left with a rough finish.

4.13 Work in Extreme Weather

During hot weather (atmospheric temperature above 40 degree centigrade) or cold weather (atmospheric temperature at 5 degree centigrade and below) the concreting shall be done as per the procedure and precautions set out in **IS: 7861** (Part I and II).

Dependence shall not be placed on salt or other chemicals for the prevention of freezing. Calcium chloride shall not be used as an accelerator except with the approval of the Engineer-in-Charge. Recommendation given in relevant clauses of IS: 456 shall be strictly adhered to.

4.14 Loading of the Structures

No concrete structures shall be loaded until the concrete is at least 28 days old and only then with the approval of the Engineer-in-Charge and subject to such conditions as he may lay down.

4.15 Testing and Acceptance Criteria of Concrete

The sampling of concrete making the test specimens, curing and testing procedures etc. shall be in accordance with **IS: 1199, IS: 3085** and **IS: 516,** the size of specimen being 15 cm cubes. Normally only compression tests shall be performed in accordance with **IS: 516.**

For each grade of concrete and for each 8 hours of work or portion thereof the following samples shall be taken.

At least six specimens shall be taken from the first 15.0 m^3 or part thereof and three of these shall be tested at 7 days and the remaining at 28 days. Four additional specimens shall be taken from each additional 15.0 m^3 of concrete or portion thereof of which 2 specimens shall be tested at 7 days and the remaining at 28 days.

To control the consistency of concrete from every mixing plant slump tests, and/or compacting factor tests in accordance with **IS: 1199** shall be carried out by the contractor every two hours or as directed by the Engineer-in-Charge. Slumps corresponding to the test specimens shall be recorded for reference. The acceptance criteria of concrete shall be in accordance with **IS: 456-2000.**

4.16 Load Test of Structures

The Engineer-in-Charge may instruct for a load test to be carried out on any structure if in his opinion such a test is deemed necessary for any of the following reasons.

The works site made concrete test-cube failing to attain the specified strength, as per the criteria laid down in **IS: 456-2000**.

Suspected overloading during construction of the structure under review

Shuttering being prematurely removed and not as per the specification

The concrete is being improperly cured.

Visible deficiencies of the concrete

If the results of the load test be unsatisfactory, the Engineer-in-Charge may instruct the Contractor to demolish and reconstruct the structure or part thereof at the contractor's cost. The load test of structures shall be carried out as per the clause 16.5 of **IS: 456-2000.**

4.17 Special methods of concreting

The contractor should propose to use special methods of concreting not included in the specifications, such as pumping concrete or using vacuum moulds, he shall obtain the Engineer-in-Charge's approval before commencing work and comply with any subsequent specification made by the Engineer-in-Charge for this special method of concreting. Contractor is advised to use modern techniques in adopting methods of laying/finishing concrete in raft/walls etc. e.g. in raft use of any other acceptable and proven method will be welcomed. The contractor may elaborate same on while quoting the offer.

4.18 CONCRETE FOR WATER RETAINING STRUCTURES

4.18.1 Materials for construction

Materials for concrete viz. Cement, sand aggregate, water etc. shall be as per the specifications of reinforced concrete works described in section 4 and IS : 3320 Part I. However, super-sulphated cement shall be used when ground water contains sulphates more than the permissible limit as indicated in IS: 456-2000.

4.18.2 Design

The design of the structure shall be based as per IS: 3370 (part I to Part IV) code of practice for concrete structures for storage of liquids.

4.18.3 Aggregates

Maximum size of the aggregate shall be 20 mm for thickness of the section upto 40 mm. above this limit 40 mm size aggregate may be used in the quantities as approved by the Engineer.

4.18.4 Controlled concrete

Controlled concrete of grade not weaker than M 20 is to be used in the structures with minimum quantity of cement in the concrete mix to be not less than 330 kg/cum, for the reinforced concrete work, 360 kg/ cum in post-tensioned pre-stressed work and 380 kg/cum in pre-tensioned concrete work. The maximum quantity of cement in the concrete mix shall preferably not exceed 530 kg/cum of concrete. The design should be such that the resultant concrete is dense and impervious. The mix of concrete should be fully compacted. The use of needle type of internal vibrators is recommended.

4.18.5 Cover

Cover to the reinforcement shall be as stated in drawing and in conformation to IS: 3370 (part-I to IV)

4.18.6 Admixtures

Admixtures such as plastic may be added to improve the workability only with the permission of the Engineer.

4.18.7 Joints

The Maximum spacing between the partial contraction joints shall be not more than 7.5 m and between the full contraction joint 15.0 m. Alternatively, temporary short gaps of width 0.5 m in walls be left out to the filled in after the concrete has hardened on sides. Vertical joint shall be avoided by casting a lift of approximately 1.0m deep in continuous operation for circular structures.

4.18.8 Shuttering

Scope

Form work shall be composed of steel and /or best quality shuttering wood of non-absorbent type. Timber shall be free of knots and shall be of medium grain as far as possible. Hard woods shall be used for caps and wedges under or over posts. Marine plywood shuttering or equivalent shall be used where specified to obtain smooth surfaces for exposed concrete work. Struts shall generally be mild steel tubes, and strong Sal bellies. Bamboos, small diameter bellies etc. shall not be used unless approved by the Engineer in specific cases.

General Requirements

If, it is so desired by the Engineer the contractor shall design and prepare, before commencement of actual work, the drawings for form work and centering and get them approved by the Engineer. The form work shall conform to the shape, lines and dimensions as shown in the drawings.

The centering shall be true, rigid and thoroughly braced both horizontally and diagonally. The forms shall be sufficiently strong to carry, without undue deformation, the dead weight of the concrete at the time of casting as well as working load. Where the concrete is vibrated, the form work shall be strong enough to withstand the effects of vibration without appreciable deflection, bugging distortion of loosening of its components. The joints in the form work shall be sufficiently tight to prevent any leakage of mortar. The form work shall be such as to ensure a smooth uniform surface free from honeycombs, air bubbles, bulges, fins and other blemishes, Any blemish or defect found on the surface of the concrete must be brought to the notice of the Engineer immediately by the

contractor and rectified, free of charge, as directed by him. To achieve the desired rigidity, tie bolts, spacer blocks, tie wires and clamps as approved by the Engineer shall be used but they must in no way impair the strength of concrete or leave stains or marks on the finished surface.

Where there are chances of these fixtures being embedded, only mild steel or concrete of adequate strength shall be used. Bolts passing completely through liquid retaining walls/ slabs for the purpose of securing and aligning the form work should not be used.

For exposed interior and exterior concrete surfaces or beams, columns and walls, plywood or other approved forms, thoroughly cleaned and tied shall be used. Rigid care shall be exercised in ensuring that all columns are in plumb and true and thoroughly cross braced to keep them so. All floor and beam centering shall be crowned not less than 8 mm in all directions for every 5 m span. Temporary openings for cleaning, inspection and for pouring concrete shall be provided at the base of vertical forms and at other places where they are necessary and as may be directed by the Engineer. The temporary openings shall be so formed that they can be conveniently closed when required and must not leave any mark on the concrete.

Cleaning and Treatment of forms

All forms shall be thoroughly cleaned of old concrete, wood shavings, saw dust, dirt and dust sticking to them before they are fixed in position. All rubbish, loose concrete, chipping, shavings, sawdust etc. shall b scrupulously removed from the interior of the forms before the concrete is poured, along with wire brushes, brooms etc. compressed air jet and / or water jet shall be kept handy for the cleaning, if so directed by the Engineer.

Before shuttering is placed in position, the form surface in contact with concrete shall be treated with approved form removing non-staining oil or composition. Care shall be taken that the oil or composition does not come in contact with reinforcing steel or existing concrete surfaces. They shall not be allowed to accumulate at the bottom of the shuttering.

The form work shall be so designed and erected that the forms for slabs and the sides of beams, columns and walls may be removed first, leaving the shuttering to the soffits of beams and their supports in position. Re-propping of beams shall not be done except with the approval of the Engineer and props can be reinstated in anticipation of abnormal conditions, if form work for column is erected to the full height of the columns, one side shall be left open and built up in sections, as placing of concrete proceeds: Wedges, spacer, bolts, clamps or other suitable means shall be provided to allow accurate adjustment of the form work and to allow, it to be removed gradually without jarring the concrete.

Pipe inserts to be laid at the time of concreting

For pipes to be laid in the walls during concrete, relevant drawings shall be followed.

Openings shall be provided in the shuttering plates at suitable positions. It is to be noted here that special shuttering plates for this purpose may have to be used, and the number of uses of shuttering material, for working out the rate, shall be calculated accordingly.

Removal of forms

The contractor shall record on the drawings or in other approved manner, the date on which the concrete is placed in each part of the work and the date on which the form work is removed there from and have this record checked and counter signed by the Engineer. The contractor shall be responsible for the safe removal of the form work but the Engineer may delay the time, if considers it necessary. Any work showing sign of damage through premature removal of form work for loading shall be entirely reconstructed by the contractor without any extra cost of the owner.

Forms for various types of structural components shall be removed before the minimum periods specified below (table V) which shall also be subject to the approval of the Engineer. Engineer at his discretion may extend this maximum period for removal of form work and contractor shall retain the form work for a longer period as desired by the Engineer at no extra cost to the owner.

Table 5: Minimum period for Removal of Form work

Part of structure	Temperature in degrees Celsius (^{0}C)			
	Above 40^0 Days	40^0 to 20^0 Days	20^0 5^0 Days	to Below 5^0 Days
1	2	3	4	5
A. Ordinary Portland Cement Concrete				
1. Column and walls	2	1	1	Do not remove forms until site cured test cylinder / cubes develop 50% of 28 days strength
2. Beams sides	3	2	3	
3. Slabs 125 mm thick or less	10	7	8	
4. Slab over 125 mm thick and soffit of minor Beams	18	14	16	
5. Soffit of main beams	24	21	22	
B. Rapid Hardening Portland Cement concrete				
1. Columns and walls	1	1.5	1	Do not remove forms until site cured test cylinder / cubes develop 50% of 28 days strength
2. Beams sides	2	1	1	
3. Slab 125 mm thick or less	7	4	5	
4. Slab over 125 mm thick and soffit of minor Beams	12	8	9	
5. Soffit of main Beams	14	10	12	

Note: For Ordinary Portland Cement the removal time should be suitably increased over the time giver for ordinary Portland cement, as directed by the Engineer.

Reuse of forms

Before reuse, all forms shall be thoroughly scrapped, cleaned, joints examined etc. and when necessary, repaired and inside surface treated as specified herein before. Form work shall not be used/ reused, if declared unfit or unserviceable by the Engineer.

Classification of form work

a. Ordinary

These shall be used in places where ordinary surface finish is required and shall be composed of steel and / or approved good quality seasoned wood.

b. Plywood

These shall be used in exposed surfaces, where specially good finish is required and shall be made mostly of approved brand of heavy quality shuttering/ marine plywood to produce a perfectly level, uniform and smooth surface.

Ordinary form work shall be used for all underground structures and 'plywood' form work shall be used for all structure above ground.

Acceptance of form work and finished concrete shall be true to shape, lines, levels, plumb and dimensions as shown on drawings. All embedded fixtures shall be correct type and in correct position as shown in drawings. Finished concrete surface shall be free from blemishes like honeycombs, air bubbles, fins, etc. Exposed decorative concrete surfaces shall be free from rust, stains, grease and mould oil stains, etc. and shall have uniform pleasing appearance to satisfaction of the Engineer. If desired, the finished concrete shall conform in all respects to the accepted sample.

Where exposed surface of concrete can be effectively sealed to prevent loss of water the periods specified for temperature above 40^0 C can be reduced to those for the temperature range of 20^0 to 40^0 C subject to approval of the Engineer. Before removing any form work, the contractor must notify the Engineer well in advance to enable him to inspect the concrete, if he so desires.

Tolerance in finished concrete

Tolerance in finished concrete shall be exactly same as for reinforced concrete structures in section 2.5.3.3.and 2.5.11.

4.18.9 Curing

Curing etc. of the structures shall be exactly same as for reinforced concrete structures in section 2.5.9

4.18.10 Vertical joints

All vertical joints shall extend full height of the wall in unbroken alignment.

4.18.11 Water Tightness

The test for water tightness of the structure shall be carried out as per clause 10 f IS 3370 part 3.

4.19 Epoxy coating and bituminous painting

EPOXY COATING

4.19.1 General

Epoxy coating is to be applied to the internal surface of MS pipes. The thickness of epoxy film shall be 400 microns.

4.19.2Materials

A solvent free epoxy coating likes "Araldite GY 255 manufactured by Hindustan CIBA Geigy Ltd. Bombay or equivalent is to be used for forming the film. In case of use of an equivalent it should be got approved by the employer before placing supply orders.

Materials used and process of application on the concrete of other surface should be strictly according to the instructions of the supplier of the epoxy.

Araldite GY 25 one part by weight is to be mixed with 1 part by weight of Hardener HY 45.

4.19.3 Subsurface Preparation

The concrete surfaces should be cleaned thoroughly by sand blasting. The mild steel parts are also to be cleaned to be free of grease and thoroughly sand blasted. The coverage should be move than 6 sq. meters for concrete and 5 sq. meters for mild steel per kg. of epoxy respectively.

4.19.4 Curing

The curing should be done for 7 days at room temperature. If the temperature is less than 15^0 C the space should be warmed up by incandescent lamps, heaters, blowers or infrared lamp.

The instructions of both the supplier/ manufacturer of the product, for use of materials and application take priority over the above instructions and they should be followed very rightly.

4.19.5 Bituminous Painting

Two coats of bituminous paint of 80/100 grade, with 1.65 kg/sq. m spread will be provided on internal and / or external surface of the pipes and on piers, in the reach, where MS/ GRP pipes are proposed, and where concrete / structure is exposed to weathering or foul conditions.

4.19.6 Application

All corners and junctions shall be properly rounded off to present a uniform and smooth finish. After complete curing of the paint, it shall be allowed to dry up. After drying, the moisture content shall be brought to a value less than 4% by using a blow lamp. The surface should be well cleaned with smooth brushed to make it dust free. The coating shall be allowed to dry and kept in dry condition till final setting takes place. The sub-surface preparation and curing is to be done as specified is para 2.7.3 and 2.7.4 respectively above.

4.20 Codes and Standards

All applicable standards, specifications, etc. and codes of practice shall generally be the latest editions, including all applicable official amendments and revisions. A complete set of all these documents shall generally be available at site, with the contractor.

All work shall be carried out as per the stipulations contained in various sections of these specifications and the latest Indian Standards, Acts, Codes and best practices.

In case of conflict between the stipulations contained in various' sections of these specifications and stipulations of Indian Standard, Codes, etc. the requirements of stipulations contained in various sections of these specifications, shall prevail over that of Indian Standards, Codes, etc.

Some of the applicable Indian Standard Codes, etc. are referred below:

IS:73	Specification for paving bitumen
IS:2060	Specification for structural steel
IS:8112	Specifications for Ordinary Portland cement 43 grades.
IS:280	Specification for mild steel wire for general engineering purposes
IS:383	Specification for coarse and fine aggregates from natural sources for concrete
IS:432 (Part I & II)	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement
IS:455	Specification for Portland Slag Cement
IS:456	Code of practice for plain and reinforced concrete
IS:457	Code of Practice for general construction of plain & reinforced concrete for dams and other massive structure.
IS:516	Method of test for strength of Concrete
IS:650	Specification for standard sand for testing of cement
IS:702	Specification for industrial bitumen
IS:816	Code of practice for use of metal as welding for general construction in mild steel
IS:1199	Methods of sampling and analysis of concrete
IS:1200 (Part II, V, VIII, XVIII, SVIII)	Method of measurement of building and civil engineering works, water proofing and damp proofing

IS:1367	Technical supply conditions for threaded steel fasteners
IS:1489	Specification for Portland pozzolana cement (Part I) Fly ash based & (Part II) Calcified clay based
IS:1566	Specification for Hard drawn steel wire fabric for concrete reinforcement
IS:1609	Code of practice for laying damp proof treatment. using bitumen felts.
IS:1786	Specification for high strength deformed steel bars and wires for concrete reinforcement
IS:1791	General requirements for batch type concrete mixer.
IS: 1838	Specification for performed fillers for expansion joints in concrete pavements and structures (non-extruding and resilient type)
IS:2204	Code of practice for construction of reinforced concrete shell roof
IS:2210	Criteria for the design of reinforced concrete shell structures and folded plate
IS:2386 (Part I to 8)	Methods for test of aggregates for concrete
IS:2438	Specification for roller pan mixer
IS:2502	Code of practice of bending and fixing of bars for concrete reinforcement
IS:2505	General requirements for concrete vibrators, immersion type
IS:2506	General requirements for concrete vibrators, screen board type
IS:2514	Specification for concrete vibrating tables
IS:2571	Code of practice for laying in situ cement concrete flooring
IS:2645	Specification for integral cement water proofing compounds
IS:2722	Specification for portable swing weigh batchers for concrete (single and double bucket type)
IS:2750	Specification for steel scaffoldings
IS:2751	Code of practice for welding of mild steel plain and deformed bars for reinforced concrete construction
IS:2911	Code Of Practice for design and construction of pile foundation
IS:3025	Methods of sampling and test for water and waste water
IS:3067	Code of practice for general design details and preparatory work for damp proofing & water proofing of buildings
IS:3150	Specification for hexagonal wire netting for general purposes
IS:3366	Specification for pan vibrators
IS:3370 (Part I & II)	Code of practice for concrete structures for the storage of liquids
IS:3384	Specification for bitumen primer for use in water proofing & damp proofing

IS:3414	Code of practice for design and installation of joints in buildings
IS:3550	Methods of test for routine control for water used in industry
IS:3558	Code of practice for use in immersion vibrators for consolidating concrete
IS:3696 (Part I & II)	Safety code for scaffolds and ladders
IS:4014 (Part I & II)	Code of practice for steel tubular scaffolding
IS:4031	Methods for physical tests for hydraulic cement
IS:4130	Safety code for demolition of buildings.
IS:4326	Code of practice for earthquake resistant design and construction of buildings
IS:4656	Specification for form vibrators for concrete
IS:4925	Specification for batching and mixing plant
IS:4990	Specification for plywood for concrete shuttering work
IS:4995 (Part I & II)	Criteria for design of reinforced concrete bins for the storage of granular and powdery materials
IS:5121	Safety code for piling and other deep foundations
IS:5256	Code of practice for sealing joints in concrete lining on canals
IS:5525	Recommendations for detailing of reinforcement in reinforced concrete work
IS:5624	Specification for foundation bolts
IS:6461	Glossary of terms relating to cement concrete
IS:6494	Code of practice for water proofing of underground water reservoirs and swimming pools
IS:6509	Code of practice for installation of joints in concrete payments
IS:7193	Specification for glass fiber base coal tar pitch and bitumen felts
IS:7293	Safety code for working with construction machinery
IS:7861 (Part I & II)	Code of practice for extreme weather concreting
IS:9012	Recommended practice for Concreting.
IS:9103	Specification for concrete Admixtures
IS:9417	Recommendations for welding cold worked steel bars for reinforced concrete construction.
IS:9595	Recommendations for metal-arc welding of carbon and carbon manganese steels
IS:10262	Recommended guidelines for concrete mix design
IS:11384	Code of practice for composite construction in structural steel and concrete
IS:12118	Specification for two parts poly sulphates

IS:12200	Provision for Water-Stops at transverse contraction joints in masonry and concrete dams
IS:12269	53 grade ordinary Portland cement
IS:12600	Portland cement, low heat
SP:23	Handbook of concrete mixes
SP:24	Explanatory Handbook on IS:456
SP:34	Handbook on concrete reinforcement and detailing.

5. BITUMINOUS, CC, BOE & INTERLOCKING TILE ROAD

5.1 All work shall be carried out as per IRC detailed specifications where there are no IRC specifications M.O.S.T. specifications/U.P.P.W.D/C.P.W.D. specifications will be followed unless otherwise specified or directed by the Engineer in charge.

5.2 The contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, marking flags, lights and flagman, as necessary at either end of work site and at such intermediate points as directed by the Engineer in charge for the proper identification of the construction area. He shall be responsible for all damages and accidents caused due to negligence on his part. The temporary warning lamps or reflective barriers or sign boards shall be installed at all barricades during the hours of darkness.

5.3 Stone ballast / Stone grit should be stacked at site for satisfaction regarding quantity of material to Engineer in charge.

5.4 The material collected for use in the work shall satisfy all requirements for the particular work, failing which the material will be rejected. The gauge of stone ballast shall be as per detailed specification for the respective items and deduction will be made for the under gauge/ over gauge material as per Engineer in charge.

5.5 During construction care shall be taken to ensure there is least disturbance to the traffic. Adequate barriers, red flags in day time and light in night hours shall be provided to guide and inform the traffic. All necessary precautions shall be taken to avoid any road accident at work-site but if there happens any the responsibility will be of the contractor and he shall be responsible for all consequences and damages/ claims etc.

5.6 The consolidation will be in specified layers. Proper and adequate camber or super elevation etc. shall be provided as per directions of Engineer in charge.

5.7 Next coat of consolidation shall be allowed after checking of the crust and quality of previously consolidated layer by the Engineer in charge and found satisfactory.

5.8 The material of the different layer will be spread in required loose thickness so as to achieve the desired compacted thickness.

5.9 The binding material for consolidation shall be soil having plasticity index not more than 6 which is to be arranged by the contractor from a suitable place as directed by Engineer in charge. The soil shall be got approved from the Engineer in charge before start of consolidation and nothing extra shall be paid either for the cost of binding material or for its cartage.

5.10 Proper arrangement of water and its storage for consolidation shall have to be made by the contractor at his own cost.

5.11 The stone ballast shall confirm to the following sieves.

Name of metal	Percentage by weight passing					
	90 mm	63 mm	53 mm	45 mm	22.4 mm	1.2 mm
63-45 mm gauge	10%	90-100%	25-75%	0-15%	0-5%	-
53-22.4 mm gauge	-	100%	95-100%	65-90%	0-10%	0-5%

5.12 (a) 16-22.4 mm size grit shall pass 100% from 22.4 mm square mesh sieve

And all retained on 16 mm square mesh sieve.

(a) 10-16 mm size shingle / grit shall pass 100% from 16 mm square mesh

Sieve and all retained on 10 mm square mesh sieve.

5.13 (A) Material for Ist coat painting shall be as follows:-

(i) Grit 16-22.4 mm size (crushed) 1.9 cum per% sqm

(ii) Bitumen

(a) For Pre coating 15 kg per cum of shingle/grit

(b) For tack coat 180 kg per% sqm.

(B) Material for IInd coat painting shall be as follows:-

(i) Grit /Shingle 10-16 mm size 1.20 cum per% sqm.

(ii) Bitumen

(a) For Pre coating 15 kg per cum of shingle/grit

(b) For tack coat 110 kg per% sqm.

(C) Material for open Graded Premix Carpet shall be as follows:-

(i) Aggregates for Carpet

(a) Stone chippings 13.2 mm size, passing 22.4mm sieve and retained on 11.2 mm sieve 1.8 cum per% sqm .

(b) Stone chippings 11.2 mm size, passing 13.2 mm Sieve and retained on 5.6 mm sieve 0.9 cum per% sqm.

(ii) Bitumen

(a) For tack coat 180 kg per% sqm

(b) For stone chipping of 13.2 mm size 52 kg per cum

(c) For stone chipping of 11.2 mm size 56 kg per cum

(D) Material for type 'A' seal coat shall be as follows:-

(i) Stone chippings 6.7 mm size passing through 11.2 mm sieve and retained on 2.36 mm sieve - 0.9 cum per% sqm

(ii) Bitumen 98 kg per % sqm

(E) Material for type 'B' seal coat shall be as follows:-

(i) Chippings aggregates passing 2.36 mm sieve and be retained on 180 micron sieve - 0.6 cum per% sqm

(ii) Bitumen 68 kg per % sqm

5.14 Stone ballast/Grit/Shingle of approved quarry only, confirming to I.R.C. Specifications shall be used. Before using stone ballast/Stone Grit/River shingle the quality & size has to be approved by the Engineer in charge.

5.15 Contractor shall always cooperate in procurement of sample, conduction of tests as may be directed and no extra payment shall be made for the same. Test samples shall be taken carefully in accordance with the standard method of taking the test sample.

5.16 The contractor shall at all times keep the premises free from accumulated waste materials or rubbish caused by his employee on the works and on completion of the work, he shall clear away and remove from site all surplus materials, rubbish and temporary works of any kind and fill up borrow pits dug by his. He shall leave whole of the site and work clean and in a workman like condition to the entire satisfaction of the Engineer in charge.

5.17 The cement concrete road shall be constructed with concrete mix of M-20 grade as per IS code-456:2000.

5.18 The permanent reinstatement of all types of roads shall be executed as per UPPWD specifications. Where UPPWD specifications are not available CPWD specifications shall be followed. The material used shall be conforming to relevant IS codes with its latest revision.

(D) TECHNICAL SPECIFICATIONS FOR OVER HEAD TANK

1.1 Purpose of work:

The proposed work is intended for storage of water for use of water supply to the surrounding areas.

1.2 Specifications

All IS specifications,UPJN Specifications, CPHEEO Manuals etc. shall be followed with latest revisions as on date of receiving of tenders.

2. Description of works included in the Contract:

The contract shall include –

2.1 The structural design of the full O.H.T structure i.e. of foundation, staging, tank body, stair case & balcony etc. shall be got done by Professor/Retired Professor of IIT Roorkee / IIT or by any reputed expert, or as directed by Engineer within one month after the tender is accepted, The entire responsibility of the design shall be of the contractor including of fees/ charges of the expert. If design is done by any Retired Professor, it should be vetted by I.I.T.

2.1.1 Foundation:

A suitable foundation of the tank shall be designed based on soil characteristics at site with prior approval of Engineer whose decision shall be final and binding in regard to type and shape of foundation as well as.

2.1.1.1 ALLOWABLE BEARING CAPACITY OF SOIL OR SOIL CONDTIONS WITH TYPE OF FOUNDATION

The total loads due to various causes of over Head Tank should be transferred to earth by means of:

Raft foundation - Net safe bearing capacity (S.B.C.) shall be got tested by the Contractor by a reputed Govt Institution or as per direction of Engineer. The design should be 8 MT/m^2 at 2.50 M/3.00M depth below Ground Level. If S.B.C found below 8 MT/m^2 the design will be according to that actual S.B.C. No extra payment shall ne made for this condition. Contractor is solely responsible for the structural safety of the overhead tank. The responsibility for the structurally soundness and water tightness of the tank shall rest with the contractor shall in no way shift the responsibility for the same on the department. The design of raft foundation shall be based on balanced cantilever as per IS-2950 (Part-I) 1981.

And/orPile foundation - which may be singly/doubly bulbed under reamed bored/bored compaction cast in-situ pile, the provisions in design & construction should be made as per IS-2911 (Part-III) – 1980 or which may be Bored/Bored compaction cast-in-situ the design and construction of pile should be made as per IS-2911 (Part-I/Sec. 2) -1979. At least on working pile shall have been got tested for safe & Ultimate Load as per procedure laid in IS- 2911 (Part-IV) – 1979. However bored compacted pile shall be referred which shall be properly connected for load distribution to safe guard against differential settlement. The decision of Engineer in this regard shall be final and binding on the contractor the design shall base on soil properties.

Pile and raft foundation - where due to subsoil condition does not permit neither the raft foundation nor the pile foundation, a combination of pile and raft foundation, should have been provided. For designing the pile and raft foundation, the load coming from over head tank due to various causes should be increased 1.20 times. The load calculated thus shall be transmitted to foundation soil through raft and pile foundation in a ratio of 40:80 respectively. The raft and pile shall be designed and constructed as detailed above.

The bottom of foundation i.e. raft with circular ring beam or cut off level of piles should be at least 2.50 m. below G.L. and there should be at least 1.20 m clear cover available over the top of foundation beam or pile cap or connection braces of piles to pas the pipes.

2.1.1.2. Permissible increase in bearing capacity of soil

A) Due to wind:

(a) Where the bearing pressure due to wind is less than 25% of that due to dead and live load, it may be neglected in design. Where this exceed 25% foundation may be so proportioned that pressure due to combined dead, live and wind loads does not exceeds the allowable bearing pressure by more than 25%.

(b) A further increase in allowable bearing capacity due to wind pressure may be allowed for shape factor as per IS specification.

B) Due to earth quake forces:

When earth quake forces are considered, the permissible allowable pressure of pertaining soil shall be in accordance to Para 3.3.3 and table 1 of IS 1893-1975 depending upon the type foundation of the structures.

Safety Against overturning & uplifting

2.1.1.3.1 The diameter of staging of tank and area of foundation shall be so selected, such that the body of the over head tank is safe against over-turning due to wind or seismic forces when container is full with water and empty, in both conditions. Similarly the dimensions of raft foundation selected shall be safe against uplifting of raft and the pressure on raft shall not exceed the Net, Allowable Bearing capacity under wind or seismic conditions when container is full with water and empty, in both conditions.

2.1.1.3 The design of foundation and staging shall be as per IS: 456:2000.

2.1.1.4 The basis of design of staging shall be as follows:

2.1.2.1 The staging of the tank will be columns & bracings the allowable stresses under wind & seismic loads will be taken as per IS 456: 2000, 875 and 1993-1975 revised to date.

2.1.2.2 The circular columns be provided and their minimum number should be six. The columns should be in even number in case of more than six.

2.1.2.3 The staging has to be designed for wind loads or earth quake load whichever is critical. In case of seismic force response spectrum method shall be used. Increase in stresses shall be allowed as per IS: 875-1964 and IS: 1893-1975 subject to condition that limit state stresses of the material does not exceeds.

2.1.2.4. The design of staging shall be made by elastic theory.

2.1.2.5 Minimum longitudinal reinforcement in a column shall not be less than 0.80% of the minimum area of concrete required to resist the direct stress.

2.1.2.6 The size of main reinforcement of columns, bracings and beams shall not be greater than 25mm dia and it should not be less than 12 mm dia in case of columns and 8 mm in case of beams, bracing etc. However size of lateral reinforcement shall not be less than 6 mm or 1/4th of the dia of the largest longitudinal bar which-ever is higher.

2.1.2.7 The minimum cover of concrete of longitudinal bars in case of column shall be 40 mm or dia of longitudinal bar whichever is greater. In case of column of 200 mm or less than internal dimension and bars do not exceed 12 mm dia, 25 mm cover may be used.

2.1.3 The basis of design of Tank Body shall be as follows:

2.1.3.1 The minimum thickness or top dome having base dia less than 12m, or more should not be less than 100mm, and that of other members of tank body should not be less than 100mm.

2.1.3.2 The dimensions of tank shall be selected to given aesthetically nice appearance.

2.1.3.3 The maximum height of vertical wall should be not more than 4.0m in overhead tank upto 500 KL capacity and not more than 6.0 m in over Head Tank above 500 KL shall be preferred.

2.1.3.4 A minimum free board of 15 cm. shall be provided in over Head Tank up to 500 KL. In over Head Tank above 500 KL capacity a 15 cm, clear free board below soffit of top ring beam, if any, should be provided.

2.1.3.5 Thickness of conical dome and vertical wall of tank body should be uniform throughout or uniformly sloping.

2.1.3.6 The body of the tank shall be designed as per IS: 3370 part- I & II on no crack basis and continuity checked for members. The body of the tank either in contact, with the liquid or enclosing the space above the liquid the concrete mix shall be not less than M20.

2.1.3.7 No cut in balcony shall be provided.

2.1.3.8 Balcony as a ring beam can be designed in Intze type of tank.

2.1.3.9 Minimum Reinforcement:

The minimum reinforcement in walls, floors and roofs in each of two directions at right angles shall have an area of 0.3 percent of the concrete section in that direction greater than 100 mm and less than 450 mm the minimum requirement in each of two directions shall be linearly 0.2 percent for 450mm thick section. For section of thickness greater than 450mm, minimum reinforcement in each of the two directions shall be kept at 0.2 percent. In concrete section of thickness 225mm or greater two layers of reinforcing steel shall be placed one near each face of the section to make up the minimum reinforcement specified in this clause.

The minimum reinforcement specified above may be decreased by 20% in case of high yield strength deformed (Tor steel) bars conforming to IS-1786-1966 or IS: 1139-1966.

2.1.3.10Spacing of Reinforcement:

The minimum clear spacing between main reinforcement bars in case of columns, beams and slabs shall be 6mm more than the maximum size of coarse aggregate used or equal to the dia of the main reinforcing bars whichever is greater.

In case of more than one layer of bars in a beam, the vertical clear distance between two layers shall not be less than 15mm or maximum size of coarse aggregate or the size of bar which over is greater except that splicing bars and two way reinforcement may be in contact with each other's.

The maximum spacing of main bars in slab shall not exceed 600 mm apart than 5 times the effective depth of the slab or 600 mm whichever is less.

2.1.3.11 Minimum cover to Reinforcement:

For liquid faces or parts of members either in contact with the liquid or enclosing the space above the liquid (such as inner faces of roof slab), the minimum cover to all reinforcement should be 25 mm or the dia of the main bar, whichever is greater. In the presence of soil and water of corrosive character the cover shall be increased by 12 mm but this additional cover shall not be taken into account for design calculation.

In beams, the cover to main bars shall not be less than 40mm or the diameter of the bar whichever is greater on liquid faces and shall not be less than 25mm or diameter of the bar whichever is greater on faces 450 mm or more beyond the liquid faces.

2.1.4 The basis of design of stair case & balcony shall be as follows:

2.1.4.1 Live load shall be taken as per IS: 875 i.e. 300 Kg/m^2

2.1.4.2 The maximum rise in staircase shall be 19 cm & minimum tread shall be 25 cm only.

2.1.4.3 Width of balcony & stair case shall be 1.0m and the width of landing to balcony & top dome shall also be minimum 1.0m.

2.1.4.4 No vertical RCC ladder will be provided in flight of stair case.

2.1.5 General Requirements:

2.1.5.1 In case of any design aspect left in these of specification shall be covered by relevant latest Indian standard code.

2.1.6 Supply and carriage of all material, tools and plants, scaffolding, all type of labor (skilled and unskilled), excavation for foundation, fabrication etc. required for complete construction of tank in the sound manner as per approved design and drawing.

2.1.7 Testing of the works during and after completion of work including maintenance period set forth in schedule 'E'.

2.1.8 Live load on top dome should be as per IS: 875-1964.

3. Aggregates:

The stone grit for all R.C.C. structures shall consist of 4.75 mm to 20 mm graded Delhi blue stone broken grit and the coarse sand shall be coarse Badarpur or Chambal sand shall be as per IS : 383, Fine sand shall be of fineness modulus not less than 1.25. All material shall be conforming to I.S.S. and as detailed specifications for materials.

4. Ventilator:

A ventilator shall be provided at the middle of roof of the and will have the internal diameter equal to 1/7th to 1/8th of the internal diameter of the tank. 40mm x 40mm x 6mm angle iron shall be fixed with columns of the ventilator and a mosquito proof wire mesh shall be fixed to the angle iron over the expanded metal which shall be of 14 gauges.

5. Manhole:

60cm x 60cm M.H Cover of 5mm thick M.S plate shall be provided in the roof duly hinged and provided with 40x40x6mm angle iron frame with locking arrangement.

Materials for the construction of manhole cover shall be arranged by contractor at his own cost.

6. Lightning Conductor:

The lightning conductor shall consist of the followings:

i) An Elevation Rod:

1.2m long 25mm dia solid Aluminium rod having solid cast Aluminium 8 cm ball on top with 5 or more final points securely screwed into it, must be fitted at the top of the over head tank on G.I. place 30 cm x 6mm with suitable aluminum nuts, bolts and washers.

ii) Down Conductor:

It shall consist of 25 x 3mm Aluminum strip and round aluminum wire 9mm dia above ground level and 8mm dia copper wire below ground level with its upper and attached down the side of the tank by mans of fasteners. Conductor shall be accurately attached to the over Head Tank by fasteners which shall be 1m% and shall be made of Galvanized steel. A fastener as prescribed under IS 2309-1989 shall only be used. The conductor and aluminum wire shall be laid about 60 cm. below summer sub soil water level as per arrangement laid down in IS : 3043 : 1966 clause 7.4.1. The fasteners (10cm. long of 10mm dia bolt with top 75x6mm aluminum strip with screws, bolts and nuts etc) shall be grouted in the body of the tank column in the R.C.C truly vertically and horizontally.

iii) Earth Plate:

It shall be a G.I. 600 x 6mm; plate buried as explained above with all provision and constructional details as stated in IS-3043-1966. A 32mm dia G.I pipe shall be buried for watering the earth plate and chamber shall be constructed with P.V.C cover hinged to P.V.C frame of 15 cm x 15 cm grouted in P.C.C 1:2:4 in cement, coarse sand and Delhi Blue stone grit 20mm of 55cm x 55cm.The lightning conductor consisting of an elevation rod, down conductor and earth plate shall confirm with the standards as required by the electrical inspector of U.P. form time to time. Any amendment, additions etc. suggested or required by the Electrical Inspector shall be carried out by the contractor, for which no extra claim shall be entertained.

7. Digital Water Level Indicator:

Digital water level indicator will be fixed as per satisfaction of engineer-in-charge. All materials for the construction of digital water level indicator shall be arranged by the contractor at his own cost.

8. S.S. Ladder:

S.S. ladders shall be provided inside the tank body form roof to the bottom dome or slab of the tank. This will be 50 cm. wide (clear of angle) consisting of S.S 65 x 65 x 8mm. angle iron sides or stringers and rungs of 200 mm dia meter S.S bars spaced at 25cm center to center. Suitable holes will be made in the angle iron stringers and runs will be suitable riveted or welded both the sides.

The ladder outside the tank will be provided with 20mm dia G.I pipe (medium quality) Railing in 2 rows duly supported by 50 x 50 x 6mm angle-iron posts of 0.60 cm clear height. This railing will be provided only on one side of that ladder.

All materials for the construction of M.S. ladders and railing shall be arranged by the contractor at his own cost.

9. Stair Case:

A R.C.C stair case on two separate columns, of 1m clear width will be provided with suitable landings. Maximum rise of the stair case will be 19cm and minimum tread shall be 25cm.

10. Railing:

20mm dia. SS pipe railing in 3 rows will be provided along the stair case, landings balcony, top dome and around to inspection manhole on Top Dome. On the stair case and landings it will be provided on both the sides and one side at

other places. Railing will be supported by 60mm SS posts of 1.25m clear height and at 1.25m distance centre to centre above the walk way. At the landing two SS posts will be provided on outer side while two SS Post on each side will be provided between the two landings. The SS post will be fixed to the RCC of the stair case by two nos. 16 mm dia bolt and nuts, length of the bolts should be 30 cm. and space between bolts should be 5 cm outside angle iron, 20mm dia SS pipe will be fixed to SS posts by 10 mm hooks duly bolted. All materials should be arranged by the contractor at his own cost. One M.S. gate size of (1m x 2.10 m) made of angle iron 40 mm x 40mm x 6 mm and 25mm x 4mm flat iron with cage (from first landing to second landing) as per design shall be provided on stair case at the place decided by the Engineer, by the contractor, at his own cost.

11. Inlet, outlet, washout and over flow arrangement:

DI D/F inlet, outlet, wash out and over flow pipes as per BOQ Document shall be fixed inside and outside the tank body with necessary specials and fittings, as directed by the Engineer or their representative up to and outside apron depending upon the lengths of pipes and size.

Puddle collars shall be embedded at the time of casting concrete if DI D/F pipe of the required size and length is not available. This shall be preferably accomplished by boring holes through the form work and inserting pipe pieces of suitable size before work and inserting pipe pieces of suitable size before the concrete is laid. Over flow and inlet pipes shall be taken up to the F.S.L. with bell mouth pieces fixed at the top of pipe as per direction of Engineer-in-Charge.

The washout pipe shall be fitted at the lowest point of the tank floor so that it drains out last drop of water held in the tank. The tank bottom shall be provided with a gentle slope towards the wash out pipe.

The outlet pipe shall be provided flushed with the bottom dome or at slope at the lowest convenient point as per direction of the Engineer-in-charge.

D.I D/F sluice value will be fixed at the end of inlet, outlet and wash out pipes near the tank. Suitable chambers of 1mx1m (clear space) and of suitable depth shall be constructed in one brick-thick brick masonry in 1:4 concrete and coarse sand mortar over the sluice values & over flow, wash out chamber with removable R.C.C cover of 8 cm thickness having 15 cm x 15 cm surface box for operating sluice values. Smooth 1:2 cement and coarse sand cement plaster shall be done inside and outside the chamber. Inside the chamber 4 cm thick floor in 1:2:4 P.C.C. will also be laid. The whole of chamber should be constructed over 1:4:8 lean concrete in cement, coarse sand and 40mm gauge hard stone ballast. Chambers shall have to be constructed for inlet, outlet sluice valves and overflow/washout pipes.

All materials shall be provided by the contractor at his own cost at site.

The vertical pipes shall be tightened to column or bracing by 65mm x 6mm M.S. clamps with rubber packing will be provided by the contractor. One clamp shall be provided at each DI/ DF pipe length applicable to all the vertical pipes. 16mm dia bolts and nuts of good quality shall be provided with each clamp.

12. R.C.C. Floor and apron:

R.C.C. floor and 1m wide apron extending from outer edge to column around shall be 8 cm PCC 1:6:12 with 40 mm gauge brick ballast and fine sand.

R.C.C. Floor and apron shall be constructed after the tank has been tested for water tightness to the satisfaction of the Engineer. All materials for construction of floor apron and chamber shall be arranged by the contractor at his own cost.

13. Balcony:

1.0m. clear wide R.C.C. balcony shall be provided around the tank at a level of middle ring beam at the top periphery of conical dome in case of Intze type of tanks and at bottom ring beam in case of circular over head tanks.

14. Apex Painting:

All exposed R.C.C work will be painted with 3 coats of approved Apex paint it marked of superior quality as per colour scheme decided by the Engineer.

The pipes, fittings, steel ladder, angle irons etc. shall be painted with three coats of approved anticorrosive paint over and above a primer coat. All railings, expanded metal etc. shall be painted with 3 coat of approved quality aluminum paint over a primer coat. Paints should be ISI marked of superior quality.

All apexes painting work will have to be carried out after the tank is tested for water tightness to the satisfaction of the Engineer-in-Charge.

All materials for painting shall be arranged by the contractor at his own cost.

15. Workman Ship:

No plastering will be allowed on the faces of concrete work. All R.C.C work shall be true to shape, alignment and grade. Vertical pipe shall be perfectly in plumb.

No kutcha shuttering will be allowed, contractors will have to provide proper steel shuttering.

All R.C.C work will have to be laid in presence of Project Engineer/ Assistant Engineer-in Charge, otherwise the same may not be accepted and may have to be re-laid at his (contractor's) own cost. The contractor will intimate the date and time of concreting at least one week prior to the Engineer- and will lay the concrete after getting the measurements of reinforcement checked by Project Engineer in Charge.

(F) DETAILED SPECIFICATIONS FOR RISING MAIN WORKS

TECHNICAL GENERAL SPECIFICATIONS

All the works as mentioned in Part-II Financial Bid /BOQ and other works pertaining to the unit shall be executed in confirmation to the relevant latest edition of CPHHEO/ Indian Standard Code specification published by Bureau of Indian Standard. If a case arises where Indian Standard Codes are silent, the current relevant specifications published by different Engineering departments shall be followed in the order viz

1. U.P Jal Nigam Specifications
2. Uttar Pradesh Public Works Department
3. Uttar Pradesh Irrigation Department
4. Central Public Works Department
5. Indian Water Works Association Standards.
6. Central Government Public Health Engineering Organizations' Manuals etc.
7. Due to the technological development if a case arises where all India Standards are silent, and International Standard shall be followed.

GENERAL SPECIFICATIONS FOR RISING MAIN WORKS

1. EXTENT OF WORK

The contract provides for the dismantling of roads, laying and jointing of all DI Rising main pipes, supply and fixing of all fittings and specials and all other appurtenant works with permanent reinstatement of roads as per Part-II Financial Bid /BOQ & index plan/design and drawings of this contract as provided by Engineer

2. LIMIT OF CONTRACT

The contract shall be deemed to be complete after all the works have been tested and handed over to the respected Nagar Panchayat and withstood a defects liability period of24 months after the date of commissioning and passage of 3 months trial run period without developing any defects etc. It will be wholly contractor's responsibility to replace the

whole or part of pipelines and fittings/ chambers at his own cost, if any irreparable defect or damage due to failure of pipe, fittings, specials and other materials occurs or if the work is found to be of inferior quality beyond acceptance in the opinion of Engineer even after execution& during the maintenance period or before handing over to respected Nagar Panchayat whichever comes later.

3. EXCAVATION OF TRENCHES

The excavation in trenches shall be carried out in accordance with the detailed specifications laid down in U.P.J.N.'s detailed specifications, which can be seen in the office at any working day during office hours before submitting in the tender, and the contractor's rate shall include all such works as detailed there in as well as all timbering, shoring and shuttering works, as this shall not be paid extra.

The rate shall be good for excavation in all types of strata and no separate claim in this connection shall be entertained. The contractor shall be liable for any damage done to any adjacent property or to any of the works in partiality or completely by settlement or movement of trenches which in the opinion of the Engineer attributable to any of the excavation/trench work timbering and refilling included in this contract or not withstanding such settlement may be allowed to have been caused by the construction of any kind of subsoil water during progress of pumping. The contractor shall also be responsible for all slips and shall not be paid extra for their removal. He shall also make good all damages due to slips, etc., and complete all the works. The contractor's lump-sum rates should therefore also include refilling of trenches in layers including watering and ramming and disposal of surplus earth anywhere, as desired by Engineer without creating any nuisance or complaint and without any extra claim what so ever. The trenches should be so dug that the pipe may be laid to the required gradient and at the required depth to give one meter clear cover. Additional width& depth should be provided at positions of joints, flanges, fittings for proper jointing. Trench width should not be less than 60 cm plus inner dia of pipe. The rates should also include for refilling of trenches including watering& ramming& disposal of surplus earth etc. complete. The rates of excavations shall be inclusive of display of flags, caution boards, fencing, lighting, watering, etc. lead shall be from the center of area of excavation to the center of heap and lift is to be measured from the mean ground level to the bottom of the excavation.

4. DISMANTLING AND PERMANENT REINSTATEMENT OF ROADS

The permission for dismantling of roads shall be obtained by the contractor and its charges will be paid to the concerned department by U.P. Jal Nigam but dismantling work and permanent reinstatement shall be done by contractor and all correspondence on demand shall be done by U.P. Jal Nigam but dismantling work and permanent reinstatement shall be done by the contractor and its charges shall be taken in the tendered cost.

5. CUSHIONS ALL ROUND THE PIPES

To avoid damage to the DI pipes due to kankar/boulders and other sharp object, if at all encounter in field then sand or alluvial soil cushion or screened earth free from all above unwanted objects shall be provided which shall be laid under the above pipe lines in thickness ½ of the outer dia of pipe or 15 cm. whichever is maximum. No extra payment shall be paid to contractor on this account.

6. LAYING AND JOINTING OF PIPES

Laying and jointing of pipes of required working pressure as detailed in Part-II Financial Bid/ BOQ and Index plan shall be done as per IS-12288. The Jal Nigam detailed specifications can be seen in the office of Engineer. Work specifications of latest edition of Manual on Water Supply and Treatment, Ministry of Urban Development, Govt. of India shall be followed in general for all other works for which specifications are not detailed herein.

7. TRENCH PREPARATION

The trenches bed should be free from any rock projections, hard object such as flints, or tree roots, etc. If Kankar/boulder mixed soil is wet, a layer of sand or alluvial earth (or screened earth) equal to ½ dia of the pipe or 15 cm whichever is maximum shall be provided under and above D.I. pipes. Sand/earth cushions shall not be paid extra.

Depth of trenches should be such as to provide minimum one meter cover to the pipe. The width of trench shall be minimum 60 cm plus the inner dia of pipe for proper laying of pipeline.

8. PRESSURE TESTING OF PIPES

Pressure testing of pipes shall not be done until otherwise desired by the Engineer In charge. However, pipelines shall be tested against any leakage by the contractor in a Manner as SPECIFIED in relevant IS code or as per relevant section of the Manual on Water Supply and Treatment. Prior to testing care should be taken to evacuate any entrapped air and slowly raising the system to appropriate test pressure. After about one hour has elapsed a measured quantity of water shall be pumped to bring the pressure back to test pressure, if there is a loss of pressure during the test. The quantity of water required for restoring the test pressure of 30 M. for; 24 hours should not exceed 1.5 litres per 10mm of nominal dia for a length of 1 Km.

Contractor shall include in his rates sufficient margin for testing and repair of subsequent leakages of joints, fitting and specials during work and after commissioning of pipe line and also during maintenance period of one year. During maintenance period contractor will also include material cost for repairing of pipe line as well as cost of repair of public places due to excavation.

9. PILLAR TYPE STAND POST AND VALVE CHAMBER

Single tap pillar type stand post and Valve chambers as per Part-II Financial Bid BOQ and index plan shall be constructed as per departmental type design. Item wise general specifications of work and materials are given in unit estimate and shown in the drawing. For detailed specifications relevant IS specification/Jal Nigam/UPPWD /CPWD specification shall be followed. Estimate of unit quantities of work and work specifications unit wise can be seen in the office on any working day.

10. LAYING AND JOINTING OF D.I. PIPES AND FITTINGS FOR RISING MAINS

Laying of D.I rising main shall conform to IS: 12288 or its latest amendment/ Jal Nigam specifications/ Manual on water supply&treatment. Other items of work not specified herein or above shall conform to relevant ISS where ever required and to the satisfaction of Engineer. Pipe line shall be made 100% leak proof and maintained up to one year by the contractor from the date of completion or handing over to respected Nagar nigam whichever comes later.

11. TESTING OF D.I. PIPES

D.I. pipes supplied will be pressure tested for field working and hydrostatic test pressure and other tests shall be carried out as per relevant IS Codes/ Jal Nigam specifications/ Manual on water supply and Treatment prior to laying and to the satisfaction of Engineer. Mains will be tested after commissioning for any leakage and rectified and during the operation & maintenance period of 24 months all defects shall be rectified by the contractor.

12. INTERCONNECTIONS

Suitable inter connections shall be made as per direction of Engineer In charge with the existing main for equitable distribution of flow in the distribution system. Details of works to be executed are given in Index Plan & Part-II Financial Bid /BOQ. The extent of this work is subject to change on either side as per requirement & satisfaction of Engineer.

13. (I) TECHNICALSPECIFICATIONFORDUCTILEIRON PIPES (SOCKET SPIGOT TYPE)

A. General

TheDuctileIronPipestobesuppliedanderectedshallbewithISImarkingconformingtoIS 8329.The CementMortar Lined DuctileIron(CMDI) CentrifugallyCast(SPUN) PressurePipes shallbewithjointsconformingtoIS8329 instandardworkinglengthof5.5m or 6 m. ThepipeshallbesuppliedwithISImarkedEPDMqualityRubberGaskets.

B. Classification

The DI pipes to be supplied and erected shall be of thickness class depending on conformity to Annexure E (Table 1) Amendment No. 1 to IS: 8329 - 2000.

C. Wall thickness

Thenominalwall thicknessofpipesshallbeaspertable2ofIS 8329:2000.

D. Flexible Push-on joint

Flexible joints shall be of spigot and socket "push-on" type suitable for angular deflection in any direction and capable of axial movement to compensate for thermal expansion or contraction and ground movement. The allowable angular deflection declared by the manufacturer shall not be less than

- 3.5^0 for DN 80 to DN 300
- 2.5^0 for DN 350 to DN 600
- 1.5^0 for DN 700 to DN 2000

Rubber ring for joints shall be of a type that will not deteriorate when stored under manufacturer's guidelines or during operation. The rubber gasket shall be of EPDM elastomer in accordance with IS: 5382 suitable for water supply.

E. Restrained Joints

D.I. pipes with restrained joints shall be utilized in underground application where pipelines have to cross roads through existing ducts or in areas with restricted accessibility where the use of concrete anchor blocks is prohibited, or as directed by the Engineer-in-Charge. The CONTRACTOR shall submit with his bid with full details of the type of restrained joint he proposes to use.

Whenever in the course of work the CONTRACTOR intends to utilize restrained joints he shall obtain prior approval from the Engineer-in-Charge.

Calculation of the number of pipe lengths with restrained joints required shall follow the manufacturer's recommendation and shall be subject to the Engineer-in-Charge approval.

Restrained joints shall be designed in accordance with ISO 10804-1. The permissible angular deflection will be as declared by the manufacturer. The joint shall be capable of withstanding the greater of the test pressure or the service pressure + the surge pressure. The performance Type test of this Joint in line with ISO 10804-1/EN545 has to be established by the manufacturer by getting it witnessed by a NABCB (National Accreditation Board for Certification Bodies) or IAF (International Accreditation Forum) or EA (European Cooperation for Accreditation) accredited institution / certification agency. The certificate must be produced with the technical bid.

F. Recommendations for Jointing Systems

Application	Type of Jointing System
Normal underground application.	Socket and Spigot Push-on Jointing.
Normal over ground application with minimum incline (1:7).	Socket and Spigot Push-on Jointing.
Over ground application in steep incline (1:7).	Flanged Jointing.
Underground application in steep incline (1:7).	Restrained Jointing.
Underground application in very high pressure zones (25 kg/cm^2).	Restrained Jointing.
Underground application in areas where thrust blocks cannot be constructed.	Restrained Jointing.

Intra Plant piping and jointing with pipeline appurtenances.	Flanged Jointing.

G. Rubber Gasket

RubbergasketusedshallconformtoIS: 5382:1985or amendeduptodate. Otherrequirementsofgasketsareasperclause-8ofIS8329:2000.RubberGaskets tobeISI markedEPDMquality.

H. Internal Lining

Recommendations for Internal Lining:

Sl.	Fluid Condition	Lining for Pipes
1	Potable Water/ Raw water with negative Lonelier Index (alkalinity between 25 and 250 ppm $CaCO_3$) and pH between 5.5 and 13 content in the input water.	Cement Mortar Lining with Blast Furnace Slag Cement or Sulphates Resistance Cement.
2	Domestic Sewage High Sulphate content <3000mg/l	Sulphate Resisting Cement Lining
3	Very Soft Water with negative Langelier Index (alkalinity below 25 ppm $CaCO_3$).	Sulphate Resisting Cement Lining or Blast Furnace Slag Cement with Epoxy Seal Coat.
4	Sewage and Industrial Effluent having pH Minimum 3 to max 13 with aggressive CO_2 >15, Sulphates > 3000 mg/l, magnesium > 500 mg/l, and ammonium > 30 mg/l	High Alumina Cement Mortar Lining conforming to the performance requirements as per BSEN598 or ISO7186. Certificate from any NABCB (National Accreditation Board for Certification Bodies) or IAF (International Accreditation Forum) or EA (European Cooperation for Accreditation) accredited institution/ certification agency must be produced with the technical bid.
5	Sea Water and Ash Slurry	High Alumina Cement Mortar Lining or *Ceramic Epoxy Lining* conforming to the performance requirements as per BSEN598 or ISO7186. Certificate from any NABCB (National Accreditation Board for Certification Bodies) or IAF (International Accreditation Forum) or EA (European Cooperation for Accreditation) accredited institution / certification agency must be produced with the technical bid.

I. External Coating - Recommendations for External Coating:

Soil Corrosively	Typical Ground Conditions Pipes	Protection System Pipes
Slight to moderately aggressive	Soil Resistivity above 2500 ohm.cm without water table.	Metallic Zinc (130 gm/m2 min.) with Bitumen or Epoxy as finishing layer.
	a. Soil resistivity above 2500 ohm.cm with water table. b. Soil resistivity between 1500 and 2500 ohm.cm without water table.	Metallic Zinc 200 gm/m^2 with Bitumen or Epoxy as finishing layer.
Aggressive	a. Soil resistivity between 1500 and	Metallic Zinc (400 gm/ m2) with bitumen or

	2500 ohm.cm with water table. b. Soil resistivity between 500 and 1500 ohm.cm without water table.	epoxy as finishing layer. Or Metallic Zinc (200 gm/ m2) with bitumen or epoxy as finishing layer and PE sleeving.
Highly aggressive	a. Soil resistivity below 500 ohm-cm without water table. b. Soil resistivity between 500 to 1500 ohm-cm with water table. c. Ground with light chemical contamination. d. Stray electrical currents.	Alloy of Zinc and Aluminum (400 gm/ m2) with epoxy as finishing layer. Or Metallic Zinc (400 gm/ m2) with epoxy as finishing layer and PE sleeving.
Special condition – All levels of corrosively	a. Ground containing clinker, bricks, flints etc. likely to cause mechanical damage. b. Ground with heavy chemical contamination* Tidal water e.g. estuaries, shorelines.	Polyurethane coating (Avg. 1000 micron with a local minimum of 700 micron) as per EN 15189.

J. Polyethylene Sleeves

Polythene Sleeves supplied should conform to Annexure-D of IS: 8329:2000. Pre-dispatch inspection to be carried out by Central Institute of Plastic Engineering & Technology. Pre-dispatch inspection report of CIPET along with the test certificate of samples drawn by CIPET to be submitted along with the invoice.

K. Joint Leak Tightness Type Test

As per clause No. 6 of IS: 8329/2000, the joint design is not a part of the standard. Since the DI pipe manufacturers use their own joint design, as stated in Note 1 of Clause 6.3 of IS 8329:2000, manufacturers should ensure that the joint and its' compatible rubber gasket is designed and manufactured, to provide adequate joint performance up to the highest possible pressure, i.e. max. allowable site test pressure (STP) as per Table-1 of Annexure- E. So, efficacy of the joint design has to be proved by suitable Type Tests as per clause No. 7 of ISO:2531 and get it witnessed by a NABCB (National Accreditation Board for Certification Bodies) or IAF (International Accreditation Forum) or EA (European Cooperation for Accreditation) accredited institution / certification agency. The certificate must be produced with the technical bid.

L. Portability Test

It shall be ensured by a suitable Type Test Certificate that the paints used inside the socket and the part of spigot ten gage din the joint assembly, cement mortar lining and rubber gasket which come in contact with the water, will not have any detrimental effect on the quality of water and should not impart any bad taste or foul odour as per Clause no. 8.5 and 14 of IS: 8329:2000. Necessary Test Certificate as per BS 6920 from a Government recognized or an internationally accepted institution / laboratory shall be submitted with the Technical Bid.

M. Lubricant for Ductile Iron pipes and specials

The contractor will be responsible for supply of lubricant of approved grade and quality to be used for pipe jointing.

Specification

The lubricant has to have the following characteristics:

- must be readyfor use
- has to adhere to wet and dry surfaces of DI pipesand rubber rings
- to be applied in hot and cold weather; ambient temperature 0-50°C, temperature of exposed pipes up to70°C
- must be water soluble
- must be nontoxic and must not affect the properties of the drinking water carried in the pipes
- must not have an objectionable odour
- has to inhibit bacterial growth
- must not be harmful to the skin

Lubricant has to be supplied by the contractor and the certificate as per BS6920 to be submitted.

II TECHNICAL SPECIFICATIONFORDUCTILEIRON FLANGED PIPES

A. General

The Ductile Iron Flanged Pipes to be supplied shall be with ISI marking conforming to IS: 8329.Ductile Iron Flanged pipes will be in standard working length of 5 m or less (as required). The following are the supply condition for the flanged pipes:

DI flanged pipe thickness class must be governed by the table given in clause 4.5 of IS 8329

a) All the flange faces shall be raised faced.
b) The flanges are to be made of suitable grade of Ductile Iron. Gray Cast Iron or Mild steel flanges are not acceptable.
c) Flanged pipes maybe welded on type or integrally cast.
d) Screwed on flanges followed by welding is not allowed.
e) Welded on flanges should be shrunk fitted on the pipe and then welded by using compatible high Nickel electrode used for welding Ductile Iron to Ductile Iron.
f) It is prohibited to manufacture Flanged pipes from scrap material as per clause No. 3.2 of the GOI notification dated 25 June 2009 regarding Mandatory BIS certification on DI pipes and Fittings

B. JointLeak Tightness Type Test

Manufacturer of Flanged pipes to provide adequate joint performance to be proved by suitable Type Tests as per clause No. 7.4 of ISO:2531 and get it witnessed by a NABCB (National Accreditation Board for Certification Bodies) or IAF (International Accreditation Forum) or EA (European Cooperation for Accreditation) accredited institution / certification agency. The certificate must be produced by the contractor.

C. Linings and Coatings

The DI Flanged pipes are to be made from pipes lined with Cement Mortar Lining, as per clause 1(H). The Coatings to DI Flanged pipes shall be similar in line with the provisions of DI pipes (Socket Spigot type) as per clause 1(I).

D. Rubber gaskets

A rubber gasket for Flanged joints shall be of EPDM elastomer approved in accordance with IS: 5382 suitable for water supply. The dimensions of the flange gaskets shall be as per IS:638.

E. Nuts and Bolts

The nuts, bolts, washers shall be of steel having minimum tensile strength of 400 N/mm^2 hot dipped galvanized or cadmium plated. Nuts and bolts shall be suitable for the pressure rating specified in the Particular Specification. Nuts and bolts shall be to IS: 1364 (Part 1) and IS: 1364 (Part 3) and washers to IS: 2016.

(Important note: It has been observed that units who are only manufacturing flanged pipes by sourcing barrels or socket & spigot DI pipes from the DI pipe manufacturers, are using K-7 pipes of lesser thickness. They are even purchasing rejected pipes as scrap from DI Pipe manufacturers and using such rejected pipes for flanging. To stop

these practices following clause should be added)

The flanged pipe manufacturers should give a certificate from the DI pipe manufacturer giving bill-wise break-up of the DI pipes (Socket Spigot type or Barrel) along with its test certificates supplied by the DI pipe manufacturer. These certificates should be submitted in original and Xerox copy will not be accepted.

III SPECIFICATION FOR DUCTILE IRON FITTINGS

A. General

DI Fittings shall be conforming to IS 9523.

DI Fittings should preferably be manufactured by the manufacturer of the pipes. In case they are not, it will be the responsibility of the manufacturer of the pipes to have them manufactured from a suitable manufacturer under its own supervision and have it tested at his/sub contractor's premises as per the contract. The pipe manufacturer will ensure the compatibility of the pipes and fittings by prescribed type test (as given in point B below) with his own pipe and the outsourced fittings. Therefore Ductile Iron fittings should be sourced from the manufacturer of the pipes.

To ensure that the fittings are made of Ductile Iron, a nodularity check report to be submitted which will show at least 75 % Ferrite with spheroidal graphite content.

Since the socket design is not given in the standard the min. socket thickness of fittings at any point must not be lesser than Nominal body thickness given in the standard.

B. Fittings with Flexible Push-on joint

Flexible joints shall be of spigot and socket "push-on" type suitable for angular deflection in any direction and capable of axial movement to compensate for thermal expansion or contraction and ground movement. The allowable angular deflection declared by the manufacturer shall not be less than

- 3.5^0 for DN 80 to DN 300
- 2.5^0 for DN 350 to DN 600
- 1.5^0 for DN 700 to DN 2000

Rubber ring for joints shall be of a type that will not deteriorate when stored under manufacturer's guidelines or during operation. The rubber gasket shall be of EPDM elastomer in accordance with IS: 5382 suitable for water supply.

C. Fittings with Mechanical joint-

Where Fittings with mechanical type joints are specified, proposed and approved they shall be supplied complete with approved gaskets, glands, hot dipped galvanized or cadmium plated bolts, nuts and all other necessary accessories.

D. Fittings with Flanged joint –

Fittings with Flanged joints will be with raised face and they shall be supplied complete with approved gaskets, hot dipped galvanized or cadmium plated bolts, nuts.

E. Fittings with Restrained Joints

D.I. fittings with restrained joints shall be utilized in underground application where pipelines have to cross roads through existing ducts or in areas with restricted accessibility where the use of concrete anchor blocks is prohibited, or as directed by the Engineer-in-Charge. The CONTRACTOR shall submit with his bid with full details of the type of restrained joint he proposes to use.

Whenever in the course of work the CONTRACTOR intends to utilize restrained joints he shall obtain prior approval from the Engineer-in-Charge.

Calculation of the number of pipe lengths with restrained joints required on both sides of the fitting shall follow the manufacturer's recommendation and shall be subject to the Engineer-in-Charge approval.

Restrained joints shall be designed in accordance with ISO 10804-1. The permissible angular deflection will be as declared by the manufacturer. The joint shall be capable of withstanding the greater of the test pressure or the service pressure + the surge pressure. The performance Type test of this Joint in line with ISO 10804-1/EN545 has to be established by the manufacturer by getting it witnessed by a NABCB (National Accreditation Board for Certification Bodies) or IAF (International Accreditation Forum) or EA (European Cooperation for Accreditation) accredited institution / certification agency. The certificate must be produced with the technical bid.

F. Joint Leak Tightness Tests

Joints shall be as per clause 6 of IS: 9523/2000. As per clause No. 6.2 of IS: 9523/2000, the design of socket is not a part of the standard. Since the DI fittings manufacturers use their own joint design, the efficacy of the joint design has to be proved by suitable Type Tests as per clause No. 5 of ISO: 2531 and get it witnessed by a NABCB (National Accreditation Board for Certification Bodies) or IAF (International Accreditation Forum) or EA (European Cooperation for Accreditation) accredited institution / certification agency. The certificate must be produced with the technical bid.

If fittings or gaskets are supplied separately from pipes, full reports of the type tests on these components, and their compatibility with pipes, shall be made available to the client by the fitting or gasket suppliers.

G.Linings and Coatings

The DI Fittings are to be lined with Cement Mortar Linings with a sand cement mixture and the lining thickness should be as per Table 33 (Annex B) of IS 9523. The Coatings to DI fittings shall be similar in line with the provisions of DI pipes. All fittings must be painted with Zinc rich paint as per Annexure A of IS 9523. Bitumen being used for External coating should be approved By WRAS or similar approval authority. However, in soil conditions where soil resistivity is less than 1000 ohm-cm with or without water table, fusion bonded epoxy coated DI fittings to be used in place of other type of coated fittings.

(G) TECHNICAL SPEFCIFICATIONS FOR POLY VINYL CHLORIDE (PVC) PIPE AND FITTINGS.

PART 1 – GENERAL

1.01 DESCRIPTION

Scope of Work: Provide and install Poly Vinyl Chloride (PVC) pipe and fittings of the sizes and in the locations shown on the Drawings and as specified for use.

1.02 LAYING AND JOINTING OF P.V.C PIPES

Laying and jointing of PVC pipes of required working pressure as per schedule 'G' and index plan will be as per I.S. 4985-1988 or its latest amendment and laying shall be done as per latest revision of IS – 7634 (Part-3) and as detailed in Schedule 'G' The Jal Nigam / L.S.G.E.D. detailed specifications can be seen in the office of Engineer, Solvent cement technique for jointing of PVC pipes shall be adopted as per I.S. 7634 or its latest amendment. Injection moulded P.V.C fitting with solvent cement joints shall be fixed as per IS 7834 with its latest amendment. Work specifications of latest edition of Manual on water supply and treatment, Ministry of Housing and development Govt. of India shall be followed in general for all other works for which specification are not detailed herein

2.01 TREATMENT OF PVC PIPES

HANDLING AND STORAGE

HDPE pipes on no account should be dragged along the ground and special care shall be taken in handing and transportation of PVC pipes. Pipes shall not be stacked in large pipes, especially under warm climatic conditions, to avoid distortion of bottom pipes for temporary stacking of PVC pipes in fields where racks are not provided care shall be taken that the ground is level, free from loose stones. Three layers should be kept at maximum and so stacked as to prevent movement. Pipes shall not be stored one pipe inside another. Contractors should fill in the rates taking care of all these in this rates

2.02 TRENCH PREPERATION

The trenches bed should be free from any rock projection, hard object such as flints or free roots etc. If kankar/ boulder mixed soil is met with a layer of sand or alluvial earth (or screened) earth equal to 1/3 dia of the pipe or 10cm. whichever is less shall be provided under and above PVC pipes. However such actions can only be taken only after written order and satisfaction of the Engineer. Sand/earth cushions shall be paid extra as per Schedule H. Depth of trenches should be such as to provide minimum one meter cover to the pipe. The width of trench shall be 60 cm plus the inner dia. of pipe.

2.03 LAYING AND JOINTING

Pipes shall be laid end to end in already prepared trenches and using solvent cement, socket and spigot. Joint shall be made. The socket in the form of injection molded fitting shall be used and glued to pipes with solvent cement. Full load should be used and glued to pipes with solvent cement. Full load should be done only after 48 hours of jointing. The PVC pipes are notch sensitive hence no threading into PVC pipes shall be done. Normally all the values are joined by flanged joints. Lockers can sometime be plugged by fastening clamps with rubber gaskets. However laying of PVC pipe will be done only after the pipes is supplies and tested as per relevant IS codes to the satisfaction of Engineer and a certificate to this effect is produced. Contractor shall be fully responsible for pipe lines to period of one year after the date of commissioning.

PART 3-TESTING

3.01 PRESSURE TESTING OF PVC PIPE

Pressure testing of P.V.C. pipes shall not be done until otherwise desired by the Engineer in charge. However, pipelines shall be tested against any leakage IS or as per Para 6.10.5 on page 120 of the manual on water supply and treatment. Prior to testing care should be taken evacuate any entrapped air and slowly raising the system to appropriate test pressure. After about one hour has elapsed a measured quantity of water shall be pumped to bring the pressure back to test pressure, if there is a loss of pressure during the test. The quantity of water required to restore the test pressure of 30 M for 24 hours should not exceed 1.5 liters per 10mm of nominal dia for a length of 1 km.

Contractor shall include in his rates sufficient margin for testing and repair of subsequent leakage of joints, fitting and specials during work and after commissioning of pipe line during maintenance period of one year.

(H) OTHER ITEMS

No extra payment shall be made to the contractor for:

(I) Inter connection done in any running line.
(II) Emergency work carried out in night hour to efficient start of water supply during day hours.
(III) Material used during maintenance period for repair of leakage and other repairs.
(IV) Control of traffic, proper sign boards and lighting arrangement for work in night.

13.HDPE PIPES:

1.1 Supply of HDPE pipes:-Supply of HDPE Pipes shall be done after getting prior approval from the engineer incharge& Third party Pre delivery Inspection.

1.2 Applicable codes

The following standards, unless otherwise specified herein, shall be referred. In all cases the latest revision of the Codes shall be referred to. If requirements of this specifications conflict with the requirements of the standards /Codes, this specification shall government

Code No.	Title/Specification
IS 4984 amendment No.2 1995	High Density polyethylene pipes for Water Supply
IS 5382	Rubber sealing rings for gas mains, water mains and sewers.
S 7634-2 (2012):	Laying & jointing of polyethylene (PE) Pipes
IS 2530	Methods of test for polyethylene moulding materials and polyethylene compounds
IS 4905	Methods for random sampling

IS 9845	Method of analysis for the determination of specific and/or overall migration of constituents of plastics material and articles intended to come into contact with foodstuffs.
IS 10141	Positive list of constituents of polyethylene in contact with food stuffs, pharmaceuticals and drinking water.

1.3 Specification of Pipes :

1.3.1 A Colour

The colour of the pipe shall be black. Each pipe shall contain minimum three equi-spaced longitudinal stripes of width 3 mm (Min) in blue colour. These stripes shall be more than 0.2 mm in depth. The material of the stripes shall be of the same type of resin, as used in the base compound for the pipe.

1.3.2 B Material

(i) Raw Material

Raw material used to manufacture the HDPE pipes shall be 100% virgin PE compound or Natural black PE resin confirming to IS: 4984, IS: 7328 and ISO: 4427; for this a certification has to be obtained by the pipe manufacturer from the resin manufacturer as per clause 3.2.3 of IS: 4984. The resin proposed to be used for manufacturing of the pipes should also comply with the following norms as per ISO 9080.

The resin should have been certified by an independent laboratory of international repute for having passed 10,000 hour long term hydrostatic strength (LTHS) test extrapolated to 50 years to show that the resin has a minimum MRS of over 10MPa. Internal certificate of any resin manufacturer will not be acceptable.

Certificate for having passed the full scale rapid crack propagation test as per ISO 13478. High density Polyethylene (HDPE) used for the manufacture of pipes shall conform to designation PEEWA-45-T-006 of IS 7328. HDPE conforming to designation PEEWA-45- T-012 of IS 7328 may also be used with the exception that melt flow rate (MFR) shall not exceed 1.10 g/10 min. In addition, the material shall also conform to clause 5.6.2 of IS 7328.

The specified base density shall be between 941.0kg/ m^3 and 946.0kg/ m^3 (both inclusive) when determined at 27°C according to procedure prescribed in IS:7328 .The value of the density shall also not differ from the nominal value by more than 3 kg/ m^3 as per 5.2.1.1 of IS: 7328. The MFR of the material shall be between 0.41 and 1.10 (both inclusive) when tested at 190°C with nominal load of 5 kgf as determined by method prescribed in IS 2530. The MFR of the material shall also be within ± 20 percent of the value declared by the manufacturer. 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 as per IS 2530.

(ii) 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 harm less and shall be selected from the list given in IS: 10141.

(iii) Reworked Material

No addition of Reworked/ Recycled Material from the manufacturer‘s own rework material resulting from the manufacture of pipes is permissible and the vendor is required to use only 100% virgin resin compound.

1.3.3 Dimensions of pipes and Ovality of pipe

Ovality shall be measured at the maximum outside diameter and minimum out-side diameter measured at the same cross section of the pipe, at 300mm away from the cut end. For pipes to be coiled, the ovality shall be measured prior to coiling For coiled pipes, however, re-rounding of pipe shall be carried out prior to the measurement of ovality. Outside diameter, tolerance and ovality of pipes shall be as per table below:

(Refer Table No. 2 IS 4984-1995)			
S. No	**Outside Diameter (mm)**	**Tolerance (only positive tolerances) (mm)**	**Ovality (mm)**
1	20.0	0.3	1.2
2	25.0	0.3	1.2
3	32.0	0.3	1.3
4	40.0	0.4	1.4
5	50.0	0.5	1.4
6	63	0.6	1.5
7	75.0	0.7	1.6
8	90.0	0.9	1.8
9	110.0	1.0	2.2
10	125.0	1.2	2.5

11	140.0	1.3	2.8
12	160.0	1.5	3.2
13	180.0	1.7	3.6
14	200.0	1.8	4.0

1.3.4 Wall thickness as per allowable hydrostatic design stress-

The minimum & maximum wall thickness of pipe for the PE100 grade of pipe as per IS : 4984 for PN6, PN8 & PN10 shall be as per table

(Refer Table No. 5 (Amendment No.2) IS 4984-1995)

Nominal Dia	Wall Thickness of pipes					
	PN 6		PN 8		PN 10	
DN	Min	Max	Min	Max	Min	Max
1	2	3	4	5	6	7
20	-	-	-	-	-	-
25	-	-	-	-	-	-
32	-	-	-	-	2.4	2.9
40	-	-	2.4	2.9	3.0	3.5
50	2.3	2.8	3.0	3.5	3.7	4.3
63	2.9	3.4	3.8	4.4	4.7	5.4
75	3.5	4.1	4.5	5.2	5.6	6.4
90	4.1	4.8	5.4	6.2	6.7	7.6
110	5.0	5.7	6.6	7.5	8.1	9.2
125	5.7	6.5	7.5	8.5	9.2	10.4
140	6.4	7.3	8.4	9.5	10.3	11.6
160	7.3	8.3	9.6	10.8	11.8	13.2
180	8.2	9.3	10.8	12.1	13.3	14.9
200	9.1	10.3	12.0	13.4	14.8	16.5

1.3.5Handling, Transportation storage and Loading & unloading of pipes

If transportation of HDPE pipes from a distance greater than 300 km than pipes shall be received only when bare coils of pipe have been wrapped with hessian cloth. The truck used for transportation of the PE pipes shall be exclusively used of PE pipes only with no other material loaded-especially no metallic, glass and wooden items. The truck shall not have sharp edges that can damage the pipe. At the time of opening coils it must be remembered that the coiled under tension and must be open in control manner. Straight length should be stored on horizontal racks giving continuous support. Loss/damages during transit, During handling, transportation, storage and lowering, all sections shall be handled by such means and in such a manner that no distortion or damage is done to the section or to the pipes as a whole.Pipe must not be stored or transported where they are exposed to heat sources likely to exceed 60ºC. Pipes shall be stored such that they are not in contact with direct sunlight, lubricating or hydraulic oils, petrol, solvents and other aggressive materials. Scores or scratches to a depth of greater than 10 % or more of wall thickness are not permissible; any pipes having such defects should be strictly rejected.PE pipes should not be subjected to rough handling during loading and unloading operations. Rollers shall be used to move, drag the pipes across any surface. Only polyester webbing slings should be used to lift heavy PE (>315mm) pipes by crane. Under no circumstances, chains, wire ropes and hooks be used on PE surface. Pipes shall not be dropped to avoid impact or bump. If any time during handling or during installation, any damage, such as gouge, crack or fracture occurs, the pipe shall be repaired if so permitted by the competent authority before installation.

Supply of all material T&P required for construction of godowns to provide safe and secure storage campus to store pipe material & specials/ fittings and electrical/ mechanical equipments. HDPE pipe shall be storage under shade of GI sheets.

The land required for godown shall be arranged by the contractor. Deptt. will not be liable for any expenditure regarding cost / rent of land and shall be borne by the contractor.

1.3.6 Length of straight Pipe & Marking on pipe

The length of straight pipe used shall preferably be 6 m, or as agreed by Engineer in charge. Short lengths of 3 meter (minimum) up to a Maximum of 10 % of the total supply may be permitted. Each straight length of pipe shall be clearly marked in indelible ink/paint on either end and for coil at both ends or hot embossed on white base every meter throughout the length of pipe/coil with the following information:

(a) Manufacturer's name and/ or trade mark.

(b) Designation of pipe(class, nominal dia.)
(c) Lot No./Batch No.
(d) BIS certification marking on each pipe.

1.3.7 Appearance

Pipe shall be free from all defect including indentation, delaminating, bubbles, pinholes, cracks, pits, blisters, foreign inclusion that due to Their nature degree or extent detrimentally affect the strength and Serviceability of the pipe. The pipe shall be as uniform as commercially practicable in colour opacity, density and other physical properties as per relevant IS code or equivalent International Code. The inside surface of each pipe shall be free of scouring, cavities, bulges, dents, ridges and other defects that result in a variation of inside diameter from that obtained on adjacent unaffected portions of the surface. The pipe ends shall be cut clearly and perpendicular to the axis of the pipe.

1.3.8 Testing of Pipe

HDPE pipes shall be subjected to Internal pressure creep rupture test, Longitudinal Revision Test, Overall Migration Test, Density, Melt Flow Rate (MFR), Carbon Black Content and Dispersion Tests. Its cost shall be borne by the contractor. Hence contractors are advised to keep sufficient margin in his quoted rates for testing.

1.3.9Lowering, Laying of HDPE pipes

IS: 7634 shall be applicable. Before using the pipe following precautions/check shall be taken. Each pipe shall be thoroughly checked for any damages before laying and only the pipes which are approved by the Engineer shall be laid. While installing the pipes in trenches, the bed of the trench should be level and free from sharp edged stones. In most cases, the bedding is not required, as long as the sharp and protruding stones are removed, by sieving the dug earth, before using the same as a backfill material. While laying in rocky areas suitable bed of sand or gravel should be provided. The fill to about 10 to 15 cm above the pipe should be fine sand or screened excavated material. Where hard rock is met with, bed concrete 15 cm thick of grade M-15 or 20 cm thick sand bed as approved by the engineer may be provided. As PE pipes are flexible, long lengths of fusion-jointed pipes having joints made above ground can be rolled or snaked into narrow trenches. Such trenches can be excavated by narrow buckets. During the pipe laying of continuous fusion jointed systems, due care and allowance should be made for the movements likely to occur due to the thermal expansion/contraction of the material. This effect is most pronounced at end connections to fixed positions (such as valves etc.) and the branch connections. Care should be taken in fixing by finishing the connections at a time the length of the pipe is minimal (lower temperature times of the day).For summer time installations with two fixed connection points, a slightly longer length of PE pipe may be required to compensate for contraction of the pipe in the cooler trench bottom. The final tie-in connections should be deferred until the thermal stability of the pipeline is achieved. The flexibility of polyethylene pipes allows the pipe to be cold bend. The fusion jointed PE pipe is also flexible as the plain pipe. Thus the total system enables directional changes within the trench without recourse to the provision of special bends or anchor blocks. However, the pipe should not be cold bend to a radius less than 20 times the OD of the pipe. The installation of flanged fittings such as connections to sluice/air/gate valves and hydrant tees etc., requires the use of stub ends (collars/flange adaptor complete with backing rings and gasket. Care should be taken when tightening these flanges to provide even and balance torque. Provision should be made at all heavy fittings installation points for supports (such as anchoring of the flange in the soil) for the flange joint to avoid the transfer of valve wheel turning torque on to the PE flange joint.PE pipe is lighter than water. Hence care should be taken for normal installations where there could be a possibility of flooding of the trench thus the trench shall be kept free of water till the jointing has been properly done. However, weights by way of concrete blocks (anchors) are to be provided so that the PE pipe does not float when suddenly the trench is flooded and the soil surrounding the pipe is washed away. Thus site conditions study is necessary to ensure the avoidance of flotation. Pipe embedment backfill shall be stone-free excavated material placed and compacted to the 95 % maximum dry density.

1.3.10Jointing of HDPE pipes

The pipe shall have a jointing system that shall provide for fluid tightness for the intended service conditions. Jointing between HDPE pipes and specials shall be done as per the latest IS: 7634 part II. **Only Bar coded electro-fusion machine (Automatically Readable) that can read the bar code of the fittings automatically shall be used for jointing of HDPE pipe/fittings. Manual feeding electro-fusion machines are not acceptable for jointing purpose**. An external memory bank must be able to record at least 350 fusion records and be easily accessible and exchangeable. The supplier must be able to provide a full range of system software and data transmission accessories as applicable for data processing. The ability to download fusion records from all memory systems via an RS 232 interface is to be provided. A back-up internal reserve memory with override must to be provided.

The contractor shall ensure that the Pipeline is free from foreign material before fusing the joints. Before joining, the Contractor shall place packing sand under the pipes on both sides of the joint to keep the pipes in line and at the correct alignment during the jointing process. Alignment clamps with the correct size shells should be used to align the pipe during the electro-fusion cycle.

The Contractor shall ensure that polyethylene pipe is only cut with an approved plastic pipe cutting tool. Before fusion is attempted, he shall remove the oxidized surface of the pipe to be inserted into the electro-fusion coupling. The tool must remove a layer of 0.1 mm to 0.4 mm from the outer surface of the polyethylene pipe. It may also be **noted that no fusion will be allowed without clamping device and only the approved cutting tools** (Hack Saw shall not be allowed for cutting the Pipe) shall be used.

The contractor has to supply all the consumables required for carrying fusion of the joints (like cloth/ paper napkin, acetone etc.).

If, upon inspection, the Engineer-in-charge determines a joint is defective, Contractor shall remove the joint by an approved method. The cost of this work shall be borne by the Contractor.

Contractor shall arrange generator for power supply for fusion machine. Taking power connection from electric poles, connections without written permission from concerned authorities or residential premises is strictly not permitted.

1.3.11 HDPE FITTINGS AND SPECIALS

All the electro fusion fittings included in this document should be designed for use in water distribution systems and be manufactured/supplied by manufacturers having ISO 9001: 2000certification for their quality systems. The products should comply with the following specific requirements.

1. The products shall comply with the requirements of BS EN 12201-3: 2003, BS EN 1555-3 or ISO 8085-3.
2. All the fittings shall be of SDR 11 rating. The product group used for drinking water applications should have undergone type test by WRc-NSF, U.K according to BS 6920 in any of their Certified Laboratories like WRc–NSF/DVGW/KIWA/SPGN and certificate of Compliance to be produced for the following parameters:
   a. Odour&Flavour of Water
   b. Appearance of Water
   c. Growth of Micro Organism
   d. Extraction of substances that may be of concern to Public Health (Cyto Toxicity)
   e. Extraction of Metals
3. All the products shall be manufactured by injection moulding using virgin compounded PE 100 polymer having a melt flow rate between 0.5 – 1.1 grams/10 minutes and shall be compatible for fusing on either PE 80 or PE 100 distribution mains manufactured according to the relevant national or international standards. The polymer used should comply with the requirements of BS 3412 and/or BS EN12201-1.
4. The fittings intended for water distribution applications shall be coloured blue for the clear identification of the services.
5. All the electro-fusion products should be individually packed so that they can be used instantaneously at site without additional cleaning process. The protective packing should be transparent to allow easy identification of the fittings without opening the bags.
6. The electro fusion products should be with only a single heating coil to fully electro fuse the fitting to the adjoining pipe or pipe component as applicable. The heating coils shall be terminated at terminal pins of 4.0 or 4.7 millimetre diameter, protected with terminal shrouds. Each terminal shroud should be additionally protected with polyethylene shroud caps.
7. No heating element shall be exposed and all coils are to be integral part of the body of the fitting. The insertion of the heating element in the fitting should be part of the injection moulding process and coils inserted after the injection moulding process or attached to the body of the fitting as a separate embedded pad etc. are strictly not acceptable.
8. The pipe fixation shall be achieved by external clamping devices only and integral fixation devices are not acceptable.
9. The brand name, size, raw material grade, SDR rating and batch identification are to be embedded as part of the injection moulding process. Each fitting should also be supplied with a barcode sticker for fusion parameters attached to the body for setting the fusion parameters on an automatic fusion control box. The barcode sticker should also include the fusion and cooling time applicable for the fitting for the manual setting of a manual fusion control box.
10. The fittings should be V-regulated type designed to fuse at a fusion voltage of 40 volts AC.
11. The heating elements should be designed for fusion at any ambient temperatures between -5 to +40degree centigrade at a constant fusion time i.e. without any compensation of fusion time for different ambient temperatures.
12. A limited path style fusion indicator acting for each fusion zone as visual recognition of completed fusion cycle should be incorporated into the body of each fitting near the terminals. The fusion indicators should not allow the escape of the molten polymer through them during or after the fusion process.
13. All the sockets in the electrofusion fittings should include a method of tapping controlling the pipe penetration (pipe positioner/stopper).

1.3.12 Flanged Joints

These are used for jointing HDPE pipes particularly of larger size to valves and vessels and large size metal pipes where strength in tension is required. It consists of flanges either loose or welded to the pipe ends. It is recommended that suitable metallic backing plates be used to support the polyethylene flanges to enable them to be bolted together. Injection moulded polyethylene flanges with metal inserts of 6 to 9 mm thickness may also be used. In most cases, sealing is improved by incorporating a natural or synthetic rubber gasket between polyethylene flanges.

1.3.13 Hydraulic Test

(a) Factory Hydraulic Test

Factory tests of the pipes shall be carried out as per the test pressure of the selected pipes.

(b) Field Hydraulic Test for HDPE Pipes

After laying the pipe hydraulic test shall be done to conform the quality of work and material. There shall not be any signs of localized swelling, leakage or weeping. It should conform to IS : 4984 & IS 7634.

i. The Sectional Hydraulic Test shall be carried out after the pipeline section to be tested has been laid jointed and backfilled to a depth sufficient to prevent floatation, but leaving the joints exposed which are to be tested. The sections to be tested shall be to the approval of the Engineer and shall not be longer than 2000 m or 500 m when either the pipeline is laid adjacent to or underneath the carriageway or when section includes an air valve chamber. The joints between each tested section shall be left exposed until the pipeline has passed the test on completion.

ii. Each length of the pipeline to be tested shall be capped or blanked off at each end and securely strutted or restrained to withstand the forces which will be exerted when the test pressure is applied. Air valves already fitted shall be permitted to function during the test

iii. Proposals for testing where thrusts on structures are involved, even where thrust flanges on the piping are installed, shall be with the prior approval of the Engineer.

iv. The length under test shall be filled making certain that all air is displaced through an air valve or any other appropriate mechanism. The test length shall then remain under constant moderate pressure, 10 to 20m head of water, for a period of several hours until the pressure can be maintained without additional pumping.

v. The pressure shall then be slowly increased at a maximum rate of 1 bar per minute to the full test pressure and pumping discontinued for 3 hours or until the pressure has dropped by 10m, whichever occurs earlier. Thereafter pumping shall be resumed and continued until the test pressure has been restored. The quantity of water pumped to restore the pressure, which is called make up water, shall be the measure of thermal expansion or leakage from discontinuation of pumping until its resumption. The maximum makeup water shall be as below:

OD of the Pipeline in mm	Litre per 1000m of Pipe length Tested		
	One Hour Test	Two Hour Test	Three Hour Test
63	9	14	24
110	16	31	50
160	37	74	112
200	50	87	124
315	136	285	422
400	174	347	521

- The maximum allowable test pressure shall be 1.5 times the system design pressure or pipe rating whichever is higher
- Notwithstanding the satisfactory completion of the hydraulic test, if there is any discernible leakage of water from any pipe or joint, the Contractor shall, at his own cost, replace the pipe, repair the pipe or re-make the joint and repeat the hydraulic test with cost including the cost of water. Water used for hydrostatic test shall be clean and potable.
- Pipelines shall be tested as above except where the Engineer issues such instructions as are necessary for testing parts of the Works that have been designed for stresses limited by considerations other than those applying to the pipeline systems.

Test pressures are to be measured in kg/cm2 at the centre of the blank flange situated at the lowest end of the pipeline under test. Unless otherwise specified the test pressure shall be as stated below.

14. INTERCONNECTIONS:

Suitable interconnections with existing mains, if any, and between different type/material of pipes or different sizes shall be made as per direction of Engineer-in-charge for equitable distribution of flow in the distribution system. Details of

works to be executed are given in Schedule 'G'. The extent of this work is subject to change on either side as per requirement & satisfaction of Engineer. Interconnections with existing mains and different pipe materials shall be paid extra as per Schedule-G.

14.1THIRD PARTY INSPECTION:

Third party inspection of pipe and specials shall be done by the Authorized Third Parties as decided by U.P. Jal Nigam and its cost shall be borne by the contractor. Hence contractors are advised to keep sufficient margin in his quoted rates for third party inspections.

15 ANCHORAGES:

Anchorages to resist the tendency of the pipe to pull apart at bends or other points of unbalanced pressure, or on steep gradients Horizontal thrust at Bend.

F= 2Aβ sinὰ/2

Where,

β= internal pressure In kg/cm^2

A= C/S Area of pipe in cm^2

ὰ= angle of deviation

Design of anchorages shall have to be got approved by the Engineer before construction.

17. MEASUREMENT OF PIPE LINES:

Water pipe lines shall be measured as per IS:1200 Part XVI-1969 or its latest amendment.

(I) TECHNICAL SPEFCIFICATIONS FOR BUILDING WORKS SUCH AS PUMP HOUSES, & SITE DEVELOPMENT INCLUDING BOUNDRY WALL, APPROACH ROAD & GATES ETC.

All building work, such as pump houses & all other works specified above shall be executed as per UPPWD building work specifications. Where UPPWD specifications are not available CPWD specifications shall be followed. The material used shall be conforming to relevant IS codes with its latest revision.

Submission of e-bid shall be taken as evidence that the tenderer has read, understood and accept for, compliance, the above mentioned instructions and conditions of this schedule and have taken these factors into account while quoting rates in Part-II Financial Bid-Schedule of Works/BOQ.

Instructions issued by Chief Engineer (Purchase) letter no. 2291/Kraya/General/2121-52/2019/82 dated 16.08.2019 and its subsequent amendments will form part of the Agreement. The salient features of instructions are as under-

i. The requirement of registration of suppliers of pipes is waived. The contractors shall buy ISI marked pipes (as mentioned above) directly from the Such manufacturers shall have to get their factory inspected by M/s Crown Agents (India) Pvt.Ltd, 405, International Trade Tower, Nehru Place, New Delhi. The contractor will have to submit the certificate of successful inspection within a month of obtaining consent of divisional officer. The firm will be eligible to supply only after successful inspection as above.

- The manufacturers who have got their factory successfully inspected will not be required to have such inspection again. In other words it will be a onetime arrangement.

- Third Party pre-delivery inspection of shall be got done by any of the following firms-M/s SGS India Pvt. Ltd. Gurugram, M/s Crown Agents (India) Pvt. Ltd, New Delhi/M/s Elites India Pvt. Ltd. New Delhi/ M/s CIPET, Lucknow.

ii. ISI Mark 'fittings and specials' shall be directly procured from manufacturers of ISI marked 'fittings and specials'. However pre-delivery inspection shall be required from third party inspecting agencies mentioned above.

iii. Electrical and Mechanical equipments shall be procured from the manufacturers/brands approved by Chief Engineer (E&M), U P Jal Nigam, Lucknow. However pre-delivery inspection shall be carried out by concerned Superintending

Engineer (E&M), Executive Engineer (E&M) or Assistant Engineer (E&M).

iv. If a contractor desires to use E&M equipments not listed above he shall proceed as below-

a. In case such manufacturer is from India, it should have a valid ISI License for the product, its testing lab should be accredited by NABL and equipments should be properly calibrated. The contractor shall submit all these documents/credentials with the divisional officer who will then upon his satisfaction allow the materials to be supplied at site.

b. In case such manufacturer is from outside India, it should have a valid License equivalent to ISI License for the product, its testing lab should be accredited by an agency equivalent to NABL belonging to the particular country and their equipments should be properly calibrated. The contractor shall submit all these documents/credentials with the divisional officer who will then upon his satisfaction allow the materials to be supplied at site.

c. The products manufactured in India shall be inspected by concerned Superintending Engineer (E&M), Executive Engineer (E&M) or Assistant Engineer (E&M) before delivery. The divisional officer may seek advice from Nodal Chief Engineer. Under no circumstances any material will be brought at site without pre-delivery inspection.

(I) TECHNICAL SPEFCIFICATIONS FOR BUILDING WORKS SUCH AS PUMP HOUSES, & SITE DEVELOPMENT INCLUDING BOUNDRY WALL, APPROACH ROAD & GATES ETC.

The all building work, such as pump houses & all other works specified above shall be executed as per UPPWD building work specifications. Where UPPWD specifications are not available CPWD specifications shall be followed. The material used shall be conforming to relevant IS codes with its latest revision.

Submission of e-bid shall be taken as evidence that the tenderer has read, understood and accept for, compliance, the above mentioned instructions and conditions of this schedule and have taken these factors into account while quoting rates in Part-II Financial Bid-Schedule of Works/BOQ.

1. Project Summary

Introduction

UP Jal Nigam is committed for the Improvement and Up-gradation of the existing water supply schemes improvement of complete water supply Scheme and has taken many steps in this direction.

Under the AMRUT2 government initiative, Uttar Pradesh plans to establish one wards in all Amrut city as a pilot basis, providing continuous 24x7 water supply "Drink from Tap (DFT)" to households while maintaining water quality. This ambitious project aims to improve living standards by ensuring uninterrupted access to clean water, addressing daily needs and promoting convenience, while stringent monitoring and quality control measures will safeguard the health and well-being of the communities benefiting from this initiative

The project should be able to fulfill following requirements with additional requirement of measuring water quality flowing in each DMA by installing required meters. The contractor will develop a digital twin of the water supply system, using a suitable hydraulic modelling software, that has good connectivity with the GIS mapping system and the monitoring/SCADA system. The digital twin will include all of the following assets:

- Transmission pipework
- Overhead Tank
- Flow meters
- Control Valves
- Water Quality sampling points

The contractor will use all of the data above, obtained from the GIS, SCADA and NRW Dashboard

Need of the Project

Following are the critical issues prevailing with existing water supply and distribution system an hence resulting into gap between water management and citizen services hence arising for the need of the project

- Non- availability of Real time data for Water
- No integrated approach of demand-supply management
- Centralize monitoring flow in transmission& distribution network for WSS is not available
- Manual measurement and accountability leading to in-efficient operation of system
- The database with regards to several aspects like, flow data, energy data, water supply history, water connection details, asset details, history of installation etc. may be available locally but centralized database & information not available for proper decision making

Objective of the Project

Atal Mission for Rejuvenation and Urban Transformation (AMRUT) was launched by ministry of housing and urban affairs. The Mission focuses on development of basic infrastructure, in the selected cities and towns Despite the abundance of water, a significant number of individuals lack access to an adequate quantity and quality of drinkable water. Moreover, the escalating costs of water necessitate a reduction in wastage and the implementation of measures to prevent pipeline leakages. To ensure a sustainable water supply network, it is crucial to monitor freshwater consumption rates closely.

In the present public drinking water systems, most of the data regarding production of water, usage of chemicals, efficiency of filters, yield of water, chlorination level of the supplied water, amount of clear water pumped, amount of water distributed to the public are done manually or using SCADA systems where information is stored locally at city level MCS.

The core aim of this initiative is to develop a robust infrastructure that can effectively deliver safe and clean drinking water to every household in state identified Amrut cities. This system will encompass the following capabilities:

- Configurable Dashboards to monitor defined KPI's like Scheme Performance, Quantity of Supplied Water.
- Analyze, store and print valuable data regarding water distribution network in
- Transparent and accountable governance
- Instant view of supply and distribution quantity
- Timely availability of real time operating parameters for monitoring of WSS
- Real time assessment of water supply situation for efficient operation
- Real time data on water quantity and quality parameters
- Readily available on-line information of distribution data in command areas periphery network
- Configurable alarms in case of deviation to set parameters
- SMS for alarms & alerts as per escalation matrix
- Bring in accountability into the system and the services
- Use latest technology effectively and efficiently to yield significant improvements in efficiency, productivity, profitability and competitive advantage to department

2. Scope of work for 24x7 Water Supply

The bidder should possess the capability to deploy the required hardware for various assets falling under the 24x7 scheme, such as DMA, OHT/ESR, Pumping station. The following hardware should be readily available at the site. This technical specification outlines the necessary hardware requirements sourced from a suitable vendor with instrument installation at DMA level for quality measure, flow, pressure etc.

Scope of work at MCS/LCS and Pumping Station

A PLC based Control system shall be provided at pumping station.

PLC based control systems in water pumping station with monitoring system through GPRS based wireless communication system.

1. The Bidder shall have to arrange all necessary modules to get data of Water Quantity, Quantity, Energy consumption of critical assets etc.
2. The Bidder shall monitor the instruments with all required accessories to get Level, pH, Chlorine and Turbidity. If additional Instrumentation are required same shall be considered in bidder scope. The supplied instruments shall be as per required technical specifications and make.
3. The scope of work shall Supply, Installation, Testing and Commissioning of PLC Panel with necessary Power and Control Cables.
4. The supplied system shall redundant and operate over an ambient temperature range of -10°C to 55°C with a relative humidity 5% to 95%, non-condensing.
5. The supplied system shall have sufficient memory as specified in technical specification.

The Project Scope will be different for each group & below is minimum list of parameters which will be monitored as part of Key performance measurements at pump house.

Key Parameters to be monitored at Pump House

1. Electromagnetic flow meter will be monitored at common delivery line of the pumping main for measuring the flow rate & total discharge flow.
2. pH meter, Turbidity meter & Residual chlorine analyzer shall be monitored for continuous monitoring of quality & characteristics.

3. Pressure transmitter will be monitored at each individual pump outlet and at Common discharge line for pressure measurement & Remote indication.
4. Energy Meter, Multi meter monitoring at each pump feeder for electrical parameter Monitoring
5. Dosing, OHT level, OHT valve, ground water level etc.

3. SCADA Specifications

Architecture

The SCADA architecture shall provide the following:

1. Client / Server architecture.
2. TLS Encryption and certificate security for servers and servers, servers and clients.
3. Stand alone single server operation.
4. This transfer shall include configuration, real-time data, historic data and event lists. Database updates shall be on an incremental basis.
5. A scalable, fully distributable, and expandable architecture of standalone system to Symmetric main-standby and capacity for triple standby server functionality if additional redundancy is required.
6. System upgrades without service interruption by upgrading servers and clients individually while the other servers and clients continue operating
7. System downgrades can be done without data loss, if performed before an upgrade is committed to the latest version
8. Change reporting on Client / Server and Server / Server links to permit operation on WAN networks.
9. Support for upto four DMZ (read-only) servers
10. Clients can access multiple servers (upto60) and graphics and trend display scan combine information from multiple servers.

Operation is required on: 64Bit Machines

Server Hardware:

- Windows Server 2022 (Standard and Datacenter editions)
- Windows Server 2019 (Standard and Datacenter editions)
- Windows Server 2016 (Standard and Datacenter editions)
- Windows Server 2012 Release 2 (Standard and Datacenter editions)
- Windows Server 2012 (Standard and Datacenter editions)

Desktop Hardware:

- Windows 10 (Professional and Enterprise Editions)
- Windows 8 / 8.1 (Professional and Enterprise editions)

Operation shall be supported on both physical and virtual infrastructure, and when hosted on the latter it shall allow interfacing with shared storage and other peripherals.

Database

The system's database shall be designed as per project requirement and shall be capable of scaling to 15 lakhdata points per system if licensed. Points can be analog, digital, input or output, and combine alarm, event and historic data functionality if configured.

The SCADA database shall be of true relational database design and optimized for real-time SCADA operation. The database shall be object-oriented and organized in a hierarchical structure. It shall support user-created "Templates" that allows management of common configuration from a single point in the database. Instances of templates shall be used for repetitive, standard configuration.
Templates of standard configuration shall support multiple object types including, but not limited to:

- Pointobjects
- PLCorRTU objects
- Mimics
- Trends
- Maps
- 3DPlots
- Logic objects
- Schedules
- Link objects
- Linked tables

Templates shall support the ability for the value of object's property within an instance to be calculated by the system using an expression.

The database shall enable the user to perform automatic (scheduled) or manual database backup.

1. The backup task shall also log an event on initiation and completion.
2. The completion event shall include statistics on the number of files copied and the total size of data copied.
3. While the backup is in progress, the database shall continue to operate; processing values, storing updates in memory and synchronizing updates to the standby. When the backup is complete, all updates shall be flushed to disk.
4. The backup task shall copy the following files:
   - Database: Metadata, Structure, Configuration and Data
   - Historic Data
   - Event Journal Data
   - Configuration Change Data
   - Alarm Summary Data
   - Registry Settings
5. Backup of historically stored records includes a configurable time range to allow the amount of historic backed up to be tuned to control both the backup size and execution to be kept within sensible limits on systems with large quantities of historic data.

Operator Interfaces

1. SCADA software shall provide the ability to support multiple local and remote display clients.
2. Display facilities shall be available via LAN, WAN and dial-up connection.
3. Display clients shall be supported as Rich Clients without the requirement of a database at the display node.
4. Rich Clients shall support database management and configuration changes.
5. Integrated Web Server capability shall be available, providing all display and operational facilities of the Rich Client without the need for third-party software to be installed.
6. The Web Server shall support distributed architecture, including concurrent connection
7. Web Clients shall allow users to view Mimics, Trends and Plots, Database Objects, and Reports as well as perform control functions using a standard web browser.
8. Web Clients shall allow users to connect from any phone, table to top to view data, alarms, events, trends and query results.
9. Configuration changes made to the SCADA server shall require no additional steps to be performed in order for those changes to be available to Rich Clients and Web Clients.
10. Each full function Rich Client and Web Client shall be configurable to connect to one, or multiple server systems
11. Rich Clients and Web Clients shall have an integrated database search feature.
12. Current generation Windows look and feel shall be provided by the SCADA system operator interfaces, including provision for "favorites lists" comprising links to any server object. This includes, but is not limited to: Mimics, Graphs, List Queries
13. The Rich Client and Web Client shall provide user-specific recent documents list and a tabbed multi-document interface
14. The rich client shall be configurable to require user confirmation on shutdown
15. Display clients shall support a minimum of 6monitors (multi-monitor)

16. Display clients shall support up to5separate independent sessions (multi-instance)

Mimics (Configured Dynamic Graphics)

SCADA system Mimics shall support a wide range of graphical facilities. Scalable vector graphics are required to permit operation of the SCADA system with different resolution clients operating simultaneously. A restriction to fixed resolution bitmap graphics are not acceptable, and the graphics shall support bitmap as well as vector graphics.

Mimics shall be multi-layered, object oriented and permit mimics to be embedded in other mimics. Other objects that shall be available for embedding in a mimic include button object, hyperlinks, disk images, remotely updated images from a web server, Hyperlinks with embedded queries, Object menus, SQL lists, Alarm lists.

Graphical facilities within a mimic shall also be object oriented including the ability to manipulate attributes of embedded objects in real time, supporting animation including but not limited to:

1. Fill patterns
2. Fill color
3. Rotation
4. Position
5. Line thickness
6. Text attributes
7. Transparency
8. Alpha blending
9. Multi-rate Flashing

24-bit Color shall be supported on mimics as standard.

A suite of Graphical Symbols shall be provided for integration with configuration templates and embedding within other mimics.

Import of mimic graphics shall be supported from DXF format, including integration of multi- layered DXF drawings in to native SCADA mimics. SVG and WMF formats shall also be supported.

Other facilities required to be supported by mimics include:

1. Context sensitive object men us available from mimic
2. Accept an alarm from a mimic
3. Issue a control from a mimic
4. Operator Notes (a sanative feature)
5. ToolTips
6. Hyperlinks to external documents (e.g. HTML, PDF, Microsoft Office suite documents)

Trends

Graph displays shall be offered and shall be requested through a menu driven system and / or embedded within displays. These shall display data in engineering units or as percentage of full scale with the appropriate units stated on the display. Displays shall be in the form offline-graph, step (-first and -last) line, and bar graph form. These display types shall be able to be mixed on one display.

The Trending System shall include facilities to display pre-configured and ad-hoc graph displays.

The user shall be able to choose the display type for each variable separately. The severable shall include analog values, integrated values and digital (status) values e.g., it shall be possible to produce a graph showing flow rate, total flow and flow regulator position (i.e. gate open / shut) as one display for

correlation.

The colors of variable traces shall be allocated automatically, which may then be changed by the user. The color of X and Y axes shall also be configurable.

It shall be possible to combine data from different parameters, from different time / days and different data sources, to perform calculations within the trending display (e.g., display the result of subtracting variable B from variable A). It shall be possible to apply a configurable multiplier to the variable. It shall be possible to select from a few pre-configured algorithms including (but not limited to) Average, Max, Min, Time Average, Start, End, Sum, Count, Total, Variance, Standard Deviation, Moving Range and Delta. It shall be possible to configure additional accumulating or moving algorithms for selection within the trending interface. It shall be possible to select from several pre-defined columns to display algorithm data for all configured traces, including Count, Sum, Total, Minimum, Maximum, Mean, Range, Delta, Standard Deviation, and Variance.

The trending system shall support display of multiple separate Y-Axes, without imposing an artificial limitation. A facility shall be provided to change both X and Y axis scales and zero for each point graph without the need for reconfiguration. The facility to select log arrhythmic scales and/or inverted scales for the Y-axis shall be provided. The Y axes shall apply auto-ranging scale unless manually overridden.

The trending system shall support recording of annotations, or text comments, on variable traces, which will be available for viewing by other users when the variable trace is in display.

It shall be possible to manually insert, modify, and / or delete recorded data using facilities available within the trending system. It shall be possible to modify a range of values via application of a formulae or replacement with a single value It shall be possible to super impose more than 50 variables on to graphs showing the trace with its alarm limits. It shall be possible to enable/disable the display of any configured variable without the need for reconfiguration; it shall also be possible to show / hide individual elements of configured variables (trace, alarm limits, markers, annotations) without the need for reconfiguration.

It shall be possible to select a sub-range in time of a graph display and to expand this to a full- screen picture. It shall be possible to manually set the displayed range for each individual variable plotted within a graph. It shall also be possible to obtain are a do but of the time or value of any point in a graph display through the position of the movable cursor. It shall be possible to roll a graph forward and backwards in time.

It shall be possible to display from both historic and current data on the same display. The time-axis shall support continuous scrolling mode to display new data as it comes into the system.

It shall be possible to export the data displayed within a graph, for example to CSV, Microsoft Excel spreadsheet software, Microsoft Word processor software.

Having configured a particular graph display with a selection of data, reference data, colors, scaling etc. as above, the user shall be able to save this configuration for later re-use.

Location Support and Maps

All database objects shall be able to store static or dynamic WGS84 coordinates which can include

Latitude, Longitude, Height, Accuracy (XY and Z), and Date/Time of last location update.

The system User Interfaces shall be able to update the location of a User on log on or log off, according to its determined location. The system shall include an interface to allow input of location data from external location-tracking systems.

The system shall allow for native creation of geographical regions by either configuring a pre-defined circle or rectangle, or by specific definition of a polygon. User accounts shall be able to be linked to geographical regions for automatic alarm notification. The system shall support filtering of alarms by configured region(s).

The system shall support native inclusion of dynamic mapping imagery, with support for online data sources including Open Street Map and Bing ™ Maps, plus layers from Arc GIS and WMS providers. Individual sources of mapping data shall be able to be combined in to a collection which shall facilitate dynamic selection between map sources and enable/disable of overlay layers by the user.

The system shall allow the user to define, via query or otherwise, one or more lists of database it ems to be associated with a map collection. On display of the map collection, the configured list(s) shall be visible and able to be turned on/off by the user. Lists shall be associated with a map pin that includes (but not limited to) support for color animation of two independent pin areas, ability to blink, a context menu and a tooltip that is displayed on hover of the mouse cursor.

A map or map collection shall be easily accessible directly from an object with a configured location, where by a map is displayed centered around the selected object. A map and map collection shall be able to be displayed via hyperlink.

Mapping data shall be transferred directly to the client software and shall not require proxying or data transfer via the server.

It shall be possible to extract and display location information from the system, including but not limited to:

- Display of objects and their location attributes
- Calculation of straight-line distance between two objects / locations
- Calculation of whether an object / location is within a defined geographic region

Configuration

The SCADA software shall provide full, seamless on-line configuration of all database parameters including but not limited to:

- Communication channels
- PLCs and RTUs
- Points
- Sequences
- Schedules
- Alarm redirection
- Mimics
- Trends (historical and adhoc) / graphs

- Maps
- 3DPlots
- Reports

Configuration changes shall be capable of being made from local and remote workstations using Rich Clients, with appropriate privilege. Configuration changes are to be applied to the Main SCADA server and seamlessly applied to the Standby server and other SCADA server nodes such as user performance sharing SCADA nodes.

Further, configuration changes made to mimics and other display objects shall be immediately available to local and remote Rich and Web display Clients without any manual intervention. Changes should be updated automatically in local caches where appropriate. This facility shall be a native feature of the product and not require external scripts or customization.

All aspects of the look and feel of the SCADA system, including default field values, shall be configurable. It is not acceptable for color regimes, communication parameters and other aspects of the system to be hard-coded.

It shallbepossibletoadduserdefinedfieldstotheSCADAdatabase.Thesefieldsshouldbe accessible both internally and externally to the SCADA system; being exposed via OPC, ODBC, OLE Automation, XML/SOAP, etc.

The SCADA server shall provide detailed diagnostics concerning its internal operation. The diagnosticsshallbeavailablethroughcapturetoalogfileaswellasonlinelocallyonaserver and remotely via Telnet and Web interface.

Alarm Management

The alarm system shall provide facilities where actions can be triggered by alarms. These facilities shall be provided as a built-in integrated part of the system and shall include, but not be limited to the following:

- Configuration criteria for alarm actions
- Escalate Alarm priority
- Delivery of alarm to users via SMS
- Delivery of alarm to users via E-mail
- Trigger other actions including sequences
- Alarm actions dependent on the geographical area of the object and the user

Integrated paging facilities shall be provided without the need for additional software. The paging facilities shall include calendar operation for roster-based user lists with flexible interface for reconfiguration of alarm management.

Tracking of alarms shall provide as a minimum:

- Alarm activation including point name, state, time stamp, priority
- Alarm de-activation
- Alarm acceptance including time, user responsible, optional comment
- Custom alarm fields for display of additional or operations specificinformation

Where a full function Rich Client is connected to multiple SCADA systems, alarms from all systems shall be combined and filtered, based on user privilege and areas of responsibility.

Full function Rich and Web clients shall provide an audible indication of alarm condition, with the ability to change alarm tone, color, and other attributes based on alarm priority.

Full page and window display of the current alarm list to be shown. It shall also be possible to modify the background color of alarm lists.

Alarm display, acceptance, query and comment entry shall be available via an integrated product Web interface.

Support for Consequential Alarms (alarm suppression) shall be provided.

The system shall support native configuration of an Alarm that is generated when a control sent to a device has not resulted in the correct feedback, either determined by receipt of feedback not within the acceptable range /value or no feedback within the required time frame.

The system shall support native configuration of an Alarm that is generated when a device does not maintain the required control value, allowing the control value to be adjusted by the user and automatically re-calculating the valid range/value for the device to maintain.

Event Journal

The system shall provide, as a built-in feature and without the requirement for custom or external software, facilities for event logging. These facilities shall be separate from the alarm list and include the capability to insert user comments at any place in the event list.

The system shall provide automatic facilities to detect and alert on abnormal behavior within the event system including overactive objects, write errors, and corrupt records, allowing for each type to have object-level thresholds configurable by the user.

Event data is to be stored in a time-series relational database. Each event record shall comprise a timestamp, responsible user, point name, message, and reason for event log.

The event journal shall support the following:

- ODBC/SQL interface to event data
- Filter and browse via full function display client
- Filter and browse from Web client interface

Historical Data

The SCADA system shall provide a built-in data historian with the following facilities as standard features. These shall be provided without the addition of external software modules:

- Time-series relational database
- ODBC/SQL interface to historical (trend) data
- Historical data to be stored with time-stamp, point quality, alarm status
- Historic storage is to be stored raw, based on configurable criteria including time between samples and alarm state change

- Compression capability, with an option to filter based on configurable criteria including time between samples and value change

Historical data shall be stored with variable interval sampling.

Where historic data can be retrieved through communication devices such as PLC/RTUs, the historic data sub-system shall natively provide the capability to backfill this data in to the historian.

No loss of data or gaps in data because of communication or server interruption shall be accepted, backfill shall be by means of protocols which buffer data such as DNP3 and IEC 870-101/4. The vendor shall demonstrate its ability to ensure data integrity and history data recovery.

The historic data subsystem shall provide fixed and user configurable views of the historic data tables. These views are required to provide SQL pre-processing and present historic data in aggregate format, such as Min, Max, Average, Standard Deviation, Moving Averages, Quality etc.

The SCADA server shall provide Historian functions including the capability to validate historic data prior to exposing it externally to the SCADA system, selectable archiving rates, point-by- point storage compression regimes, annotation on history samples for tracking comments on operational conditions, modification of historic data for normalization and correction (tracks previous value and modifying user and is subject to user privilege), auditing of modified or annotated history.

System Security and Access

The SCADA system shall provide a high level of inherent security. To this end the SCADA software shall provide security access down to data point level, and support individual Users, User Groups and a matrix of system capability and access to any level of the SCADA database.

Full-function Rich and Web client interfaces shall require explicit administrative configuration to valid connection to the SCADA server.

Client interfaces shall provide the ability to restrict access to sensitive system information based on user privilege.

System Administrators shall have the ability to allow/restrict client access to specific system interfaces by IP Address. IP Address Range, and/or CIDR (Classless Inter-Domain Routing) notation.

Web interface facilities shall provide the capability to operate the Web interface using SSL and encrypted data. The Web functionality shall be provided in an integrated way with the web server facility tightly coupled with the SCADA database. It is not acceptable for the system to require web pages to be “published” from the SCADA system. Changes in configuration to the SCADA system shall not require additional steps to provide modified information to the SCADA Web interface.

Windows Authentication shall be supported, (ability to log into Geo SCADA using domain credentials). It shall be possible to integrate with Active Directory to facilitate automatic creation of a user account in response to accessing the system using domain credentials. Once a user account linked to the domain has been created in the system, subsequent logon to the system by the user shall refresh the permissions assigned to that user, based on their permissions as assigned in Active Directory.

System Administration

It shall be possible to run the system services under a local Administrator account rather than as a Windows System User. It shall be possible for the system to run under a Windows virtual account (or other) with reduced functionality.

It shall be possible to run certain system services under a less-privileged Windows virtual account.

Open Connectivity

To provide easy access for customized reports and external data manipulation the SCADA software shall provide inherent OPC and ODBC database connectivity without the need for additional software options or modules. Integration with desktop Microsoft products is essential.

The following Open interfaces shall be provided as integrated components of the SCADA system are required:

1. OPC Data Access (OPC-DA) to the SCADA server real-time and configuration database
2. ODBC to the SCADA server real-time / configuration database
3. OPC Historic Data Access (OPC-HDA) to historian
4. OPC Alarm and Event (OPC-AE) to event sub-system
5. OLE Automation interface to the SCADA server database
6. .NET client API support
7. ODBC/SQL to the SCADA historical database
8. ODBC/SQL to the SCADA event database
9. Support for specific database packages (e.g. Oracle)
10. SQL Export for creating csv files

Reports

An integrated reporting package shall be able to generate, print and export reports:

1. Triggered by SCADA events
2. On user demand
3. On timed schedules

Report generation shall use latest technology in database access and be capable of combining data from multiple databases via ODBC/SQL. This shall include SCADA and non-SCADA databases.

Reports shall be able to be generated in several formats including:

- HTML for viewing via Web interface
- PDF format
- CSV format
- MS Office suite format
- Crystal Reports

Generated reports shall be able to be:

- Printed on a local or network printer
- Stored on disk file, locally or remotely
- Emailed to assigned users

Standard Drivers

The SCADA system shall provide native support for fully integrated Wide Area SCADA PLC/RTU protocols. This shall include the capability for supporting all protocols in redundant SCADA server configurations and support redundant communication paths.

The SCADA system shall provide an advanced communications architecture to allow use of round-robin polling regimes as well as polling of multiple devices on the same channel at the same time.

All drivers shall provide the ability to monitor communication statistics, log driver diagnostics, and provide online access to driver and channel diagnostics remotely via Telnet or similar mechanism. Captured diagnostics shall be able to be translated to HTML for analysis in clear human-readable format.

Apart from PLC and RTU communication drivers, the system shall also support as standard the following drivers:

- SMS / Paging – a full function system is required including calendar based rosters
- SNMP – monitoring of network devices such as routers, computers, UPS, etc.
- NTP – time server monitoring and alarming
- ODBC – query data from other databases
- Windows Performance Monitoring
- OPC-DA driver
- OPC-UA driver
- OPC-XML-DA driver
- MQTT – using a JSON payload

PLC/RTU Protocol Support

Wide area PLC/RTU protocols shall support:

1. Local serial port communication
2. Terminal server serial port communication
3. Ethernet LAN communication via TCP and UDP ports
4. Time synchronization
5. Pre-setting output configuration points where configured
6. Fully integrated incorporation of events from a PLC/RTU
7. Unsolicited exception reporting

All drivers shall support capability to update SCADA database point value / alarm state / point quality / timestamp. PLC/RTU protocol drivers shall support the ability the backfill time- stamped data into Event Logs, Historic Data to maintain data integrity in the event of communication failure.

The driver architecture shall support user accessible interfaces to access major driver functions. This shall include, but not be limited to:

- Enable / disable PLC/RTU communications
- Trigger an integrity poll
- Alter communication parameters

Drivers shall maintain current state of target device information, and when used in redundant server architecture shall retain state information and be able to receive solicited and unsolicited information from the PLC/RTU immediately following a server transition. It is not acceptable for the system to indicate

communication failure or not be able to receive communication from a remote device during the period of transition from one server to another.

DNP3 protocol shall be fully supported natively, including operation as a DNP3 Master and DNP3 Slave. DNP3 driver shall operate with fully redundant SCADA server architectures and natively support a variety of communication methods:

- Direct serial communications
- Flow control serial devices (including data radios)
- PSTN dial-up systems
- Ethernet DNP3 communications supporting both UDP and TCP communications as per the DNP User Group requirements
- Dual Networking configuration with built-in channel switching
- DNP3 direct communications with PSTN backup

4. Water Management software for 24x7 water supply

This document describes the functionalities and features required i as part of Water Network Management System (WMS). A water network simulation platform for improving system design and operation of the water utility shall be utilized to improve:

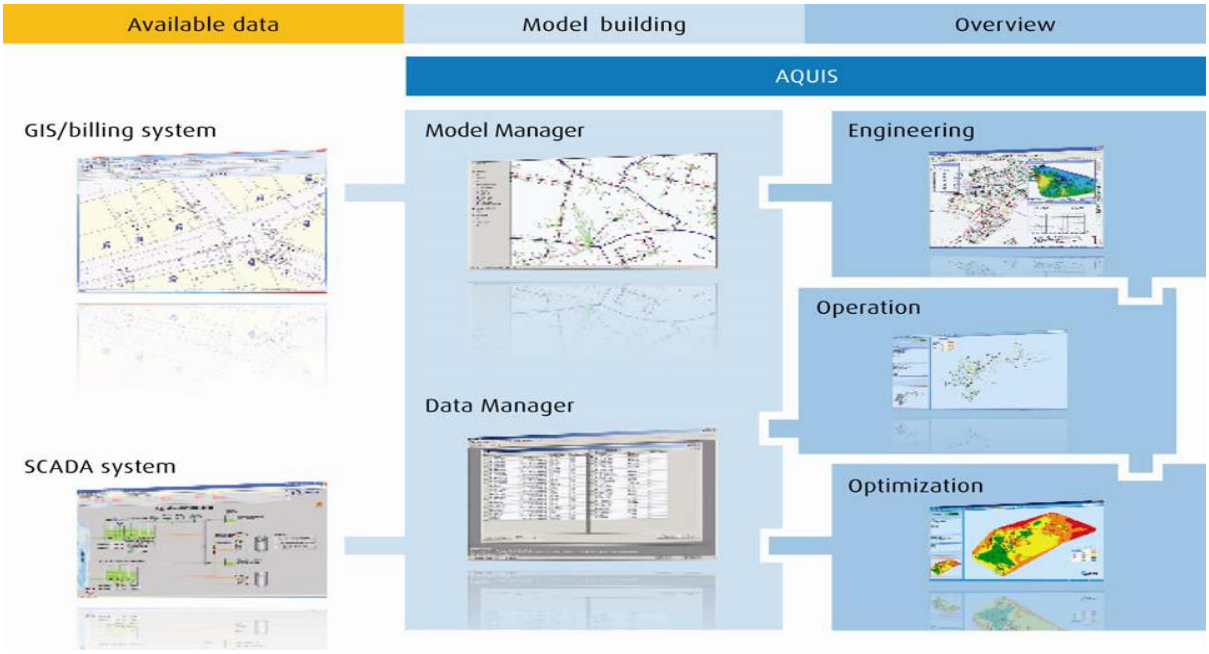
Water network management system shall be developed to improve:

1. Hydraulic performance
2. Water quality
3. Safety of operation
4. Pressure Monitoring
5. Water Quality and Quantity
6. Water Demand

While reducing:

1. Leak risks
2. Non-revenue water
3. Water supply costs

The most advanced, powerful and extensive water network simulation platform for improving system design and operation of the water utility.



WMS Offline, Online and Real-Time

The Solution shall introduce a number of advantages:

1. Knowledge about the operation of the water utility can be obtained by all level of staff – no modelling experience is required
2. Decisions can be made by SCADA operator and no specific modelling experience is required to operate the same.
3. **'No incident policy'**–Operator cannot allow themselves to supply with too low pressure or mistakenly close a valve – **Operation is an integrated part of securing that mistake are not made.**
4. one platform–enabling the user to go back in time, look at the situation now and look at the future.

Model Development

Model development has become a much easier task with future configuration of adding small additional line in WMS Software. You only need the following data:

1. GIS/mapping data
2. Demand data/profiles/geocoding
3. Elevation data
4. Calibration data – pressure, flow, level and water quality

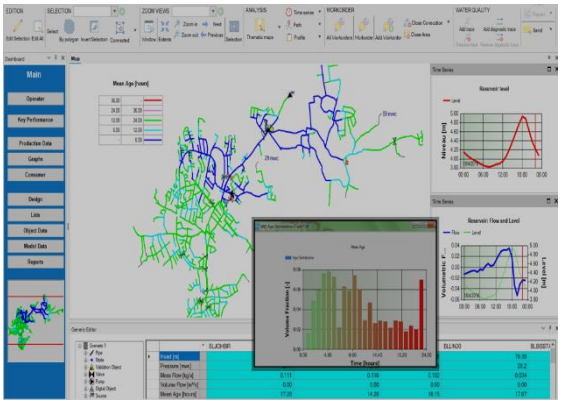
When you have fed in this data, Model Manager automatically generates the model for you. What previously took a man-month is now finalized within hours!

Furthermore, you benefit from the fact that the data is checked for errors such as double piping, wrong sizes and missing pipes, and these are identified.

Network Analysis

Water Management system should be feasible with studies and scenarios to evaluate the effect of:

1. New residential areas
2. New industrial sites
3. Increased demands
4. Maintenance and rehabilitation jobs like list of repeated failures of pipes and recommendations.
5. Fluctuations in consumption up to Zone/DMA level monitoring



WMS Software can design the network to meet future demand or to comply with regulations while improving service.

WMS includes a number of features and modules that enable you to save on operating costs and capital investments.

1. WMS Software shall quickly evaluate the effects of online modeling changes. Dynamic network elements such as valves, pumps and reservoirs are color coded to reflect current operational status. Pressure prediction allows you to identify how to operate the network at exactly the necessary operating pressure. In this way, you will be able to reduce the effect of existing leaks.
2. WMS Shall be used to determine mean, true, and maximum water ages. You can also use the water quality module to track any pollutant in the system, and to separate the zones to avoid spreading of the pollutant.
3. WMS Surge enables you to establish the reasons for a pipe burst. Many water companies estimate surge to cause as much as 50% of the pipe bursts in the network. The module can be used to collect information about the exact causes of surge events.
4. Calibration of networks.
5. Handling of hazardous situations such as the occurrence of major leaks and pipeline ruptures, outages of production plants or pumping stations.

Hydraulic Simulations

1. Extending and rebuilding networks.
2. Optimization of operation.
3. Contingency planning.
4. Water production cost and evaluation.
5. Analysis of dynamic system elements, such as flows and pressures over time.
6. Analysis and simulation of leak, work order creation for Active leakage control
7. Rehabilitation planning and designing.
8. Designing new networks or network extensions.
9. Pre- and post-project appraisal.

Calibration and network reporting are made easier using the WMS features, which include:

1. Simulation of hydraulic results.
2. Import data capability.
3. Comparison of modeled and measured data.
4. Export of data to other programs running under Windows, such as Excel.

Rehabilitation planning and designing are assisted using:

1. Local plotting options.
2. Exportable selection criteria.
3. Configuration of specific results data.

By using a simulation model, you can optimize network operation without affecting the customers. Useful features within WMS for this purpose include:

1. Dynamic changes of process variables and status of elements can be displayed through color coding.
2. Pressure reduction.
3. Pump optimization and cost of pump operations using tariffs.
4. Hydrant batch flushing.
5. Extensive user messages and reports.
6. Global or local factorization of demands.

WMS should provide guidance on when to simulate network behavior during transients, for example when stopping and starting of pumps, opening and closing of valves, or large clients going online. You can determine the pressure fluctuations, which such incidents will introduce on the network, and identify where the peak loads are.

Reading for Flow meter/AMR meter should be minimum timestamped or totalized for average calculation of actual flow.

WMS system should be having open protocol communication with any third-party device/AMR Metering system like OPC-UA, SQL etc.

Eg for minimum data of Consumer Metering Database

ID	Street	Street_ Number	Qm3y	FLOWTYPE		Timestamped	Flow Tot for day
1324	Rana Pratap Marg	25	41.0	2	0.001	456321	-81,809.00

By using live data from Existing operation System, the WMS model is transformed from a planning tool to a decision-making tool, integrated in your day-to-day operations – with instant and clearly identified benefits and economic advantages. Like GPS automobile navigation,

Prediction of Demand

WMS OperationisfullyintegratedwithSCADAandcanbepreparedtosendanalarmtoSCADAiferror conditions in the network are predicted. The WMS system will constantly predict the demand of your network, which is based on history and on the current and future weather situation.

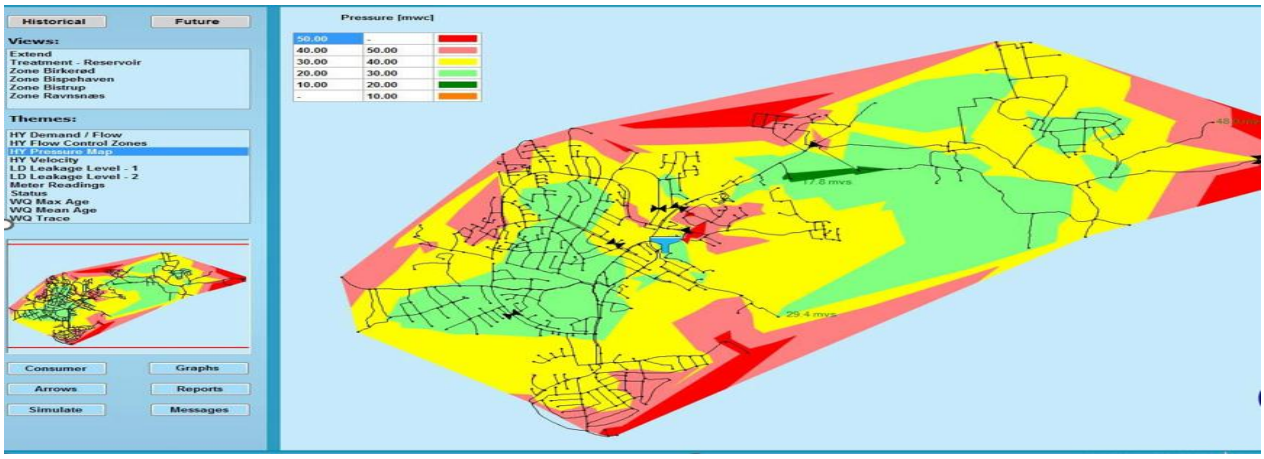
By a click of the mouse the operator can simulate the closing of a valve. WMS will run prediction and

return an alarm if one of the pre-configured set-points is exceeded. The operator will the before quickly and easily be able to advise the staff in the field if it is safe to close a specific valve. Other related problems can be seen and avoided with intervention simulation.

Graphical User Interface

The graphical user interface (GUI) is designed for easy and intuitive access from all parties involved, whether it is:

1. The operator
2. The man in the field
3. The planner
4. The specialist
5. The maintenance staffs
6. The management
7. Even the clients can get updated information on the Internet, if the Utility wish to broadcast this.



The overall idea is that we wish to create a control room atmosphere with focus on simplicity and easy access to information–enabling everyone to obtain qualified information about the network–now and in the future.

Themes

It is possible to pre configure the themes the user wishes to see, whether it is related to:

1. Pressure
2. Velocity
3. Age
4. chlorine concentration
5. leakage

It is easy to configure these and define the legend as the specific user wishes to see this.

Historic data – Now - Future

The GUI makes it possible to move quickly back in time-to the situation nowand scroll forward to any future situation. This is done by toggling on the buttons at the top.

Alarms / Events

The system is equipped with ‘alarm’ buttons–or ‘events’ where the user can free-configure thresholds that shall raise a historic or future breach of a threshold – if for instance the pressure will be too low, the utility can reach by opening a valve or start a pump – avoiding the problem.

If the user presses the event button he can go directly to the point of al arm and highlight the exact problem.

Water Quality

It is possible to see how the water moves and hence theageofthewater.Inthebelowisshownage– Itcouldalsobeshowing chlorine gradationorotheraspects reducing the need for analysis or just being aware when flushing is necessary.

Thismayalsobeextremelyinterestingfortheutilitywithmorethan1watersupply.Theywillbeableto identify which water supply supplies water to whom.

What-if Scenarios

The system enables on the fly what-if scenarios.

From a given on-line scenario what- if situation can immediately be simulated. Prior to actually implementing this.

If you face the challenge of having to shut down a main pipe, or basically any pipe, due to maintenance etc, the effect can be checked.

Iftheoperatorwishesto analyse theeffectonthepressureandvelocitiesinthenetworkofclosingaspecific valve for say 6 hours, he can click on the line in question and close the connection, followed by starting the simulation using the simulate button.

The result for the pressure is shown right away.

As seen from the above15.35 is not a good time for closing his valve. But when is?–he can continue to click on the time until adequate pressure is reached. As seen below it is safe to close the valve at 17.35. or time as specified.

If he continues to analyze, the valve must be opened before 06.35 in then Ext morning.

Cutting off consumers

If the utility needs to close an area cutting of some consumers, this normally requires staff to go out 'knocking on doors' informing about the problem – or at least that the consumers are notified by letter about the shutdown.

If an area is closed, we know who you hit – close the valve as shown – the yellow dots represent consumers that will not receive water.

By clicking 'reports' it is possible to get a report showing the consumers that are out of water. And by clicking 'send messages' it is possible to send out messages by letter, e-mail or SMS.

This may not be relevant for villas, but it may be extremely relevant for critical consumers such as restaurants, hospitals, schools, or hairdressers–allowingthetotakeprecautionintheirbusiness.

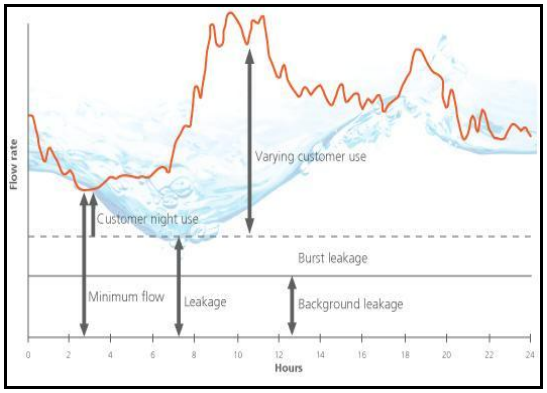
Water Loss Management

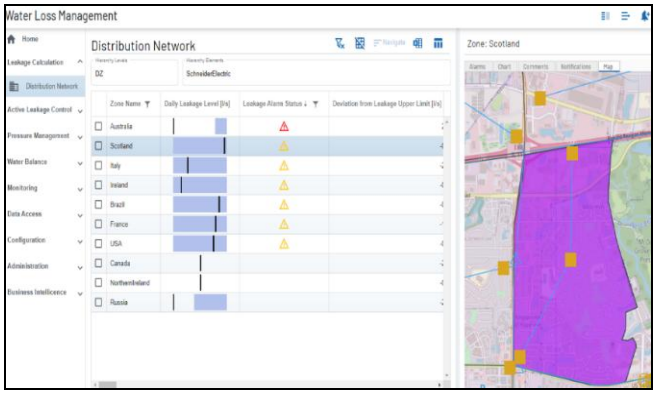
Water Loss shall calculate water balance, leaks and other events both in transport and primary distribution networks (upstream of the sectors), as well as in the interior of the sectors

The most important functions of the tool, from SCADA data acquisition, can be summarized as follows:

1. **Data Validation** – Water Loss SW Shall analyse and check-up any raw input data coming from SCADA/telemetry system or data loggers using a powerful validation tool with which the user can define several rules to be applied over raw data. This process is done automatically by the tool each time new data enters the system.
2. **Leakage Calculation** – Water Loss Shall have the capability of performing leakage calculations in both distribution and transmission networks and, using them together with other parameters, to build water balance tables. The tool calculates leakage in distribution networks with established DMAs by applying two possible approaches: "bottom-up" and "top-down":

3. **Bottom-up approach**: This approach uses the Minimum Night Flow (MNF) analysis which is based on the commonly accepted principle that leakage is most accurately determined when customer consumption is at a minimum, which normally occurs at night.
4. Water Loss SW shall calculate the daily leakage detracting from the MNF the Legitimate Night User (LNU) estimated or calculated using real customer consumptions. Finally, to consider the effect of varying pressure on leakage, the tool calculates the "hour-to-day factor" (HTDF) to be applied to the night leakage.





5. **Top-down approach**: Water Loss SW collects data from the corporate billing system of the water utility and calculate customer´s consumptions. The top-down approach calculates leakage in a distribution network zone by subtracting the customer consumption from the water volume entering the zone. Additionally, the tool is also able to calculate leakage levels at different hierarchical levels from DMA level up to Company level. This calculation can be performed in two different ways: by using the measurements of the flowmeters linked to these areas if available or by aggregating leakage values of the DMAs that belong to the selected zone.
6. The tool shall calculate the daily net flow for each area; defined as the sum of the values of the zone boundary flow meters with their algebraic signs (inlet flows are positive; outlet flows are negative).
7. **Transmission Pipelines** – Water Loss SW also provides tools for calculating leakage in the transmission and primary distribution (upstream of DMAs) network based on SCADA data using the conservation of mass principle. Water loss calculations are performed for any monitored asset/infrastructure (including pipelines, storage tanks, pumping station, water treatment works).
8. Apart from the leakage calculations, the system can calculate other relevant indicators such as leakage per property, leakage per main length, ILI, etc.
9. **Operability** – Water Loss shall have series of controls to determine the "operability" of a sector of the network, understood as reliability in the calculation of losses.

The leakage level resulting from the application of the top-down algorithm is compared to leakage figures obtained through MNF analysis (bottom-up analysis) over the same period. If the difference between the two values lies outside of an administrator-defined range, then the zone is categorized as inoperable.

User can define more operability rules to check if leakage calculation results are reliable or, on the contrary, they should be estimated by the system. A zone is considered as inoperable if it fulfill any or all the following criteria:

1. **Meters in fault** – the system checks if there are faults raised for the boundary meters of the zone.
2. **Large users' meters in fault** – the system checks if there are faults raised for the flowmeters of the large users within the zone.
3. **Unmeasured domestic per household consumption** – the system checks if the unmeasured domestic per household consumption in the zone is within configured limits. This figure is obtained after performing a water balance calculation taking into consideration the water distributed to the zone, its leakage level and its measured consumptions.
4. **The number of estimated data** – the system can calculate a ratio taking into consideration the number of estimated data and their contribution to the total flow of the zone. If the value of this ratio is above the configured limit, the zone is considered inoperable.

For zones that failed the operability tests and zones with invalid or missing data, the tool can estimate leakage for that zone for that day

Reporting – Water Loss is powered with a Business Intelligence (BI) platform providing a wide range of "Key Performance Indicators" (KPIs) related to water loss control and management activities that accurately and objectively represent water distribution network performance.

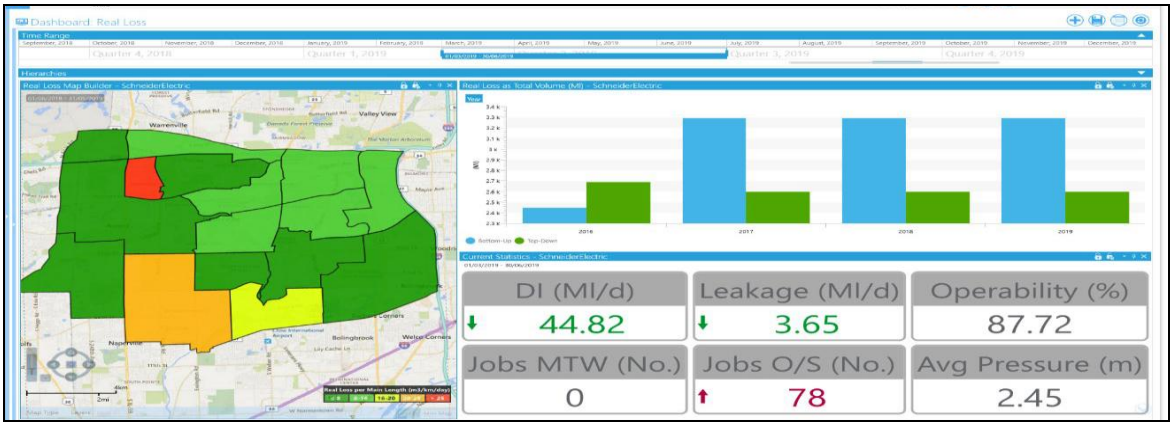
Water Loss SW shall support the organization both in the operations and planning process by:

1. Comparing the achievements of different units within the organization (internal benchmarking).
2. Providing near real-time KPIs calculation for more effective process monitoring and fast decision making.
3. Setting up indicators on a geographical base (geo-referenced benchmarking) to link KPIs to other factors, such as geographic units and asset conditions, and obtain information in a much more immediate and intuitive way.
4. Cross check any type of data stored in Water Loss SW data warehouse thus providing an enhanced level of analysis.

Dashboard – Dashboard is where user can view KPIs related to a particular zone and period. The system allows a user with administration role to define a series of standard dashboards (templates) which are common to all users. The aim of doing this is to have a set of different KPIs representations shared throughout the organization making it easy to evaluate. Any user can create additional dashboard views starting from existing templates or an empty dashboard by simply dragging KPI's icons from a menu and dropping them on the dashboard. KPIs are presented with a variety of "widgets": trend charts, pie charts, dials/speedometers, tables, thematic maps, etc.

Some of the KPI's that can be monitored in the dashboard are:

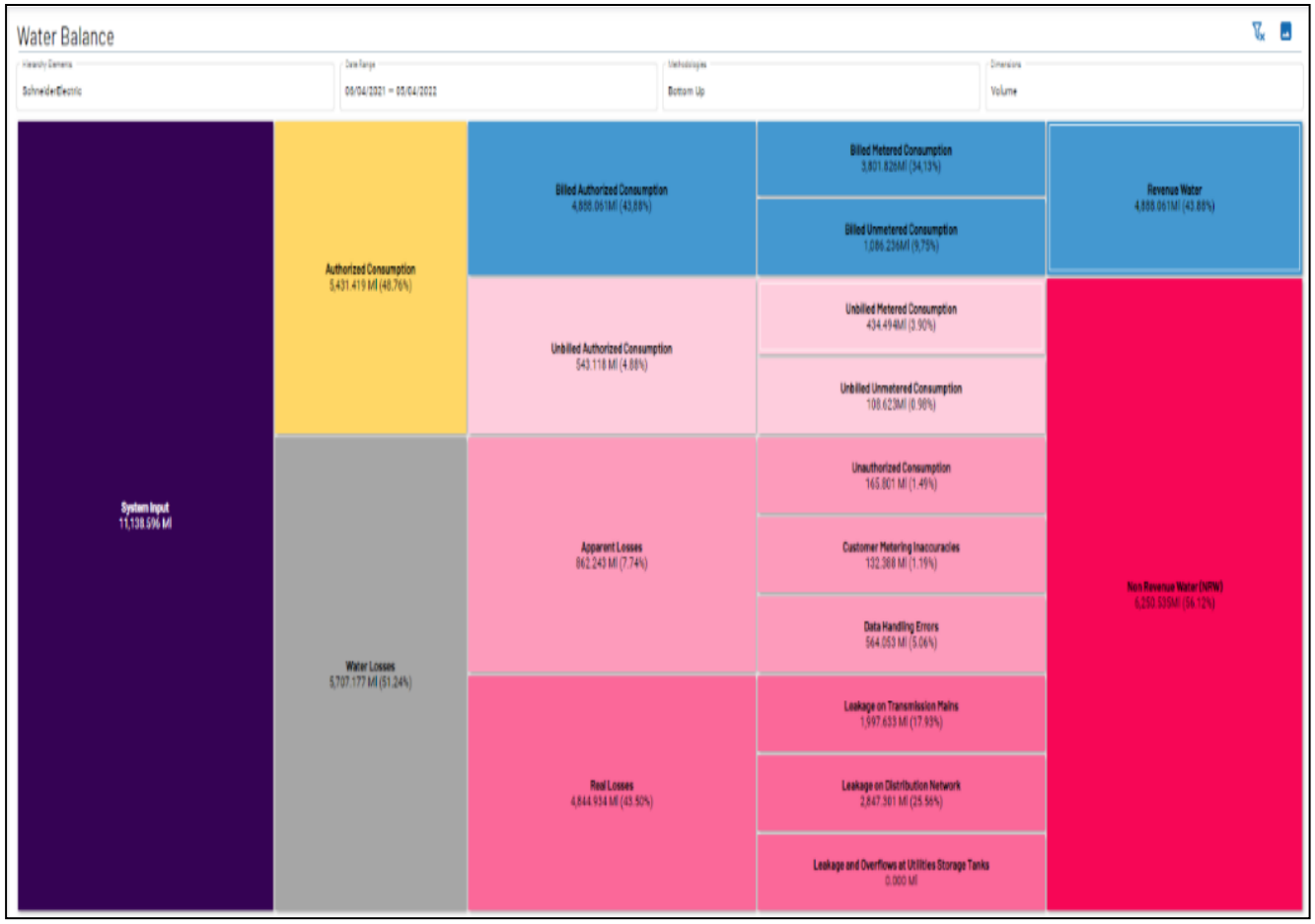
1. Water Loss as total volume,
2. Water Loss as a percentage of input water,
3. Water Loss per main length.
4. Water Loss per connection.
5. Infrastructure Leakage Index (ILI).
6. Apparent Loss as total volume.
7. Apparent Loss as a percentage of input water.
8. Apparent Loss per connection.



The platform of Water Loss SW shall provide a dedicated functionality to automatically calculate the Water Balance (top-down and bottom-up) at each hierarchy level of the water system (from company level down to DMAs).

The Water Balance is presented in the Dashboard with a special widget and in a specific report in the Reporting area. The Water Balance is calculated and updated daily.

Reporting – Water Loss SW shall offer a Report Building tool which allows the customer to create reports based on the information stored in the data warehouse. The user can visualize reports containing information in a tabular and graphical format at any hierarchical and zone level aggregation (DMA,



Distribution Zones, Company etc.) and for any chosen period.

Events and Alarm Management

Water Loss module has advanced analytical capabilities, which, in addition to the leakage calculations made for transport and distribution networks, allow a quantitative analysis of the current dynamics of the network (flows, volumes, pressures and levels) and the comparison of the current data with historical data, which facilitate the identification of exceptions and the capture of events in the network.

The tool allows the creation of alarms about the operational status of the DMAs or or zones of a higher hierarchical level; for example, alarms on the results of algorithms calculated such daily calculation of the minimum night flow or the daily leakages. Alarms can also be configured on measured data such as pressure gauges, flow meters etc

The system allows creation of alarms related to any algorithm/indicator calculated for the zones but also the automatic calculation a daily average profile based on historical data for any telemetry signal in the system.

User can configure alarms profiles that can be updated dynamically, using the most recent values imported from the telemetry/SCADA system, to reflect the most recent changes in the distribution network. The

system allows the user to establish over what period the system will calculate the profiles, to define types of days based on a calendar or to exclude from the calculations all those values affected by anomalous events. The user can define the alarms threshold following different approaches and assign to them persistency and severity. All these configurations can be done in bulk (for example, for all flow signals) or individually for each signal.

Once the alarms have been associated with the target elements, Water Loss will automatically execute the calculations and report an alarm if the conditions are met.

Water Loss shall detect many events and situations that may occur in the water supply network, including:

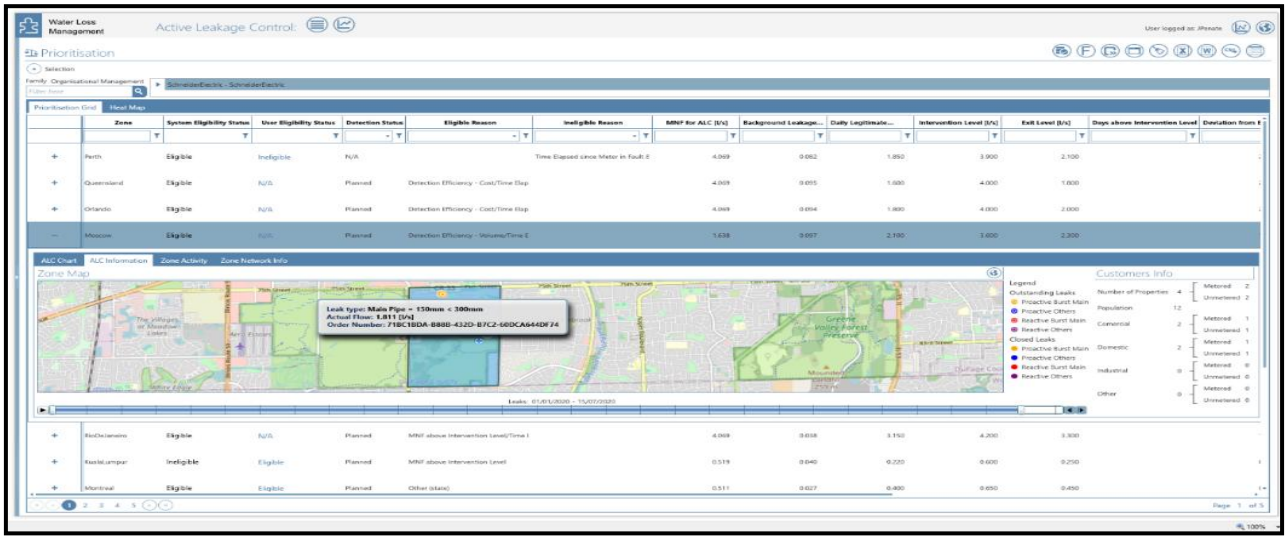
1. High level of losses in DMAs;
2. New breaks occurred within the DMAs;
3. High level of losses in elements of the transport network (upstream of the sectors);
4. Abnormalities in the operation of elements of the transport network.
5. Lack of reliability in the calculation of losses ("Operability") of a DMA;
6. Anomaly in the consumption of a DMA;
7. Anomaly in the value measured by a sensor (flowmeter, a pressure gauge, a level sensor or another sensor);
8. Failure in the measurement of a sensor;
9. Failure in the communication of a sensor;
10. Other events associated with alarms defined by the operator

Active Leakage Control (ALC)

Active Leakage Control (ALC) can be defined as the process by which unreported and/or invisible leaks are detected and repaired. This contrasts to reactive leakage control, which is carried out by repairing leaks that become visible and reported to the water company.

Before scheduling a leakage survey, it is important to determine which areas require a leakage survey, who is available to go to the field to search for leaks and when is this going to happen.

The first step in the ALC strategy of a company is to identify the areas for which a leakage survey is needed in the first place. Accurate leakage calculation is key to make the right decisions on how to intervene to lower water loss. Water Loss allows utility to establish different criteria to identify and prioritize the most critical areas to launch ALC campaign.



Users can select among different prioritization methods to rank the most suitable DMAs for ALC, such as:

1. **MNF rate above intervention level** – This method calculates the comparison between the Minimum Night Flow and the Intervention Level (flow value above which the ALC activities should start) defined per DMA. Should result be positive, the DMA will be considered as Eligible by the system for ALC survey

2. This method also takes into consideration days the MNF stays above Intervention Level. The longer it stays positive, the higher the system will rank it.

3. **Detection Efficiency Cost** – This method calculates the accumulated cost of water lost since the MNF of the DMA is above the Exit level in comparison to the average cost of a leakage survey in the DMA.

4. **Detection Efficiency Volume**– This method calculates the accumulated volume of water lost since the MNF of the DMA is above the Exit Level (flow value below which is not technically or economically viable to further detect leaks) in comparison to the average cost of a leakage survey in the DMA

5. **Periodicity Method** – User will have also the possibility to make the system to consider a DMA as Eligible for a leakage survey based on a pre-defined time interval: i.e., an ALC survey should be always done in a particular DMA every 6 month

6. **Manual Prioritization** – User can also indicate why a particular DMA is critical or not critical maybe because of faulty instruments and questionable measurement data and should be chosen or removed for ALC campaign

The results of the applied algorithm determine the "Eligibility status" of a DMA and Water Loss provides them with a proposed list of DMA candidates for ALC activities based on all the above criteria. Preferred Detection technique and the usual duration of the ALC activity in every DMA are also suggested by the system to support the creation of an ALC plan at a later stage. This initial list can be amended by the user based on his/her judgment in terms of eligibility or ineligibility of the DMA, duration of the activity and detection technique to be used

5. Technical Specification for PLC System

Industrial Automation Architecture shall provide a complete solution, enabling the most of the Internet of Things, in order to drive the best plant operating efficiency, reliability, safety & security and well as sustainability. The solution must also bring integrated bricks and solutions for advanced Energy Efficiency management.

There shall be continuous, powerful and secure communication backbone across the entire plant automation architecture and field devices (sensors, captors, motors, drives, power meters…) to analytics layer. Solution is based on industrial standards for advanced transparency and maximum interoperability and openness.

This continuous communication backbone becomes the foundation of IoT architecture, providing increased real time plant-wide data visibility to allow better insight from operations and to maximize efficiency of assets during all lifecycles. Smart connected sensors, products, or machines support business initiatives and increase operating profitability by enabling remote asset management, analytics-driven performance improvement from advanced software suites. Automation solution also provides high level of cyber security, with native Safety Integrated capabilities, as well as control and power redundancy.

The engineering software tool provides efficient engineering and comprehensive diagnostics for the complete architecture. Controllers can be either integrated in traditional architecture (PLC+SCADA), or in DCS system with key values like single database or object-oriented configuration.

Basic functional requirements expressed below:

Connectivity

Continuous communication backbone based on Standard protocols to connect devices, edge controls and analytics Switches, IP forwarding, Wi-Fi access point, copper to fiber converter embedded in controller to ease cabling, configuration and troubleshooting

Cybersecurity

1. IPsec encrypted and secured communications
2. Cyber Security Achilles Level 2 or equivalent IS Specification.
3. Cyber Security compliance as per IEC 62443-4-1, 2018 for secure development life cycle requirement.
4. Built-in control of firmware and software integrity

Improve Availability and Reliability

1. Redundant CPUs including Intelligent and redundant power supplies to achieve close to zero downtime for critical applications
2. Error Correction Code implemented

Flexibility

1. Hot swap modules
2. Add new RIO drops or new modules in the architecture in run
3. Modify channel configuration parameters, applications or change variables in run

Eco-Design

Comprehensive Eco Design approach for the controller to detail
Information on regulatory compliance, material content, environmental impact and circularity attributes

Redundant hot standby PLC/SCADA system, redundant Power supply module, redundant communication module, and non-redundant IO modules (suitable for IOs in the raw water pump house area) with the following shall be provided at PLC / SCADA.

The following software provisions (with necessary licenses) shall be provided as minimum requirements.

1. HMI SCADA Software
2. PLC Programming software (programming as per IEC 61131-3)
3. Windows Operating Software (latest version)
4. Application software (as per PLC OEM Standard)
5. Web SCADA Software
6. MS Office
7. Antivirus Software (as per PLC OEM recommendation)
8. CE/UL approved manufacturer's RTU/PLC in IP42 (Indoor)/IP65 (Outdoor) certified Panel

Processor

1. Hot Redundant processor configuration, the system is designed to have a bump less transition (no unattended spike on the IO during switchover)

2. The processors shall have to be dedicated to the services of the redundancy and won't have to be associated with any specific coupler, configuration, nor specific programs. The implementation of the redundant solution shall be "plug & play" by design.
3. The data exchanges between the two redundant processors (Primary and Standby), are using a very high-speed link of 1 Gbps.
4. The processors must have an internal non-volatile memory to store application and data.
5. It must be possible to connect a PC (programming terminal) or a human – machine interface
6. The range must provide processors with at least 3 built – in Ethernet ports featuring a web server complaint with various operating system: minimum is Windows, IOS, and android.
7. Embedded web server must provide CUP diagnostic, including detailed information on Ethernet system networking.
8. The Embedded web server must be customizable by the user to display application variables and advanced diagnostics features. Each processor should have a savable real – time clock which manages
    a. The current date and time
    b. The date and time of the last application shutdown. The date and time should be managed even when the processor is switched off for 20 days.
9. The processors must be equipped with ground connection contacts without additional cabling.
10. The PLC must be able to load the program with the use of the memory cartridge.
11. Possible to add modules or add remote I/O islands in the configuration without interrupting the running process.
12. The whole redundant variable database must be exchanged during each scan time, with a minimal impact on the cycle time of the system.
13. The user shall be able to select which variables are redundant in the application.
14. The dedicated redundant connection between the 2 processors can either be using fiber optic or copper RJ45 cable.
15. The application logic program can be modified while the system is running, and without compromising the redundancy function.
16. The redundant system must be seen by the SCADA as a single PLC (one IP address). The system manages in all transparency and automatically the IP address swapping of the Ethernet couplers.
17. The redundant controllers have their own IP addresses that never swap, to connect the engineering tool continuously.
18. The system components internal firmware can be updated while the system is running without losing the redundancy function.
19. The processors must have 8MB internal non-volatile memory to store application and data.
20. It must be possible to connect a PC (programming terminal) or a human – machine interface.
21. The range must provide processors with at least 1 built in Ethernet Parts featuring a web server complaint MS Windows. Also, RTU/PLC has on board USB Port for performing the maintenance operation.
22. The control system requires some form of defense of this Internet threat. IPSEC protocol will provide both anti replay, origin authentication and integrity of data.
23. No battery supply is needed for non-volatile backup of the controller application.
24. The RTU/PLC module microprocessors shall be 600 MHz ARM based microprocessors or equivalent. The RTU/PLC has low energy consumption and the highest environmental robustness
25. The controller simulator comes as the standard software package, it should include in the standard software. The Controller shall be remotely configurable from SCADA Software.
26. The PLC hardware module shall have a feature to diagnostics itself and check the health status of the modules installed in the system through the web service /web browser. The diagnostic will check the condition of the modules and report it if there's something wrong with one of the modules.
27. The Embedded web server must be customizable by the user to display application variables and advanced diagnostics features. Each processor should have a savable real – time clock which manages
28. The current date and time
29. The date and time of the last application shut-down. The date and time should be managed even when the processor is switched off for 20 days.
30. The processors must be equipped with ground connection contacts without additional cabling.
31. The operating system (OS) must be capable of multitasking with 1 periodic fast task, 2 auxiliary tasks, 1 cyclic/periodic master task 64 event tasks. Numbers of instructions per ms- 7.5 Kinst/ms 65 % Boolean + 35 % fixed arithmetic, 10 Kinst/ms 100 % Boolean.
32. Outputs can be set to fallback position when the RTU/PLC switches to STOP mode via channel-by-channel parameter entry.

33. Able to set breakpoints and watchpoint in application to check all system and data when executing application for debugging. System must also provide Step-by-Step running feature to execute all operations one by one in the application.
34. The redundant power supplies must provide natively information about their ageing, to be able to be replaced before failure (preventive maintenance.
35. The redundant power supplies must use a true redundant technology (one active at a time, the other ready to take full load if needed), not using load sharing technology

Operating system

The operating system (OS) must be capable of multitasking with up to 4 periodic tasks and more than 60 event or I/O tasks.
Physical input can be program to prohibit any modification or downloading of the program.
Outputs can be set to fall back position when the PLC switches to STOP mode via channel-by-channel parameter entry.
Able to **set breakpoints and watch point** in application to check all system and data when executing application for debugging. System must also provide Step-by-Step running feature to execute all operations one by one in the application. Engineering tool must provide a trending tool embedded to display variables at a minimum of **1ms sampling rate**

Memory

Application memory execution can be done on through embedded or removable memory.
No battery supply is needed for non-volatile backup. The processor must support up to 32 MB of on-board non-volatile memory
Feature to store the program, comments and symbols in the PLC. The "empty terminal" functionality must be possible whichever IEC language is used. It must be also possible to use the memory extension to back up files (production data, recipes, etc.)

Communication

Synchronized and unsynchronized drops with PLC scan can be **managed over standard and open Ethernet communication.** Must provide exchanges of variables:

- Explicit exchanges (via function blocks integrated in the application)
- Implicit exchanges (Using cyclical variables generated by the single declaration of the device) Dedicated function blocks should be available.

The PLC must be accessible via Ethernet (from a remote site) using a standard Internet browser or any other platform (android, iOS). These functions must not require any prior configuration or special software. In addition, the use of these functions must have no effect on the PLC scan time.
A device must be reconfigured automatically after replacement
The PLC must have serial links which support various types of communication: Modbus or open protocols.

Standards and certifications

The PLC must conform to the main national and international standards covering electronic equipment for industrial control systems & FOLLOWING TYPE TEST REPORTS to be provided by the vendors

- CE marking according EN 61131-2
- Be compliant with IEC – 62443 standards
- Cyber Security Achilles Level 2 or equivalent IS Specification.
- Cyber Security compliance as per IEC 62443-4-1, 2018 for secure development life cycle requirement.

Description of Type Test **Test Std.**
Electromagnetic Compatibility (EMC)

Electrostatic Discharge Immunity	IEC 61000-4-2
Radio-frequency, Electro Magnetic Field Immunity	IEC 61000-4-3
Surge Immunity	IEC 61000-4-5
Immunity to conducted disturbance by RF Field	IEC 61000-4-6
Environmental & Climatic Tests	
Dry Heat	IEC 68-2-2
Cyclic Damp heat	IEC 68-2-30
Steady State Damp Heat	IEC 68-2-78
Change of Temp.	IEC 68-2-14

The system MUST be Achilles level 2 or equivalent certification for cyber security.
The system must be able to secure communication between PLC/ RTU and engineering workstation / SCADA providing authentication and integrity of data
The internal firmware of the CPU must be digitally signed and encrypted
The integrity of the firmware must be checked before any application download and at start-up of the system
The integrity of the engineering software must be checked on demand. The system provides an access control list for each protocol and each connected IP address
Any modification of the operating mode of the system (Run / Stop / Program modifications) must be authenticated real time memory Integrity Control.

Environment

- Standards CSA C22.2 No 142, UL 1604, UL 508, Resistance to conducted disturbances, induced by radio frequency fields
- EN/IEC 61131-2: 2007
- Marine specification (LR, ABS, DNV, GL)
- 1 kV for Ethernet line conforming to EN/IEC 61000-4-4

PLC System - Main Control Room

Sr. No.	Description	Specification
1	PLC Make	ANY INTERNATIONAL MAKE MEETS THE FOLLOWING REQUIRMENT & APPROVED IN UP JAL NIGAM
2	PLC Type	HOT Redundant PLC
3	Data Exchange	through high-speed link of 1 Gbps
4	Operational Voltage	24V DC
5	Specification	Local indication using LED
6	CPU	16-bit Dual core processor
7	Programming Memory & Data Memory	32 MB memory
8	Clock	Real time clock (RTC)
9	Communication	Serial (1 - RS 232, 1 - RS232/RS485) (GSM, GPRS, Data call, Satellite, Radio modem, serial, Ethernet)
10	Communication port	1 no RS 232/RS 485 1 Nos 10/100 base Ethernet port, 1 Nos USB Port
11	Ethernet Services	FTP Server, SNMP, DHCP Client, IEC

		VAR Access, Modbus TCP Server/Client
12	Web Services	Web Server
13	Operating temperature	-10 to 55 deg C.
14	Storage temperature	-10 to 70 deg C
15	Humidity	5- 95 % non-condensing
16	Vibration	3 gn (vibration frequency: 8.4...150 Hz) on panel mounting
17	Shock Resistance	15gn for 11 ms
18	Operating Altitude	0 – 2000m

The hardware is a unique blend of rugged industrial I/O, real-time multi-tasking software and powerful communication capabilities. It shall be a locally intelligent unit having local memory and processor installed at a respective control and monitoring location in the water network; this can be a pumping station or a tube well station. The Redundant PLC hardware shall be programmable in SFC, IL, LD, ST & FBD.

PLC system CE/UL approved manufacturer with rack-based PLC system only, No flexible cable communication between the process and IO modules is accepted.

The high performance modular Redundant PLC must be designed to log all the pumping station parameters with time stamping in its NON-VOLATILE memory at the defined logging interval.

The PLC shall be battery backed-up so as to maintain the parameters during power failure.

The PLC shall be designed to have communication compatibility for wireless mode viz. for GSM, GPRS, and Radio, satellite or wired mode viz. Telephone and serial to transmit data and receive commands remotely.

PLC System – Pumping Plant

Shall have following minimum specifications: -

1	Input/outputs	
2	Digital Input	As per requirement
3	Operational Voltage	24V DC
4	Specification	Local indication using LED
5	Analog Input ranges	0-10VDC, 0-5VDC, 4-20mA, 0-20 mA
6	Resolution	16 bits
7	Digital Output	As per requirement
8	Relay type	Relay/transistor Output
9	Operational Voltage	24V DC
10	Specification	Local indication using LED
11	CPU	16-bit Dual core processor
12	Programming Memory & Data Memory	Minimum 1 MB ON board memory
13	Clock	Real time clock (RTC)
14	Analog to digital converter	12/16-bit Resolution
15	Communication port	DNP3, Dual LAN Ports 10/100/1000 MB Ethernet port 1 no Serial Port
16	Operating temperature	-10 to 55 deg C.
17	Storage temperature	-40 to 70 deg C
18	Humidity	5- 95 % Non-condensing

19	Vibration	3 gn (vibration frequency: 8.4...150 Hz) on panel mounting
20	Shock Resistance	15gn for 11 ms
21	Operating Altitude	0 – 2000m
22	UPS in panel	Minimum 2 hr backup with auto switching arrangement

IO Descriptions

Digital Inputs

- Channel Density -8/16/24/64 CH
- Input voltage range 24 VDC, Input current (max): 7mA @ 24 VDC/ channel
- On off delay times: 1.6 ms
- Confirming to IFC 61131-2 type I
- Input impedance 4.7 kohm
- Response time 50 usec
- filtering time 1 usec
- Execution Time for 1 kinst. 0.7 msec and 0.3 for event and periodic

Digital Outputs

- Channel Density -8/16/24/64 CH
- Supply-Internal power supply via rack
- Typical current consumption-125 mA at 3.3 V DC
- Protection type-Reverse polarity protection, External short-circuit protection, overload protection, overvoltage protection
- Output short-circuits protection-With 2 A external fuse
- insulation resistance- > 10 M Ohm 500 V DC
- Load impedance- >=220 Ohm
- dielectric strength-1500 V AC at 50/60 Hz 1 minute, output/ground, 1500 V AC at 50/60 Hz 1 minute, output/internal logic
- Maximum overload time-15 ms

Analog Inputs

- Channel Density -8 CH/4CH/2CH
- Input Scan time: 500 ms Min.
- Input Type: 4-20 mA DC, 0-10 VDC.

Analog Outputs

- Channel Density -8 CH/4CH/2CH
- Output Type: PID Controlled.
- Output Level: 4-20 mA DC, 0-10 VDC

Note – 20% Spare IOs shall be provided

6. PLC / RTU Specification &System - OHT's

The RTU shall be an intelligent, modular unit, capable of both data acquisition and local data The SCADA controller (RTU) shall be an intelligent, compact unit, capable of data acquisition, local data processing and data logging. It shall monitor and control local equipment in a stand-alone mode as well as being an intelligent node in a distributed system. It shall be based on a multiprocessor architecture, in which a co-processor is used for handling on-board input/output channels.

To facilitate initial installation, maintenance and future expansion, all external input/output modules shall connect to the basic controller using a high-speed internal bus

The controller configuration shall include a logic programming and debugging environment with standard programming such as Function Block Diagram (FBD), Structured Text (ST), Instruction List (IL), Sequential Function Chart (SFC) and relay Ladder Logic (LL). The programming languages shall be compliant with the IEC 61131-3 open programming standard

Controller configuration (including logic programs) shall be downloaded in a single step either directly to the controller using any of the RS-232, USB and Ethernet interfaces, or remotely through the communication network media such as phone lines, dedicated lines, or wireless systems.

The controller must be supplied with the number and type of input/output modules and communication ports as indicated elsewhere in the specifications. Future expansion shall be made by simply plugging in additional input/output modules to the I/O bus.

Central Processing Unit (CPU):

The central processing unit shall be a 32-bit, dual-core microcontroller operating at 500 MHz, with an integrated hardware floating point unit and data storage of events of upto 1,00,000 events.

Configuration, object data, event storage and all logic data and program states shall be retained in non-volatile memory across a loss of power. Non-Volatile contents shall be retained for 2 years with no power and for occasional loss of power over a period of at least 8 years, when the CPU is operating with a connected power source.

The CPU shall include a real-time clock/calendar, accurate to within one minute per month, with lithium battery backup. The battery will maintain the memory and clock/calendar for two years of power off time. The RTU shall provide an adjustable period for updating time from SCADA protocols in order to achieve accurate clock time.

The CPU shall include an internal clock with at least 10mS resolution and be capable of applying timestamps at this resolution to internal and externally obtained data. Diagnostic LEDs shall be included for the following:

1. RTU Status
2. Wide area communication link activity such as transmit, receive
3. Local peripheral communication link activity
4. I/O point indication for all DI & DO points (as a minimum)
5. Forcing.

The controller shall include an internal temperature measurement channel, readable in degrees C or F to indicate the operating temperature, for remote monitoring via the communication network, or use within the application software.

The RTU shall include a built-in power supply with wide range input, at least 12VDC - 30VDC. The power supply shall be capable of providing 24VDC output to power field transmitters.

The RTU shall be available in several basic configurations. As a minimum, the following are required in devices with minimum footprint. Further I/O shall be available through I/O module expansion.

Digital inputs shall be configurable for reporting of time-stamped events (including unsolicited reporting of state changes), and alarm time dead bands. Digital input changes on the RTU's local I/O shall be time-stamped to at least 200mS accuracy of actual input change, with an internal resolution of 10mS between detectable events. State change and timestamp shall be reported through DNP3 Level 4 SCADA protocols. Point quality shall be indicated in the point database and through status flags on individual points in DNP3 Level 4 SCADA protocols. Digital outputs shared with digital inputs shall be dry contact (closure to ground) type inputs.

Analog input changes on the RTU's local I/O shall be time-stamped to at least 200mS resolution, with an internal resolution of 10mS between detectable events. Value and timestamp change shall be accessible by a user application and reported through DNP3 Level 4 SCADA protocols.

Analog Input points shall include point quality such that I/O module or other failure will indicate bad point quality. User logic shall also be able to derive bad point quality on a per-point basis. Point quality shall be indicated in the point database and through status flags on individual points in DNP3 Level 4 SCADA protocols.

The RTU I/O shall be controlled by an independent co-processor.

The state of digital and analog outputs shall be configurable to hold their last output value or go to the OFF condition when the application program is stopped.

Communication

The controller (RTU) shall possess a minimum of five built-in communication ports with the following characteristics:

1. Two Ethernet port 10BaseT / 100BaseT with individual Mac Address with DNP3 and Modbus TCP/IP configurable simultaneously.
2. Ethernet Service port and Remote IO ports shall not be considered for SCADA and Third-party communications.
3. One USB device port
4. Four Serial Port, software controlled to 115200 baud rates. 2 kV surge withstand protection as per IEC 61131-2, At least two of these ports shall be software selectable for RS-232, and RS-485 2-wire operation. Serial ports shall support speeds from 300 to 115200 baud.
5. USB Host USB 2.0 compliant "A"-type receptacle, supporting USB storage devices up to 32 GB and power up to 500 mA at 5 Vdc. The USB Host port shall support communications at 1.5 Mb/s and 12 Mb/s

Open Standard Protocols

The RTU shall support the following industry standard protocols:

1. DNP3 Level 4-Level 4 conformant Master and Slave serial and DNP3 Level 4 over IP,
2. DNP3 Level 4 Slave is required to have the ability to send DNP3 Level 4 Master Read and Control requests to a peer Slave RTU
3. Modbus RTU Master, Modbus RTU Slave
4. Open Modbus/TCP Client, Open Modbus/TCP Server

5. The controller shall be capable of supporting both DNP3 and Modbus
6. concurrently on the same Ethernet or serial IP communications port

Firmware Upgrades

The operating system firmware shall be capable of being upgraded locally and remotely, utilizing compression techniques to minimize the communications transaction size for loading of firmware patches or a new firmware image. The firmware upgrade shall not commence until complete reception of the firmware image. RTU operation shall not be interrupted during the communications transfer of the firmware image.

User Programming Software:

The RTU shall support all five IEC 61131-3 programming languages:

- Sequential Function Chart (SFC)
- Functional Block Diagram (FBD)
- Ladder Diagram (LD)
- Structured Text (ST)

The RTU configuration and programming software shall be accessible from a single user interface. The software shall allow the user to develop and then download the application and system configuration locally via USB, serial port or Ethernet interface, and over the communication network via TCP/IP, DNP3 Level 4 protocols.

Event Capability:

The RTU shall natively support event facilities without the need for user programming. Open protocol event capabilities for DNP3 Level 4 shall be fully integrated with the RTU's event facilities. The number of events stored by the RTU shall be configurable, with a maximum up to at least 1,00,000 events. The RTU shall provide the following capabilities:

1. Generate events from physical or derived data objects
2. Accept, process and chronologically sort events from external devices
3. Merge external events using the original timestamp information provided by an external device
4. Where a timestamp is not supplied externally, the RTU shall add a timestamp to all event data
5. Report Binary, Counter, Integer analog and Floating-point analog events as a minimum
6. Report events for analog points on rate of rise exceeded, rate of fall exceeded and no change after a period. This functionality shall be provided natively without the need for user programming.
7. Event configuration for each data object shall include an event priority
8. Individual event configurations (e.g. each alarm limit) shall provide a selection for enabling an unsolicited communication transaction when the event is generated

Data Logging functionality:

The RTU is required to have the following data logging functionality in addition to its event capabilities. The RTU shall support both event and data log operation simultaneously, including both event generation and logging on the same RTU data objects.

Logging shall be selectable on digital input, digital output, analog input and analog output data objects. Analog logging shall be by 32-bit floating point engineering values.

Logging shall be configurable to include current value and summary statistics at a defined interval, including average, maximum and minimum logging trends.

Logging frequency shall be selectable by the user for each logging trend and vary from 1 second to 1 year. All data shall be able to be retrieved and made available as a .csv file for use in Excel, Access, or HMI software. Data uploaded to a PC shall be supported using direct serial connection, leased telephone lines, radio, dial-up modem, external memory media and via the SCADA communication link.

Environment, Certifications and Standards:

Environment

The RTU shall operate over an ambient temperature range of -10°C to 70°C (-10°F to 158°F) with a relative humidity 5% to 95%, non-condensing.

The RTU shall operate from nominal power supplies 12-30 VDC but shall tolerate a wider range than this. 115/240 VAC operation shall be provided through the use of an optional power supply.

The controller shall have power consumption of less than 4.0 W, USB Host port (5 Vdc at 500 mA)

Certifications and Standards

1. The RTU shall be certified with CE Mark
2. All inputs and outputs (except the serial communication ports) shall survive ANSI/IEEE C37.90 surge withstand capability (SWC) tests without damage.
3. RTU serial ports shall be static protected to +/- 15kV as conforming to IEC 801-2 and 2.5kVsurge withstand capability as per ANSI/IEEE C37.90.1-1989.
4. The RTU shall be certified to meet or exceed the following standards:
   - Electrical safety classification: c(CSA)us, CAN/CSA-C22.2 No. 61010-1
   - Discharge Immunity: EN61000-4-2
   - Radiated immunity: EN61000-4-3
   - Fast transient immunity: EN61000-4-4
   - Surge immunity: EN61000-4-5

Security:

The controller shall support DNP3 Secure Authentication. A software tool shall be provided for managing security credentials, protected by AES-256 cryptography.
RTU shall support next generation Cybersecurity features such as RTU security access control, individually addressable Ethernet Ports are tested to meet Achilles level communications robustness.
The RTU shall provide communications security using recognized SCADA security open standards.
Communication link security shall be provided for the DNP3 Level 4 open protocol as a minimum, supporting operation on serial and network links. This shall include DNP3 Level 4 Secure Authentication V2 as a minimum with an option for data encryption.
Security standards shall be aligned to FIPS-120 standards and include AES-128 encryption and HMAC SHA-256 hash algorithms as a minimum.
A secure administration application shall be provided for the Security Administrator to issue and track security keys, users and configuration computer nodes.

The administrator application shall provide the capability of specifying security configuration for groups of RTUs, users (via username/password) and individual configuration.

Main Functions of IOT:

Without being all-inclusive, the list of the functions below represents the majority of the needs encountered:

- Data acquisition from sensors using gateways
- Generating analytics events using streaming analytics and processing events
- Automatic transmission of events to multiple stakeholders and central location

- Publishing the data in the central database/Hadoop/big data platform
- Remote monitoring of the process, device management, streaming analytics software upgradation /updation and installation

7. Technical specification for Soft Starter

The soft- starter shall be developed and qualified in accordance with international standards, particularly with the standard dedicated to soft-starter EN / IEC 60947-4-2. The starter must be CE marked under the harmonized standard EN / IEC 60947-4-2.

Description

The operating principle of the Soft-starter should not simply take ground on a limitation of motor current during the transitional phases or on a voltage ramp but on a torque control motor. The Soft-starter should provide a torque ramp during the acceleration phase. Thus, it can control the torque during the starting period and if necessary, provide a motor torque constant throughout the acceleration phase. For pumping applications, the deceleration will be on torque a ramp.

- All Soft-starter sizes will have the same control board. That control board must be identical for all applications.
- All Soft-starters shall be equipped with means for measuring motor current to ensure protection.
- The measurements of the current will be active when the Soft-starter is by-passed (embedded by-pass for all sizes).
- The Soft-starter should have a separate power control.
- The terminals of the board control shall be of plug type for easy maintenance.
- Soft Starter should control 3-phase output with Programmable display.
- The Soft-starter will handle the by-pass itself: manage the closure of the by-pass at end of acceleration time and open that by-pass at end of stop sequence. That function must be compatible with the types of stop: freewheel, ramp
- The access to the settings can be locked by code. The monitoring parameters should remain accessible.

Environment

- The maximum relative humidity will be 95% without condensation or dripping water according to standards IEC60947-4-2.
- The storage temperature can be between -25 ° C to + 70 °

Electrical characteristics of the Soft-starter

- The Soft-starter will automatically adapt itself to the frequency of the mains 50 or 60 Hz with a tolerance of + / -10%.
- Outputs: The Soft-starter must have at least 2 relays with a NO/NC contact Maximum switching capacity on inductive load: 2 A at 250 Vac and 30 Vdc.

Protections

- The starter will include the management of Motor PTC probe.
- The starter will calculate continuously the motor overheating from the real current value (the current) must be measured and not estimated). Several classes of thermal protection will be proposed following the standard EN/IEC60947-4-2: Classes 10, 20, 30. The calculation of the thermal protection must be active even when the Soft-starter is not power energized.
- The starter shall be protected against thermal overload, over & under voltage.
- Dry run protection for pump motor.

- Protection against reverse-phase network, the loss of phases on mains or on motor.
- The protections will always be maintained even the Soft-starter is by-passed internal or self.

Communication

- The starter will include a multipoint serial link to be connected directly to a Modbus network. The starter shall be able to be connected to Ethernet and other networks and communication bus option.
- The communication shall provide access to the control, adjustment and monitoring of the Soft-starter.

Display

- The starter shall have a display and programming push buttons.
- The following information must be accessible on the display
  - Motor current (by phase)
  - Motor state
  - Current status (acceleration, deceleration, running).
  - Operating time.
  - The last fault occurred
  - Fault history
  - I/O status

8. Technical specification for VFD

The AC Drive shall comply with National and International standards and the recommendations for electrical industrial control:

- EN61800-5: Electronic equipment for use in power installation
- CSA C22.2 N274: Industrial Control Equipment
- UL 508C: UL Standard for Safety Power Conversion Equipment
- IEC/EN 61508-1/2 SIL3 Machine Safety directive.

- The AC Drive shall be able to start and control the speed of a standard squirrel cage induction AC motor and synchronous motor.
- The AC Drives shall be CE marked
- The AC Drives have to be built to comply with the IEC standards.

Speed accuracy

- The AC Drive shall provide a speed accuracy ± 10% of the nominal slip of the motor

Voltage reflection superimposition suppression with motors compliant to IEC60034-25

- Unshielded motor cable length up to 300 meters no precaution is needed
- Unshielded motor cable length up to 500 meters a dV/dt filter is requested
- Unshielded motor cable length up to 1000 meters a Sinus filter is requested

Filters and Chokes

- The AC Drive manufacturer shall provide DC chokes ,
- The AC Drive manufacturer without DC choke should provide 5% impedance AC chokes

Protections

- The AC Drive shall be compliant with the remote diagnostic capabilities provided by the manufacturer.
- The AC Drive shall provide a programmable accurate diagnostic sequence to reduce down time for maintenance. Diagnosis and accurate downsize the maintenance duration.
- The AC Drive shall be UL 508C listed for use on distribution systems. The AC Drive has a coordinated short circuit rating designed to UL 508C and NEMA ICS 7.1 and listed on the nameplate. The AC Drive shall not create a hazard in the event of a short circuit at any point within the AC Drive when it is connected to a power source as specified on the nameplate and protected as specified in the instruction bulletin
- Upon power-up the AC Drive shall automatically test for valid operation of memory, option module, loss of analogue reference input, loss of communication, DC to DC power supply, control power and the pre-charge circuit.

- The Power Converter shall be protected against short circuits, between output phases and ground and the logic and analogue outputs.
- The AC drive shall have a minimum AC under voltage power loss ride-through of 200 msec.
- The AC drive shall have a selectable ride through function that will allow the logic to maintain control for a minimum of one second without faulting.
- The deceleration mode of the AC drive shall be programmable for normal and error conditions. The stop modes shall include freewheel stop, fast stop.
- Upon loss of the analogue process follower reference signal, the AC Drive shall error and/or operates at a user-defined speed set by a software programmed speed settings or last speed.
- The AC Drive shall integrate a protection against IGBT modules over-temperature that is different to the heat sink over-heat.
- The AC drive shall have solid state thermal protection that is UL Listed and meets UL 508C as a Class 20 overload protection and meets IEC 947.
- The AC drive shall have a motor thermal memory retention.
- The AC Drive should be able to protect the motor when PTC probes are connected.
- The AC Drive should be able to manage different types of probes such as PT100, PT1000, KTY.
- The AC drive should be able to limit the motor surge (I dv/dt) at twice the DC bus voltage
- The AC drive shall display all faults in plain text and help screens shall be available to guide the user in the troubleshooting. Codes are not acceptable.

Communications

The AC drive shall provide as standard one embedded Modbus port and one embedded Ethernet, Modbus TCP port. The AC drive shall have the capability to host additional communication card. The following protocols shall be the minimum available:

- Profibus DP V2, 1 port, SUB-D9.
- Profinet , 1 port , RJ45.
- Device Net , 1 port , , terminal 5points.
- Ethernet IP / modbus TCP, RJ45. Dual port.

Graphic display terminal

The AC drive shall provide a detachable graphic display terminal

- Keypad designed for harsh conditions IP65
- Keypad with a graphic display.
- Remote mounting shall be possible at a distance of 10m.
- The display should have a coloured red back-light when an event occurs.

The programming terminal shall be able to display a chart relative to energy efficiency and energy management.
VFD should have provision to plot actual pump curve received from pump manufacturer
The programming terminal shall be able to display the “efficient” set point for pump based on pump characteristics.
The programming terminal shall be able to display the “pump monitoring” data.
The AC Drive shall have self-diagnostic capabilities to display errors or warnings as they occur and be able to store at least 15 last errors into the error memory including.

Functions dedicated to pump applications

Pump Control & Monitoring Functions

- The AC Drive should be compliant with centrifugal pump characteristicsand configurations.
- The AC Drive should provide a pump monitoring function in order to define data relevant for pump (acceleration, low speed, high speed...)
- The AC Drive should provide a Application Unitsfunction in order to define units used in applications

Pump Protection Functions

- The AC Drive should provide an Anti-Jamfunction in order to remove automatically clogging substances from the pump impellers.

- The AC Drive should provide a Pipe Cleaning function in order to start pump regularly to avoid sedimentation in pump impeller
- The AC Drive should provide a Cavitation Pump Protection
- The AC Drive should provide a Inlet protection in order to avoid system dry running system.
- The AC Drive should provide a Pump Cyclic Start Protection in order to protect of the pump against too many restarts in a dedicated time period.

Application control functions

- The AC Drive should provide a Stop and Go function in order toreduce consumption of AC drive in case of pump doesn't work
- The AC Drive should provide a pulse input in order to connect a flow meter.
- The AC Drive should provide a Process control (PID)function in order to maintain a process at a given pressure or flow reference in the water network.
- The AC Drive should provide a Flow limitation function in order to allow limiting the consumption of water especially in countries with local regulations.
- The AC Drive should provide a Friction loss compensation function in order to compensate pressure losses over pipes due to friction.
- The AC Drive should provide a Pipe Fill function in order to manage a smooth control during pipe filling also prevents hammer effect.
- The AC Drive should provide a Sleep wake-up function in order to manage periods of the application where water demand is low and where it is not needed to keep main pumps running.
- The AC Drive should provide a Jockey pump controlfunction in order to start a jockey pump, during sleep period, to maintain emergency service pressure or answer a low water demand.
- The AC Drive should provide a Sensor management in order to define how will be used drive inputs to manage Pressure sensor or flow sensor

Application protection functions

- The AC Drive should provide a High flow protectionfunction in order to preserve the pipe or detect running outside normal working area
- The AC Drive should provide an Outlet pressure protection function in order to fix minimum and maximum pressure.

Pump monitoring

- The AC Drive should provide a Storage of the pump characteristics
- The AC Drive should provide a best efficiency points (BEP) function in order to run in optimum conditions and detect deviation from this point.

Advanced functions

- The AC Drive should provide a Scheduler based on Real Time Clock.
- The AC Drive should provide an Energy management
- The AC Drive should provide a Data logging function in order to keep files ready for maintenance or user.
- The AC Drive should provide information related to the instantaneous consumption of the machine
- The AC Drive should provide information related to the evolution of machine consumption during the time.
- The AC Drive should provide information related to Energy management through different channels such as : Web Server ,Keypad, Facet for Scada architecture ,communication networks.
- The AC Drive should provide a Real Time Clock management with embedded battery.

- The AC Drive should provide output power estimation below 5 % of accuracy.

9. Technical Specification of Industrial Grade Display System for Local Control Room (L.C.S./ M.C.S) i.e. 65" Industrial Grade LED Monitor

Qualification Requirements

- The OEM should be present in India with own manufacturing facility from minimum 5 years.

- The OEM should have service centers spread all over India.
- LED display should be BIS approved

Group	Specification Item	Detailed Specification	Remarks
System	**Display wall**	**PANELS OF 65" DIAGONAL IN A (1) X (1) CONFIGURATION COMPLETE WITH STANDARD WALL MOUNT**	
	Display technology	Liquid Crystal Display	
	Display size and resolution	The diagonal size of each display unit/ module shall be 65" with a native resolution of at least 1920x1080 pixels	
	Light source	LED	
	Brightness	360 Cd/m2	
	Color	1.07 Billion	
	Response time	8ms	
	Viewing angle	H:178° V:178°	
	Contrast ratio	should be minimum 4000:1	
	Architecture	The control box and power supply should be in the same housing to ensure quick swapping of module for repair with minimum downtime	
Signal Interface	**Input terminals**	• HDMI IN X1 • DVI INX1 • VGA IN X1 • PC Audio –In X1 • YPBPR IN(BNC)X1 • AV INPUT X4 • Audio IN (RCA)X1USBX2 • Video Out BNC X1 • Audio Out (RCA)X1	
User controls	**Power control:**	1 AC power ON/OFF switch	
	Wire control:	RS232C/ RS422 input	
Electrical	**AC power input range**	100 V ~ 240 V, 50-60 Hz.	
	Power consumption	Normal operating should be <270 W	
	Life Time	50,000 hours	

10. Technical specifications for Instruments and Cabling

A)-Electromagnetic Type Flowmeter

➢ **SPECIFICATIONS OF ELECTRO MAGNETIC FLOW METER**

Electrical

Power Supply : 24 VDC
Option : 90 V AC to 265 V AC, 50/60 Hz
Power consumption : 35 W (max.)
Output : a) 4-20 mA Isolated (Max. Load 800 Ohms).
b) 2 SPDT Relay. Programmable relay function Max. rating 2A at 230 Vac for non-inductive Load.

c) Pulse output: 24 VDC Pulse Isolated (min. Load 150 Ohms) Option Frequency output of 0 to 1 KHz full scale

Accuracy	: ± 1% of flow rate
Repeatability	: ± 0.1 % of F.S.D
Time constant	: 0.8 to 8 seconds adjustable
Minimum conductivity	: 0.5 μ /cm (Micro Siemens/centimeter)
Input impedance	: 10 giga ohms
Full scale velocity	: 0.5 m/s to 10 m/s
Display	: 16 x 2 Alphanumeric LCD, in multiple -Engg. units
Data Entry	: 2 Hall Effect Switches
Flow data	: Bi-directional Flow with separate totalizers for forward and reverse flow
	: Empty Pipe Detection with Low Flow Cut off
Diagnostics	: Built in with Data retention in case of power failure. Password protection

Enclosure

Housing material	: Cast Aluminum
Paint	: Polyurethane
Cable entry	: M 16 (3 No.) suitable for cable diameter from 4.5 mm to 10mm
Controller mounting	: Integral with sensor or Wall mounted
Ambient Temperature	: - 20 deg. C to + 60 deg. C
Protection	: IP 67

Sensor

Nominal Bore	: 10 NB to 600 NB
Meter Lining	: Rubber
Electrode Material	: SS 316
Metering pipe Flanges	: Low carbon steel, ASA 150 # flanges
Metering Pipe Material	: SS 304
Sensor Body Material	: Sheet Steel
Protection	: IP 68
Process Temperature	: + 80 deg. C
Process Pressure	: Up to Size 200 NB: 16 bars Sizes above 200 NB: 10 bar
Certification	: CE certified, RoHS from DNV & FM approval FM Certified

B) - Technical specification of Smart Pressure transmitter

- Range as per site requirement

✓ Working Principle	:	Micro - Capacitance Silicon sensor
✓ Type	:	Smart Microprocessor based, 2 wires
✓ Output	:	4 – 20 mA DC with Digital Communication (HART protocol)
✓ Power Supply	:	10.5 – 45 V DC
✓ Field Communication	:	Adjustment through push buttons on LCD" or Hand-Held HART Calibrator OR Remotely by PC Possible
✓ Span & Zero Adjustment	:	Local & Remote
✓ Accuracy	:	0.065 % of calibrated Span
✓ Drift / Stability	:	±0.1 % of URL for 10 years
✓ Ambient Temp	:	- 40^{o}C to 85^{o}C
✓ Process Temp. Limits	:	- 40^{o}C to 100^{o}C

✓ Humidity	:	0 to 100 % RH
✓ Load Impedance	:	577 ohm at 24 V DC
✓ Diagnostic	:	Self indicating feature
✓ Supply voltage effect	:	Less Than 0.005% of calibration span per volts
✓ Temperature effect	:	Less than ± 0.05% of span per 100 C
✓ Zero Elevation & suppress span	:	Anywhere within the range limits maintaining min allowable
✓ Turn on time	:	Less Than 10 sec
✓ Damping	:	0.06 to 32 sec (configurable)
✓ Vibration effect	:	Better than ± 0.2 % of span per g at 200 Hz in any axis
✓ Response Time	:	Less Than 150 msec
✓ Over Range Pressure	:	Capable of withstanding over pressure up to 3 Times
✓ Update Time	:	Better than 50 msec
✓ Housing	:	Die cast aluminium alloy finished with polyester coating
✓ Protection class	:	IP 67
✓ Wetted Parts	:	SS 316
✓ Flange material	:	SS 316
✓ Diaphragm material	:	SS 316L
✓ Process Connection	:	G ½" male
✓ Electrical connection	:	½ NPT
✓ Mounting Brackets	:	Provided (SS)
✓ Turndown Ratio	:	100: 1

C)- Technical specification of sub soil water level transmitter for Submersible Pump

The "Hydro bar" series are submersible level transmitters with a cable to measure the level in water works, deep wells, underground tanks, concrete bunkers, etc.

All transmitters are fully temperature compensated and are equipped with strong flush mounted diaphragms which are laser welded, this results imperfect long-term stability.

Measuring ranges	: 0.1 bar to 10 bar
Output signal	: 4-20 mA, 2-wire
Adjustment	: Zero and span internally (not for FR type)
Overall accuracy	: 0,2% of adjusted span, temperature compensated
Power supply	: 13 to 40 V DC
Electrical connection	: M20 x1.5
External load (max.)	: 550 Ohm/24 V to 1400 Ohm/40 V DC
Protection grade	: IP68 (cable/SS tube) IP66 (electr. housing)
Process temperature	: -10°C to +70°C
Temperature sensitivity	: +/- 0,015%/K
Wetted parts	: AISI 316L (standard)
Material cable	: Polyethylene (PE)
Measuring sensor	: SS 316 with strong diaphragm for long life & long term stability (<0.1%/year)
Certification	: ISO 9001-2008, Bureau Veritas & DNV

D) - Technical Specification of Radar Type Level Transmitter for Over Head Tank

A **Radar** type level transmitter is being specified for continuous monitoring of the water level at the LCS & MCS and for the logical operation of the pumps based on water level at the overhead tank/Bore well.

- **F U N C T I O N A L / P H Y S I C A L**

Type: 6" horn configuration
Measurement: Pulse burst radar @ 26 GHz
Measured Variable: Level, determined by the time-of-flight of radar pulse reflections
Span: 15 inches to 40 feet (380 mm to 12.2 m) measured from threads
Output: 4 to 20 mA with HART: 3.8 mA to 20.5 mA useable (per NAMUR NE43)
Resolution: Analog 0.01 mA
Loop Resistance: 591 ohms @ 24 VDC and 22 mA
Diagnostic Alarm Selectable: 3.6 mA, 22 mA **(meets requirements of NAMUR NE 43)**, or HOLD last output
Diagnostic Indication Meets requirements of NAMUR NE107
Damping Adjustable: 0-45
Keypad: 4-button menu-driven data entry
Display Display:2-line 16-character display
Digital Communication HART Version 7–with Field Communicator, AMS, or FDT
DTM (PACT ware™), EDDL
Power (Measured at instrument terminals) HART: General Purpose (Weather proof)/Intrinsically Safe/Explosion-proof: 11 VDC minimum
Housing Material: IP67/die-cast aluminum A413 (<0.6% copper)
Cable Entry 1⁄2" NPT
SIL 1 Hardware (Safety Integrity Level):
Functional Safety to SIL 1 in accordance with IEC 61508

- **E N V I R O N M E N T**

Operating Temperature with LCD viewable: -20° to +70° C
Electromagnetic Compatibility Meets CE requirement Meets CE Requirements: EN 50081-2, EN 50082-2
Surge Protection: Meets CE Requirements: EN 61326 (1000 volts)
Shock/Vibration: ANSI/ISA-S71.03 Class SA1 (Shock); ANSI/ISA-S71.03 Class VC2 (Vibration)
Reference Conditions: Reflection from ideal reflector at +20° C
Linearity: ±0.3 inch (8 mm) or 0.1% of tank height (whichever is greater)
Measured Error ±0.3 inch (8 mm) or 0.1% of tank height (whichever is greater)
Resolution: 0.1 inch or 2.5mm
Repeatability: ±0.2 inch (5 mm) or 0.05% of tank height (whichever is greater)
Response Time: <2 seconds (configuration dependent)
Initialization Time :< 30 seconds
Ambient Temperature Effect: 0.05% per 10° C

E) - SMART Energy Meter

Sr. No.	Description	Specification
1	Type	True RMS, Microcontroller based design, 2W 1? ? 4W/3 ? 3W Balance & unbalanced operation
2	Accuracy class	1/ 0.5

3	Cut out size	92 x 92 mm Bezel: 96 x96 x mm
4	Suitable for	Multi parameter monitoring
5	Display	Seven Segment display
6	Casing	Compact 96 x 96 DIN enclosure
7	Key Pad	4 Functional keys to scroll through display pages for system values and programming parameter.
8	Auxiliary Supply	100-240V AC 50 Hz /110-240V DC
9	Voltage Input	Up to 480V (field configurable)
10	Current rating	5A or 1A AC (field configurable)
11	CT overload capacity	4000% of rating for 1 sec., 2000% for 4 sec., 120% continuous
12	Operating P.F.	ZERO LAG to UNITY to ZERO LEAD
13	Communication	RS 485 output port Standard MODBUS for all power parameters including harmonics. It should be possible to monitor real time vector chart using software.
14	Operating Temperature	0 to 55OC
15	Storage temperature	-200C to +700C
16	Humidity	90% RH, non-Condensing

F)-Actuator:

All Sluice valve along with motorized Actuators as per "Schedule -G" shall be supplied by the Tenderer. The installation of Sluice valves with actuators is responsibility of the SCADA Vendor.

- All the valves shall be operated by an electro mechanical actuator, comprising of motorized gear train and screw assembly which drives the valve stem. The actuator shall be supplied with the following accessories.
- 3 phases, 415 V, + 10%, 50 Hz. + 5%, A.C. squirrel cage induction motor.
- Reduction gear unit.
- Torque switch mechanism complete with set of torque switches.
- Limit switch mechanism complete with set of limit switches.
- Hand wheel for manual operation.
- Hand-auto changeover lever with suitable locking arrangement.
- Local control switch / push buttons.
- The actuator shall be suitable for operation in the climate conditions and power supply conditions given in the specification. The actuator shall be capable of producing not less than 1½ time the maximum required torque and shall be suitable for at least 15 minutes continuous operation.
- Inbuilt Starter for actuator and positioning card shall be provided .

Valve operational requirements:

- The operation of valves must be sequential w.r.t the pump operation. As the pump starts, the valve shall start to open and reach 70% opening (identified by a limit switch) only after the complete pressure / full pump speed is reached, does the valve open 100%; the operation of this valve shall be based on time sequence w.r.t start time of respective pump.

Actuator Specifications

Sr. No.	Description	Specification
1	Type	Three phase rotary / linear, multiturn /quarter turn /single phase

2	Enclosure	Standard/Flameproof version
3	Output speed	10-426 RPM
4	Output torque max.	30 MKG
5	Locking system	Self-locking
6	Drive kW/HP	0.75/1 to 2.2/3
7	Drive Speed	1500/3000
8	Maximum Axial Thrust Capacity	12000 kgs or as per actual calculation
9	Output shaft designs	As per DIN 3210
10	Mechanical stopper	Adjustable
11	Coupling to suit	Sluice valves, dampers
12	Gear reduction ratio	100:1 (max)
13	Type of gear box	Spur gear/worm gear
14	Supply Conditions	
	a. Rated voltage	415 V AC ± 10% ,220 v for single phase type
	b. Rated frequency	50 Hz ± 5%
	c. Combined variation	± 10%
	d. NO. of Phases	3 Phase (4 wire) /2 phase
15	Reference Standards	I. S. 325, IEC34, VDE 0530,BS 2613
16	Type of motor	TEFC (Totally Enclosed Fan Cooled, Squirrel cage, induction.) / TESC (Totally Enclosed Surface Cooled) for IP 67 / 68
17	Drive Frame Size	80/90
18	Rotor Class	KL 60
19	Protection	IP 67 as per IS 13947 Part I 1993
20	Class of Insulation	Class 'F' with temperature rise restricted to class 'B'
21	Duty cycle	As per IS 325 - S1 continuous (S4 – Modulating as a special case) OR (S2 - 15 / 30 min as a special case.)
22	Method of starting	Inbuilt starter
23	Reference ambient temp	50° C
24	Motor paint	corrosion proof epoxy resin paint
25	Motor duty	S1 Duty motor suitable for
		3 Nos. of consecutive starts in hot condition
		8 Nos. of starts distributed over 15 minutes
26	Travel Switches	1 NO + 1 NC
27	Micro Switch	
	a. Torque Switches	1 NO + 1NC
	b. Travel / Torque Switches	2 NO + 2 NC

Actuator Panels

- wall mounting type
- non-compartmentalized
- dust and vermin proof, IP 66 protection
- 1.5mm CRCA sheet, powder coated with Siemens grey shade, 2mm CRCA sheet door
- Mounting plate 2.5mm CRCA sheet
- 415 V , 50 Hz
- size 500mm(W) x 700 mm(H) x 250 mm (D)
- single door, bottom gland plate, earthing terminal

➢ Isolation Transformer

- Primary: 0-380V-440V-470V
- Secondary: 0-230V
- Capacity: 300 VA
  Insulation: 2.5 Kv
- Rated Temperature: 55 deg. C
- Frequency: 50 Hz, with required DIN rail mounted glass fuse type 4 sq. mm screw terminals and with extended bottom mounting angle; in output side to provide wago make push in type terminals 4 sq mm rating.

G)-Uninterruptible Power Supply (UPS) with 45 minutes batteries backup on full load (as per site requirement)

➢ Technical Specifications

Input	Nominal Voltage		200/208/220/230/240 Vac (single phase)
	Voltage Range		100 ~ 300Vac (full load) *
	Current Harmonic Distortion		<5%(full load)
	Power Factor		>0.99(full load)
	Frequency		40 ~ 70Hz
	Electrical Connection		Terminal block
Output	Voltage		200/208/220/230(default)/240 Vac (single phase)
	Voltage Harmonic Distortion		≤ 2% (linear load)
	Voltage Regulation		±1%(static); ± 2% (typical)
	Frequency		50or60 ± 0.05Hz
	Overload Capability		106 ~ 110%:10 minutes; 111~ 125%:5minutes;126 ~150%:30seconds
	Electrical Connection		Terminal block
	Crest Factor		3:1
Battery & Charger	Nominal Voltage		192VDC 240VDC
	Charger Current		Standard Charger (Built-in): 4A (adjustable) Extended Charger Internal: 4A (maximum) and External: In steps of 4A
	Electrical Connection		Delta standard cable
Display	LED		AC input, Battery, Bypass, Fault
	LCD(Multi-Language)		Input/Output/Bypass (voltage, frequency), Loading and battery level, Remaining runtime Abnormal message and intelligent self-diagnosis
Interface	Standard		RS232 x1, SNMP slotx1, Smart slot x1, Parallel portx1
	Management Peripherals	SNMPS lot	SNMP card, Mod bus card, Relay I/O control card, Enviro Probe, SNMP hub
		Smart Slot	Mini SNMP card, Mini Mod Bus card, Mini relay I/O control card, USB card, TVSS card
Conformance	Safety		CE, TUV, EN62040-1-1
	EMC		CISPR22 Class A, EN50091-2, IEC 61000
	Parallel Redundancy		1+1redundancy
	Remote Control		REPO (Remote Emergency Power Off); ROO (Remote On/Off)

Others	Common Battery Installation		Feasible
	Optional Accessories		Rail kit; Maintenance bypass box; External battery pack; Internal charger board; External charger box; External charger board; Dust filter
Overall	Efficiency	Online Mode	92%(full load)
		ECO Mode	96%(full load)
	Temperature		0 ~ 40°C
	Relative Humidity		0 ~ 95%(non-condensing)
	Audible Noise		54d BA(atone meter)

H) Control panel with HMI & switch gear-

- Control panel enclosure should be from CE/UL/TUV/CSA/LLOYDS REGISTER certified, Make- Rittal only
- Drawing and test report should be submitted with panels.
- MCCB should be at least 25KA capacities.
- Type 2 coordination should be followed
- Dimension shall be min 600mm (W)x1600mm(H)x500mm (D)
- Enclosure must be IP54
- Sealing gasket must be Neoprene (liquid foam must not be used)
- Mounting plate must be 3mm in thickness
- 1.5mm CRCA sheet, powder coated with Siemens grey shade, 2mm CRCA sheet door Mounting plate 2.5mm CRCA sheet
- Panel should be modular construction type on a frame which should be having 9-fold profile.
- Mounting plate should be adjustable & removable
- Bottom gland plate shall be in three parts
- Locking system must be three-point locking type

➢ **HMI Specification**

- Minimum 7" wide 800X480 Pixel LCD display with back-lit to display.
- In built Ethernet, USB miniport, USB type A for report generation, data lodging, 485 Port embedded.
- 64000 colors
- Luminance :450cd/m^2
- Real Time Clock
- Front panel: IP65
- Touch Screen
- Facility to connect printer directly
- Serial and parallel printing option
- Make: -Proface /Schneider/Allen Bradley/ABB

I: -Technical Specification of Desktop / PC FOR LCS

Processor: 10th Generation Intel® Core™ i5-6500 processor (8MB Cache, up to 4.60 GHz)

or

Processor: 10th Generation Intel® Core™ i7-6500 processor (6MB Cache, up to 4.20 GHz)

Common Specs

Operating System: Windows 10 Professional 64bit English
Monitor: 32" LED
Memory: 4GB, DDR4, 2133MHz
Hard Drive: 1TB 7200 rpm Hard Drive
Video Card: Intel® HD Graphics 510 with shared graphics memory (for i3 Desktop)
Intel® HD Graphics 530 with shared graphics memory (for i5 Desktop)
Optical Drive: Tray load DVD Drive (Reads and Writes to DVD/CD)
Data transfer rates up to 3,600 KB/s (CD read/write)
Data transfer rates up to 10,800 KB/s (DVD read/write)
Ports & Slots

1. Power on button
2. Audio in & Audio Out Jack
3. (2) USB 3.0 ports,
4. Tray Load Optical drive
5. Air vent
6. Line in/out and microphone port
7. VGA port
8. DVI port
9. (4) USB 2.0 ports
10. Expansion card slots
11. Power supply unit
12. Network port

Wireless: 802.11n + Bluetooth 4.0, M.2, 1x1
Networking
Interface: M.2
Transmission standards: 802.11 b/g/n
Single band: 2.4 GHz
LAN: 1000BASE-T
Technology: Realtek RTL8161
Data transfer speeds: up to 10/100/1000 Mb/s
Transmission standards: 1000BASE-T Ethernet
Power: 65W External Power Adapter, 180W Internal PSU

11. Specification of Modular Control Desk for LCS-

Bidder should refer the control desk design for any clarification of items.
Bidder should submit the below certificates / documents at the time of BID submission for Console Manufacturer, in light of absence of the documents BID can be rejected.

a) ANSI / BIFMA Certificate for Consoles
b) ISO 9001 & ISO 14001 Certificates
c) Green Guard GOLD Certificate for low emissions

- **Structure**

Console System must be of modular design. The Console design shall address the functional, ergonomic and aesthetic requirements of the particular working environment while complying with accepted human factor design and ergonomic standards for viewing distance, angle, keyboard height, and knee space requirements.

- Standard top height of modular control desk shall be 750 mm. The Console Table Top / Working Surface should be made of25mm MDF Board with 1mm Laminate to be wrapped around the Table top. Drawing is enclosed.

- Size of modular control desks shall be as per seating capacity of 2 Persons and 4 persons and it should have arrangement for placing their workstations below the desk on the Bottom Tray of the Control Desk.
- The Basic Structure should consist of Extruded AL Profiles (6063T6 grade) binded by Top & Bottom (min 2mm) MS Frames formed in such a way as to provide maximum buckling and torsion resistance. The Front & Back Panels should be openable / removable (with Push Lock Mechanism) made of laminated MDF Board in min thickness of 18mm. The Side Panels should be fixed type, made in 26mm MDF Board Claded on 18mm MDF Board. All panels must be attached to the frame with concealed fasteners. Console access panels (Front & Rear Panels) must be removable without the use of tools. The Front panel should be positioned in such a way that there should be sufficient leg space (min of 400mm from the front edge of the Table Top).
- All sheet metal / aluminum parts must be finished with electrostatic powder coating with average of min 80 microns over all surfaces.
- The console frame shall have provisions for leveler legs to be incorporated into the frame.

➢ **Work Surface**

The Console Table Top should be made of 25mm MDF Board with wrapped around Laminate, with no sharp Edges. The work surface platform shall have smooth edges and transitions, thus avoiding sharp corners or potential rib catchers for operator safety.

➢ **Modular Rear Wall (Slat Wall)**

- Wall should be of min 86 mm (Height) and approx. 200-300 mm high from the Monitor Base.
- Modular walls shall be made of 2mm thick Extruded Aluminum (6063T6 aluminum alloy).
- It should have high Load bearing capacity. Minimum weight carrying capacity has to be 20 KGs per Meter.

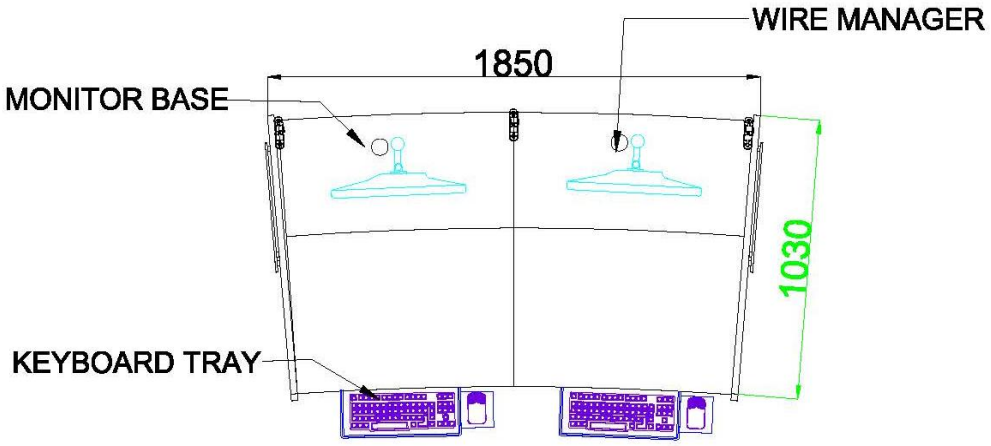
➢ **Monitor Arms**

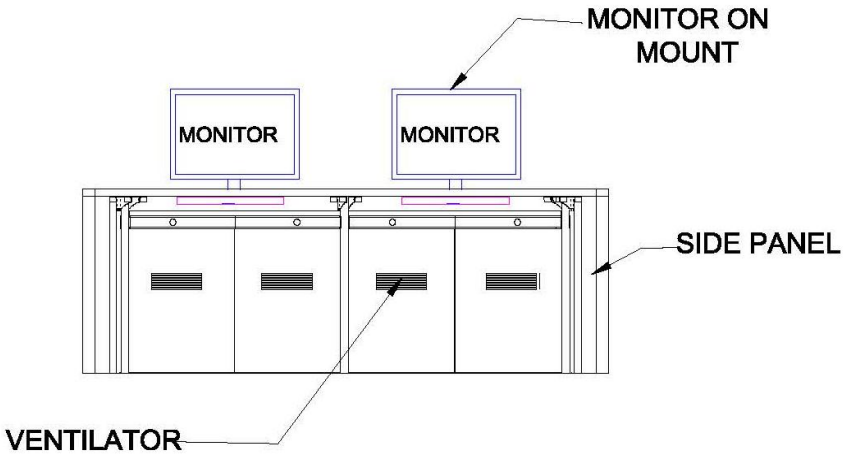
- It shall be capable for mounting all type of existing LCD monitor with dimensions between 17" to 27" using suitable adopter/additional base plate, if required any.
- Vendor shall provide the suitable adopter/additional base plate for mounting the existing LCD monitors.
- It shall allow the rotate/ tilt/ raise/the monitors as well as fix their adjustment.
- The monitor arm should be Articulating monitor arm

➢ **Miscellaneous: -**

- There shall be a closed cabinet below the modular control desk for placing of CPU. Cabinet should have proper cooling system. CPU needs to be accessible from front as well as rear side of control desk for easy working and maintenance.
- The cabinet shutters shall be of Butt Hinged type with 18mm thick MDF.
- Rear shutters of each console should have provision of Airflow opening for cooling and heat dissipation effect.
- Rear panel shall have ventilation fans mounted on it.
- It shall have proper arrangement for flow of cables i.e. LAN Cable, Power cable, VGA cable, Mouse cable, Keyboard etc.
- Design of control desk shall allow cables from the floor cable channel.
- Control desk shall be equipped with individual power distribution unit (PDU) (06 no for one Modular Control Desk**)** and capable of being switched on/off individually. Power supply socket should be dual type i.e. Universal type.
- All bolts must be of SS material to avoid rust due to environment.

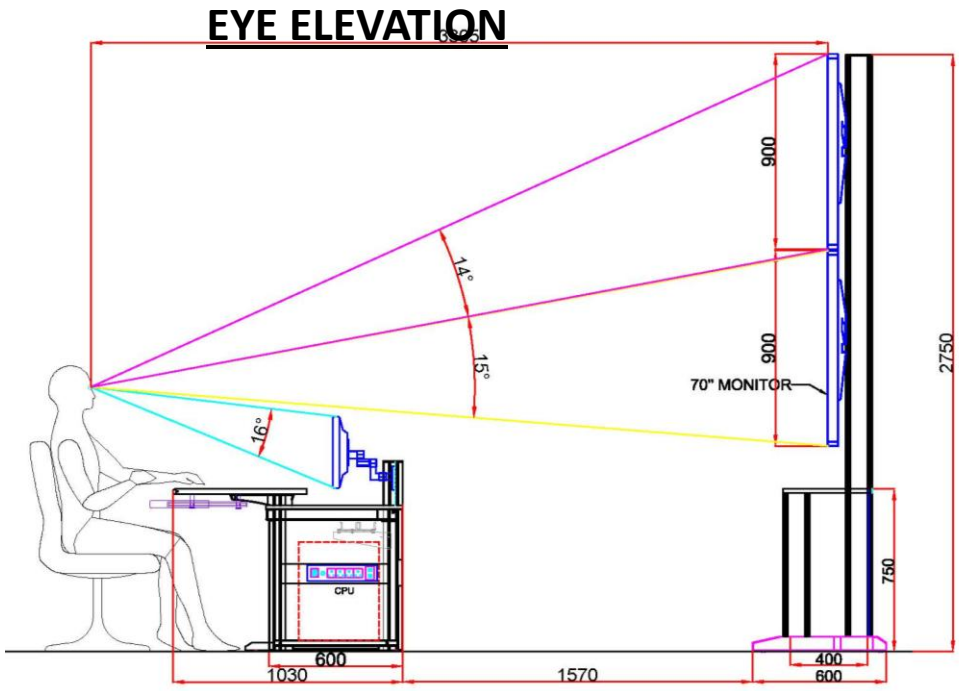
PROSPECTIVE VIEW OF CONTROL DESK WITH 2 WORKS –STATION FOR VIDEO WALL CUBES (MCS) OR LCD MONITORS (LCS) ARE





MONITOR WALL AS PER SITE REQUIRED MATRIX OPTION-1

H x W x D = 750mm X 6400mm X 600mm



MONITOR WALL AS PER SITE REQUIRED MATRIX

H x W x D = 750mm X 6400mm X 600mm

Construction

a) Extruded AL Profile structure with MS (2mm) Top & Bottom Frame.
b) Laminated 18mm (±1mm) MDF Board Side Panels (Fixed Side Panels) & Laminated 18mm (±1mm) MDF Board Based Front & Back Modesty (Removable Front & Back Modesty through Lock).
c) Table Top in Laminated 18mm (±1mm) MDF Board.
d) Both Horizontal & Vertical Managers - For routing Lan & Power Cables within the desk.
e) Power Distribution Sockets - within the desk for Powering of Active Devices.
f) Adequate space for CPUs & Other equipment placed with in the desk.

- **Work Station Chairs**

- Medium back rest ergonomically designed revolving chairs.
- The chair should have a hydraulic gas for seat height adjustment.
- Adjustable PU Arms
- The seat and back Net Tapestry
- The chair base should be of nylon material

J: - Cable

- Following types of cables shall be supplied, laid and terminated as per instructions provided.
- Copper 1.5Sq.mm control cables from REMOTE TERMINAL UNIT panel to field sensors.
- Control cables for Aux. Supply to transducers
- GSM/GPRS cable between MCS/REMOTE TERMINAL UNIT and modems
- Any other cables required for the job.
- Control cables shall be of 1100 Volts grade, Tinned annealed electrolytic solid copper conductor, PVC insulated, extruded PVC inner sheathed, and overall PVC sheathed conforming to IS1554-I/1988.
- Communication cable if used anywhere shall be twisted pair multi-core 1.0 Sq mm, Braided &Aluminum Foil Shielded & Screened as per Belden standards.

12. Technical specification of Equipment's for 24x7 Water Supply Distribution Network

Actuator Operated Isolation Valves

Electric Actuator

The actuators shall be suitable for use on a nominal volt phase Hz power supply and are to incorporate motor, integral reversing starter, local control facilities and terminals for remote control and indication connections housed within a self-contained, sealed enclosure.

In order to maintain the integrity of the enclosure, setting of the torque levels, position limits and configuration of the indication contacts etc. shall be carried out without the removal of any actuator covers over an Infrared interface. Sufficient commissioning tools shall be provided with the actuators and must meet the enclosure protection and certification levels of the actuators. Commissioning tools shall not form an integral part of the actuator and must be removable for secure storage/authorized release. In addition, provision shall be made for the protection of configured actuator settings by a means independent of access to the commissioning tool.

The actuator shall include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel irrespective of the connection sequence of the power supply.

Actuators shall be suitable for indoor and outdoor use. The actuator shall be capable of functioning in an ambient temperature ranging from 15 to 45 degree C, up to 100% relative humidity.

Actuators for hazardous area applications shall meet the area classification, gas group and surface temperature requirements specified in data sheet.

Actuator sizing

The actuator shall be sized to guarantee valve closure at the specified differential pressure and temperature. The safety margin of motor power available for seating and unseating the valve shall be sufficient to ensure torque switch trip at maximum valve torque with the supply voltage 10% below nominal. For linear operating valves, the operating speed shall be such as to give valve closing and opening at approximately 10-12 inches per minute unless otherwise stated. For 90□ valve types the operating time should be specified.

Enclosure

Actuators shall be 0-ring sealed, watertight to /IP68 7m for 72hrs, NEMA 4, 6. The motor and all other internal electrical elements of the actuator shall be protected from ingress of moisture and dust when the terminal cover is removed for site for cabling, the terminal compartment having the same ingress protection rating as the actuator with the terminal cover removed.

Enclosure must allow for temporary site storage without the need for electrical supply connection.

All external fasteners shall be zinc plated stainless steel. The use of unplated stainless steel or steel fasteners is not permitted.

Motor

The motor shall an integral part of the actuator, designed specifically for valve actuator applications. It shall be a low inertia high torque design, class F insulated with a class B temperature rise giving a time

rating of 15 minutes at 40°C(104°F) at an average load of at least 33% of maximum valve torque. Temperature shall be limited by thermostats embedded in the motor end windings and integrated into its control. Electrical and mechanical disconnection of the motor should be possible without draining the lubricant from the actuator gear case.

Motor protection

Protection shall be provided for the motor as follows:

- Stall - the motor shall be de-energized within 8 seconds in the event of a stall when attempting to unseat a jammed valve.
- Over temperature - thermostat will cause tripping of the motor. Auto-reset on cooling
- Single phasing - lost phase protection.
- Direction – phase rotation correction.

Gearing

The actuator gearing shall be totally enclosed in a oil-filled gear case suitable for operation at any angle. Grease lubrication is not permissible. All drive gearing and components must be of metal construction and incorporate a lost-motion hammer blow feature. For rising spindle valves the output shaft shall be hollow to accept a rising stem, and incorporate thrust bearings of the ball or roller type at the base of the actuator. The design should be such as to permit the opening of the gear case for inspection or disassembled without releasing the stem thrust or taking the valve out of service. For 90□ operating type of valves drive gearing shall be self-locking to prevent the valve back driving the actuator.

Hand operation

A handwheel shall be provided for emergency operation, engaged when the motor is declutched by a lever or similar means, the drive being restored to power automatically by starting the motor. The handwheel or selection lever shall not move on restoration of motor drive. Provision shall be made for the hand/auto selection lever to be locked in both hand and auto positions. It should be possible to select hand operation while the actuator is running or start the actuator motor while the hand/auto selection lever is locked in hand without damage to the drive train.

Clockwise operation of the hand wheel shall give closing movement of the valve unless otherwise stated in the data sheet. For linear valve types the actuator handwheel drive must be mechanically independent of the motor drive and should be such as to permit valve operation in a reasonable time with a manual force not exceeding 400N through stroke and 800N for seating/unseating of the valve.

Drive bushing

The actuator shall be furnished with a drive bushing easily detachable for machining to suit the valve stem or gearbox. input shaft. Normally the drive bush shall be positioned in a detachable base of the actuator. Thrust bearings, when housed in a separate thrust base should be of the sealed for lifetype.

Torque and turns limitation

Torque and turns limitation to be adjustable as follows:

- Position setting range – multi-turn: 2.5 to 100,000 turns, with resolution to 15 deg. of actuator output.
- Position setting range – direct drive part turn actuators: 90□ +/10□ , with resolution to 0.1 deg.

of actuator output.

- Torque setting: 40% to 100% rated torque.

Measurement of torque shall be from direct measurement of force at the output of the actuator. Methods of determining torque-using data derived from the motor such as motor speed, current, flux etc are not acceptable A means for automatic "torque switch bypass" to inhibit torque off during valve unseating and "latching" to prevent torque switch hammer under maintained or repeated control signals shall be provided.

The electrical circuit diagram of the actuator should not vary with valve type remaining identical regardless of whether the valve is to open or close on torque or position limit.

Remote valve position/actuator status indication.

Four contacts shall be provided which can be selected to indicate any position of the valve, Provision shall be made for the selection of a normally closed or open contact form. Contacts shall maintain and update position indication during handwheel operation when all external power to the actuator is isolated.

The contacts shall be rated at 5A, 250V AC, 30V DC.

As an alternative to providing valve position any of the four above contacts shall be selectable tosignal one of the following:

Valve opening, closing or moving

- Thermostat tripped, lost phase
- Motor tripped on torque in mid travel, motor stalled
- Remote selected Actuator being operated by handwheel
- Provision shall be made in the design for an additional 4 contacts having the same functionality.

Provision shall be made in the design for the addition of a contactless transmitter to give a 4-20mA analogue signal corresponding to valve travel for remote indication when required. The transmitter will auto range to the set limits

Local position indication

The actuator display shall include a dedicated numeric/symbol digital position indicator displaying valve position from fully open to fully closed in 1% increments. Valve closed and open positions shall be indicated by symbols showing valve position in relation to the pipework to ensure that valve status is clearly interpreted. With main power on the display shall be backlit to enhance contrast at low light levels and shall be legible from a distance of at least 6 feet (2m).

Red, green, and yellow lights corresponding to open, closed, and intermediate valve positions shall be included on the actuator display when power is switched on. The digital display shall be maintained and updated during handwheel operation when all power to the actuator is isolated.

In addition, the actuator display shall include a separate text display element with a minimum of 32 characters to display operational, alarm and configuration status. The text display shall be selectable between English and/or Hindi. Provision shall be made to upload a different language without removal of any covers or using specialized tools not provided as standard with the actuator. Provision shall be made to orientate the actuator display through increments of 90 degres.

Local torque Indication:

The digital display shall be capable of indicating real time torque and valve position simultaneously, both being displayed in 1% increments of valve position and actuator rated torque. In addition torque

shall also be displayed in horizontal bar graph form.

Integral starter and transformer

The reversing starter, control transformer and local controls shall be integral with the valve actuator suitably housed to prevent breathing and condensation. The starter shall be suitable for 60 starts per hour and of rating appropriate to motor size. The controls supply transformer shall be fed from two of the incoming three phases and incorporate overload protection. It shall have the necessary tappings and be adequately rated to provide power for the following functions:

- Energization of the contactor coils.
- 24V DC output for remote controls.
- Supply for all the internal electrical circuits.

Local controls

The actuator shall incorporate local controls for Open, Close and Stop and a Local/Stop/Remote mode selector switch lockable in any one of the following three positions: local control only, stop (no electrical operation), remote control plus local stop only. It shall be possible to select maintained or non-maintained local control.

The local controls shall be arranged so that the direction of valve travel can be reversed without the necessity of stopping the actuator.

Provision shall be made to orientate the local controls through increments of 90 degree.

Control facilities

The necessary control, wiring and terminals shall be provided in the actuator for the following functions:

Open and close external interlocks to inhibit local and remote valve opening and/or closing control. It shall be possible to configure the interlocks to be active in remote control only.

Remote controls fed from an internal 24V DC supply and/or from an external supply between 20V and 120V AC or 20V and 60 V DC, to be suitable for any one or more of the following methods of control:

- ✓ Open, Close and Stop control.
- ✓ Open and Close maintained or “push to run” (inching)control.
- ✓ Overriding Emergency Shut-down to Close (or Open) valve from a normally closed or open contact.
- ✓ Two-wire control, energize to close (or open), de-energize to open (or close).

It shall be possible to reverse valve travel without the necessity of stopping the actuator. The motor starter shall be protected from excessive current surges during rapid travel reversal.

The internal circuits associated with the remote control and monitoring functions are to be designed to withstand simulated lightning impulses of up to 2kV.

Provision shall be made for operation by distributed control system utilizing the following network systems.

- Modbus
- Profibus
- Foundation Fieldbus
- Device Net

Monitoring facilities

Facilities shall be provided for monitoring actuator operation and availability as follows:

Monitor (availability) relay, having one change-over contact, the relay being energized from the control transformer will de-energise under any one or more the following conditions:

- Loss of main or customer 24V DC power supply
- Actuator control selected to local or stop
- Motor thermostat tripped
- Actuator internal fault

Where specified, provision shall be made for contacts to provide discreet indication of one or more of the following:

- Remote selected
- Thermostat trip
- Actuator fault

Actuator text display indication of the following status/alarms:

- Closed Limit, open limit, moving open, moving closed, stopped
- Torque trip closing, torque trip opening, stalled
- ESD active, interlock active
- Thermostat trip, phase lost, 24V supply lost, Local control failure
- Configuration error, Position sensor failure, Torque sensor failure
- Battery low, power loss inhibit

Integral data logger to record and store the following operational data:

- Opening last /average torque against position
- Closing last /average torque against position
- Opening motor starts against position
- Closing motor starts against position
- Total open/closed operations
- Maximum recorded opening and closing torque values
- Event recorder logging operational conditions (valve, control and actuator) The data logger shall record relevant time and date information for stored data.

Data logger data is to be accessed via non-intrusive IrDA communication. Sufficient standard intrinsically safe tools shall be provided for downloading data logger and actuator configuration files from the actuators and subsequent uploading to a PC. The actuator manufacturer shall supply PC software to enable data logger files to be viewed and analyzed.

Wiring and terminals

Internal wiring shall be tropical grade PVC insulated stranded cable of appropriate size for the control and 3- phase power. Each wire shall be clearly identified at each end. The terminals shall be embedded in a terminal block of high tracking resistance compound.

The terminal compartment shall be separated from the inner electrical components of the actuator by mean sofa watertight seal and shall be provided with a minimum of 2 threaded cable entries with provision for a maximum of 4.

All wiring supplied as part of the actuator to be contained within the main enclosure for physical and environmental protection. External conduit connections between components are not acceptable.

A durable terminal identification card showing plan of terminals shall be provided attached to the inside of the terminal box cover indicating:

- Serial number
- External voltage values
- Wiring diagram number
- Terminally out

The code card shall be suitable for the contractor to inscribe cable core identification alongside terminal numbers.

DIDF PN 1.0 rating having data communication feature with PLC SCADA and also transmit data along with controlling and monitoring of valve through M.C.S incorporated with integral Starter & gear box including DI tail pieces with EPDM fully covered wedge and epoxy coating internal and external etc complete. of followings Sizes- 110,150,200,250,300 mm Dia. As per site condition

Electromagnetic flow Meter with Battery (if required)

Electromagnetic flow Meter withpower connection and battery in case of power failure both data communication though GSM Module to PLC SCADA including pressure transducers fittings to facilitate the installation in remote places as specified in the specification of employer's requirements for different Dia. As per site condition.

Flow Control Valve (FCV)

a. The control valve shall be designed for flow control application for providing. Precise control over the flow rates/pressure range.
b. The body of the control valve shall design and hydro tested for the applicable pressure rating, considering the surge pressure as per previsions in BS-EN-12266---2013 or any other equivalent standard.
c. The control valves hall be design of cause minimum head loss. The calculation method confirming to ANSI/ISA-75.01.01-2007 (IS/IEC 60534-2-1 mod) for flow equation for sizing of flow control/pressure reducer valves shall be adopted. This approach allows valve from various manufacturers to be compared using the same approach, thus ensuring that the best valve its selected for the application. Fisher's control valve Handbook, latest international standards//publications may also be referred in the above context.
d. The seal at the seat ring should give leak tight assembly. The valve shall pass through seat leakage test as per ANSI FCI-70-2-2006 Class VI or any other equivalent standard.
e. Flange to flange (face to face) distance shall be as per ANSI B 16.1 EN 558-1 and flange end should be as per ANSI B-16.5 Class 150 and Class 300 / EN- 1092-2
f. The material of all component s of valve/internal working parts shall be corrosion resistance for chlorinated water.
g. Wherever capability with SCADA or RTU local PLC is required, digital communication port RS 232/485/ fiber optic having connectivity as per industry standard protocol should be provided (RTU shall be provided by the contractor and contractor shall also comply with the computability requirements)
h. Provision of Battery, operated option should be there in case of power failure.

A- Plunger type flow control /pressure reducer valve:

in additional to (a) to (h) above

1. Plunger valve shall be provided with electrical actuators having the control facility for intermediate valve positioning by connecting external signal.
2. The electric actuators shall be designed to provide the required torque for operations in the flow and pressure conditions of the water transfer system. Gear assembly shall provide as necessary.

3. The flow path with annual flow cross section in any open position shall be rotationally symmetric. The movement of piston. plunger by means of crank/shaft spindle drives shall be Axial/Linear along with irreversible worm gear box including position indicator.
4. The general design requirements of the valve, gear assembly and electric actuators described in the tender will be applicable to the flow control valves also.
5. A hand wheel shall be provided for plunger valves so that operations of the valve can be carried out when the power supply of valve has failed. The torque requirement at the hand wheel shall be such that one person can operate the valve. Hand wheel shall be positioned to give good access for operational personnel.
6. Hand wheel shall be provided with integral locking device to prevent operation by unauthorized persons.
7. A selector switch shall be provided on the actuator for remote/local/hand operation of the valve.

Material of construction for plunger type flow control valve.

Body (Globe type)	Ductile Iron GGG40 –DIN 1693 or EN-JS 1030
Plunger/Piston	Stainless Steel AISI-304/Gr 1.4301
Piston guides	Bronze welded overlay /SS
Shaft crank/spindle	Stainless steel AISI-420 Gr. 1.4021
Seat Ring	Stainless Steel AISI-316 Bronze
Seat (O-Ring/Quad ring)	Synthetic Rubber-Buna-N/EPDM (FDA/WRAS approved)
Bearing Bush	Bronze
Bolts	SS A4
Eye bolt for lifting	Galvanized steel –I 1.0401
Slotted cylinder /strainer	Stainless steel
Coating (both inside & outside)	Fusion Bonded Epoxy, Min-250 micro 9NSF/FDA/WRAS approval)

B- Diaphragm type flow control /Pressure reducing valves.

in additional to (a) to (h) above

1. Diaphragm type flow control/pressure reducing valve shall be single /double chambered self-actuated Automatic valve i.e. operated form line fluid pressure itself. For continuous regulation or any intermediate positioning, the control valves shall be provided with two solenoid valves with facility of connecting the external signal.
2. Commands/electric signals for positioning of the control valve (for SCADA compatibility) will be from RTU.
3. The “Diaphragm’ shall be of nylon fabric reinforce (NBR) synthetic elastomer-Buna-N/EPDM. The centre hole for the main valve stem must be sealed by vulcanisation. The stem shall fully guided at top and bottom to avoid any defection with a removable stem cap at tope.

4. The diaphragm must with stand a mulling Brust Test of a minimum 25 bar per layer of nylon fabric and shaft by cycle tested 100000 time to insure longevity.
5. The entire actuator assembly (Sea disk to top cover) shall be removable from the valve as an integral unit.
6. The internal valve component shall be accessible removal and repairable and repairable without removing the valve body from pipeline.
7. There valves should be of self-regulating type when power supply is not available.

Material of construction for plunger type flow control valve.

Body and cover (Globe type)	Ductile Iron ASTMA 536 or DIN 1693-GGG40
Diaphragm and Resilient seal disc	Flexible non-wicking nylon fabric reinforced synthetic elastomer- Bura-N/EPDM (FDA/WRAS approval)
Seat ring	Cast stainless steel ASTM-A 315 GR. CF8M/AISI 316, raised replaceable inline and outsite.
Stem	Stainless steel AISI-316, raised replaceable inline and outside.
Spring & Bearing bush	Stainless steel AISI-316
Disc guide, disc retainer & Diaphragm washer	Stainless steel AISI-304/316 Bronze & Coated steel
Seal	Synthetic Rubber-Buna-N/EPDM (FDA/WRAS approved)
Pilot	Body: Stainless steel, AISI-304/CF8 or Brass/Bronze Elastomer: NBR
Tubing	Stainless steel AISI-304/ copper
Nut-bolt & studs	Stainless steel AISI-304/ASTM 193 B7
Solenoid valve	Stainless steel AISI-316
Throttling plug	To have the linear flow 9non turbulent flow) if required V-Shape or U-shaped throttling plug may be provided.
Coating (Both inside & outside)	Fusion Bonded Epoxy, Min 250 micron (NSF/FDA/WRAS approved)

Flow Control Valve (FCV) with latching Solenoid PLC web-based controlling with data communication, hydraulically operated self-actuated flow control valve with downstream orifice having D.I. body, double

chamber united actuators, copper control tubing, fusion bonded epoxy coating suitable for drinking water of different Dia. as per site condition.

Pressure Transmitter Electricity operated and Battery operated in case of power failure(If required)

CE marked with following technical parameters and Interfacing with PLC module along with data communication with SCADA System including Mounting arrangement.
Output 4-20 mA / HART
Power supply - 24V DC
Display - 4" LED
Accuracy - +/- 0.1 % of full scale or better
Enclosure- IP 68
All arrangements Shall be in MS Fabricated Cabin/Enclosure Mounted on Ground or Wall as per site conditions.

Residual Chlorine Analyzer

Residual Chlorine Analyzer single parameter system ready to operate to measure free or total chlorine , Panel made of white PVC (hard foam core, 1100x350x13 mm) with mounting possibility, Pressure reducer, dosing valve for flow regulation, flow through armature, Optical flow measuring, Inlet and Outlet with 0.5" hose connection, Temp. 0-50 C, Single parameter controller with PID Controller , 2 current outputs, 3 relay outputs and RS 485 Interface, chlorine measuring sensor for free chlorine membrane covered sensor 0.01 - 2 mg/l , low ph dependency ph 4-9 , 0-50 C, 25 mm dia, 4-20 mA, connection cable 2m., 2-wire, 2 x stripped ends, tinned along with its required accessories for continuous operation and data communication arrangement with control room complete for all DMAs. All arrangements Shall be in MS Fabricated Cabin/Enclosure with IP 68 protectionMounted on Ground or Wall as per site conditions.

13. Service to be provided by the contractors:

The contractor shall take the responsibility for all the testing and inspection at manufactures works to be conducted in manner as specified in this specification.

Make of equipment's shall be finalise with the consent of the Engineer in charge.

Transportation of all equipment, packing for transporting in the specified way from the manufactures works to the project site inclusive of all intermediate handling.

Unloading of equipment and other material from truck at site, transporting and proper stacking at site in the approved way under security.

Opening of packages, checking, tallying out and inspection of equipment received at the site and lodging of insurance claims.

Taking delivery of equipment /materials from contractor's site stores/transportation at site and arrange for proper storage of equipment/material in approved way, pending erection.

Erection, inspection, testing, start up and running of the equipment and complete plant at rated capacity and speed.

Furnishing, all erection and commissioning, supervisor, service. The contractor shall also arrange for operation & maintenance of equipment during commissioning and trial run period.

The contractor shall also arrange technical experts of equipment's from proprietary supplier as and when felt necessary until the commissioning and trial run of the plant is completed

Water Supply Services shall include the operation, maintenance and repairs of all existing and new assets created for the proposed water supply system to deliver the services. computerized billing & distribution of bills, operating 24-hour consumer care Centre, consumer complaint redressal within specified time period etc.

Continuous Pressurized Water Supply means a continuous supply of water for 24 hours a day, at consumer meter point. Continuous supply and pressure to be measured at Critical Points in the zone from mid night to mid night.

Critical Points in the zone means the points on the distribution network at which the flow or pressure measuring devices would be installed which shall be mutually agreed by the Employer and the Contractor during the works contract.

Potable Water means water meeting the Water Quality as per the standards specified in IS 10500-1991.The following important parameters are to be checked, documented and ensured properly.

The bacteriological examination shall be carried out for one sample daily per 10,000 population as given in CPHEEO manual.

The minimum residual chlorine of 0.2 ppm shall be maintained continuously at the consumer end.

Nonrevenue Water (NRW) = System Input Volume (SI) –Billed Authorized Consumption (BC)

14. Technical Specification of Software - Smart Meter Billing Platform

Sl. No.	Module Name	Description
1	Meter consumption data syncing module	The Client should be able to view/download the water bill of the requested month. ● API will be called to fetch the meter information and readings of the meter for the requested month. ● Once the meter reading is fetched, logical calculation will be performed on the data keeping tax, penalty and discount factors under consideration. ● The bill is then generated using all the data. And the generated bill is then displayed on the User Interface as well as in a pdf format, which can later be downloaded or printed.
2	Communication Module	The Client should receive SMS regarding bill updates, payment status etc. ● Integration of SMS service with the system enables communication between a client and the business through robust APIs. ● After an operation has been performed, to send an sms to the client, his mobile number will be fetched from the database or synced from the API if not found. After fetching the mobile no. , the sms will then be delivered using the SMS service. ● SMS updates can be a due bill reminder.
3	Grievances Module	The Client should be able to add, view, reply or check the status of the grievances. and the Department will be notified upon the grievance ticket Department users can revert and check the history of the tickets.
4	Tariff Module	The Admin can manage the tariffs, tax and discount according to the customer category, sub-category, fixed, percentage and range. The updation will then be managed or saved in the respective Master table.
5	Mobile number change	Customer can request for mobile number change
6	Manual bill generation by admin	The Admin can generate bills manually for some cases where data was not synced or faulty data was present at the time of auto bill generation
7	Superset For analytics	The Admin can view/manage reports on the Apache Super Set. The client's meter readings can be used to perform analysis or generating reports, which can be viewed on Apache Super Set platform
8	Collect offline payment	The Admin can accept cash payment against a bill and

		new connection fee and can print the receipt.
9	Reports	System is supporting various reports : Bill generation report Faults in bill generation data (at the time of syncing the consumption data and bill generation) Stats related to syncing of consumption data
10	API rate limiting	To prevent some threats like Dos attack

Technical Specification of Electromagnetic AMR/ AMI Water Meters

A. Detailed Specification of Electromagnetic Smart API enabled AMR/ AMI Water Meters (DN15 to DN40)

Providing, Installing and Giving satisfactory field testing of domestic Battery operated, MID approved with minimum Dynamic ratio (Q3/Q1) of 500:1, Electromagnetic API enabled AMR/ AMIWater Meters from 15 mm to 40 mm having no moving part in contact with water, with fully body made up of composite material, confirming to ISO 4064 along with manufacturing test certificate and Guarantee certificate with Battery life 10 years with RF Technology for communication.

ITEM	SPECIFICATIONS
a) Measuring Principle	A battery operated inline non- Intrusive Electromagnetic AMR / AMI water meter with no moving parts.
b) Power Supply	Power-Supply-Battery operation for complete meter including AMR/ AMI with battery life of more than 10 years to ensure recording at all times
c) Meter Lifetime	More than10 years
d) Protection Class	Must comply to IP68 Standard for indoor and outdoor operation, including fully submerged installations
e) Approvals and certifications	The meter should be type approved and verified according to international water meter Standard OIML R 49 and or ISO 4064. Manufacturing plant –Required quality Management System Certificate. Manufacturer's Testing facility should be ISO 17025 certified.
f) Accuracy	+/-2% typical operating range and temperatures. The Electromagnetic water meter should maintain its accuracy over its lifetime. Accuracy class 2 standards of OIMLR49/ ISO 4064.
g) Calibration	3-Point calibration with calibration certificate available for each unit.
h) Dynamic Ratio (Q3/Q1)	Minimum of 500:1. Measuring range shall be as per ISO 4064/OIML R 49.
i) Material	The water meter body shall be made of Composite material or Engineering plastic.
j) Pressure Rating	Pressure rating shall be ≥ PN16
k) Environmental Temperature	0 °C to 50 °C
l) Data Protection and tamper proof	The meter should be tamper proof with suitable

	data protection of calibration and revenue parameters
m) Self-diagnostics for error detection.	The smart meter should have advanced diagnostics with active alarm(s) indicated on display
n) Access to information	Display with ≥8 digits for main information. Index, menu and status symbols for dedicated information
o) Measuring Units	The measuring units should be m^3 for volume and m^3/h or l/h for flow rate.
p) Facility for Remote Communication interface	The Electromagnetic water meter should be configured with battery operated remote reading capability using point-to-point RF.
q) Data Storage	The Electromagnetic water meter should record Hourly data for minimum 90 days and same should be able to read over AMRusing RF communication.Fixed Day readings of Last 24 months.
r) Indicators / Alarms	Tampering, Reverse Flow, Leakage etc.

B. AMR/ AMI SYSTEM

1) The water meters shall have the anti – magnetic properties / immunity, as specified inISO-4064:2005, when tested with 4000 gauss magnet. The AMR/ AMI system shall remain unaffected with application of 4000 gauss magnet, as specified in ISO-4064:2005.
2) The remote readings of AMR/ AMI water meter need two-way communications without affecting battery life and reading performance.
3) The remote readings of AMR/AMI water meter should be obtainable by 'Walk by/Drive by methods as well as Fixed base AMI System. The Walk by/ Drive By mode shall be used only in case the meter is unreadable by Fixed base AMI method.
4) The data Communication from the meters shall comply with the European standard on wireless M- bus/Radian protocol/Manufacturer specific protocol supporting interoperability. The frequency used shall be de-Licensed band frequency in India as per Govt. of India regulations.
5) The AMR/ AMIwater meter shall be wireless and have IP 68 protection category i.e. no ingress of water after submerging AMR/ AMI water meter for 48 hours under 3 meters of water column.
6) The remote Meter reading device shall have instant reading facility. The remote readings and physical meter readings of water meters shall match at all the times.
7) All AMR/ AMI readings shall show the date and time of the reading recorded.
8) The AMR/ AMI system shall have facility to record the reverse flow in water meters readings and it shall show the quantum of reverse flow on the AMR/ AMI Reading device as well as computer system**.**
9) The AMR/ AMI system shall have the facility to record the abnormalities like application of external magnetic effect, very high consumptions, water leakages, tampering, etc. along with necessary alarms in AMR/ AMI reading device and in software.
10) The battery of AMR/ AMI water meter shall be inbuilt and its life shall not be less than 10 years from successful installation of said AMR/ AMI water meter along with its AMR/ AMI system, the battery life shall be calculated by considering the temperature conditions of installation site and remote reading.
11) During remote reading, meter reading device will show low battery alarm/alert of AMR/ AMI water meter.
12) All water meters shall be fitted with inbuilt RF based wireless remote Trans-receiver for AMR/ AMI reading. Meter manufacturing company will assure that the frequency is FREE TO USE and necessary documentation with Department of Telecom is available.

13) The AMR/ AMIwater meters shall have the facility to transmit reading in submerged condition & the remote readings should be obtained with water meter in submerged condition & lid of the chamber closed.
14) All the time electronic index of the water meter shall match with the physical reading, available on water meter.
15) The AMR/ AMI system should date and time synchronize every meter.
16) The AMR/ AMI meters and the AMR/ AMI module should be of the same brand andshould use open source protocol along with manufacture specific protocol.
17) AMR/AMI system should operate in free frequency band available in India as per notification of Department of Telecommunication Govt. of India. The necessary documents should be submitted with the proposal.
18) The Water Meter Manufacture should give undertaking on non-judicial stamp paper of Rs.100 stating that the frequency used for AMR/ AMI system is in free frequency band available in India.
19) The meter manufacturer should provide signed warranty contract for AMR/ AMI Water meters for at least 10 year period of contract.

C. AMRSOFTWARE

1) The software shall give output, at least in the CSV (Comma Separated Value)/Txt/Xls format.
2) The Route Management software must be capable of running on a standard PC compatible with minimum Pentium processor; in addition, the software must run under latest version of windows operating system.
3) The Route Management software should be cloud based and should have web portal access so that user can view customer data through browser.
4) The software shall allow the PC operator to review and edit any account in Route Management/ AMRsoftware database. Also, the PC operator shall be able to generate routes/groups as per zones or areas and activity reports.
5) The software shall alert the meter reader for unread accounts in that route.
6) The software should have the facility to export CSV/Txt/Xls files in the pre-defined format by utility to billing system.
7) The software shall enable the user to specify the data to be exported from the database for transferring to billing system.
8) The software shall select the routes to be read, and assignment of routes to a reading device and dynamic updating of routes and sub-routes to be enabled.
9) The software shall upload routes from the reading device through GSM/GPRS/USB/Cable. And Meter Reading Device shall send meter reading data to the server through GSM/GPRS/USB/Cable.
10) The software shall post the reading from the reading device onto appropriate accounts within the database.
11) The software shall have provision of taking a backup copy of the route data or exporting the route data.
12) Software shall be able to set meter status as meter not okay, reading not reliable, meter maintenance required etc. Meter reader must be able to mention the irregularity in meter reading device related to meter/meter reading/condition of meter which will reflect in reading software.
13) The software should be able to display reading data on screen.
14) The software should have capability to add additional customer information and create customizable data fields.
15) The software should manage GPS data of AMR/ AMI Meters.
16) The software should manage customizable list of message codes for Meter Reader.
17) The meter manufacturer should provide O&M for software ofAMR/ AMI Water meters for the entire period of contract.

D. Meter Reading Device

1) Minimum System Requirement for Android Device
    a. 5” Screen
    b. 2.2 GHz Processor
    c. 4 GB of RAM
    d. 16 GB of Flash Disk
    e. GPS Sensor
    f. Wi-Fi Connection
    g. Bluetooth 4.0 LTE
    h. Android 5.0 or Higher (Highly Recommended)
2) Meter reading device shall have the sufficient memory for storage of data / meter readings along with sufficient power back up
3) Meter reading device shall have the onsite search facility, to locate the exact physical location of water meter areaand to obtain the corresponding details of it
4) The Meter reading device should have adjustable back light, sun light readable, colour display and touch screen.

5) The Meter Reading Device must come with an integrated intelligent fast charge capability that allows full charge within 3 Hours.
6) The Meter Reading Device must have a 3G/GPRS connectivity for transmitting data directly from field to cloud or web server for route monitoring.

E. AMI SCOPE OF WORK

The Fixed Base AMI system must be capable of meeting the data collection needs of the Utility now and in the future for the specified area. For the deployment of Fixed Base AMI System throughout its territory, a RF communication network has to be built covering Smart water meters across its service area. The scope of work involves,

1) Design, supply, installation, testing and commissioning of network platform that can support fixed base communication platform.
2) Site survey for identification of network design (equipment locations etc.).
3) AMI Software integration using API with various application like MDM, billing etc.
4) Minimum support of RF communication components (complete solution including hardware and software) for 10 years.
5) Training to utility's staff and associated documentation for all deployed systems to ensure a smooth transition from deployment to post-deployment operations and maintenance of the system.

F. FIXED BASED SYSTEM OVERVIEW

The Fixed Base AMI System must provide communication from the AMI Software/Computer to strategically located Gateways and also have the ability to communicate down to the installed meter. The communication from the Gateway to the meter must utilize unlicensed frequency band. The System must be capable of migration from mobile AMR to fixed base AMI and shall allow data collection (manual, mobile RF, and/or fixed base) to operate together seamlessly in a mixed system that utilizes the same technology with a common interface to the utilities MDM/billing system. The System shall provide a secondary means of reading meters equipped via a handheld device equipped with an RF transceiver.

The Fixed Base AMI System must be designed to provide coverage for all meters located within the specific Utility service area to collect data. The Fixed Base System must have the ability to support NRW reduction initiatives, customer leak detection alerts, reverse flow and distribution line leak detection. During the programming initialization, the system should provide the ability to identify successful transmission and allow the installer the ability to verify transmission success while at the installation site.

G. GATEWAYS

1) The Gateways shall communicate via a universal wide area network (WAN) connection, such as 3G/4G/GSM/GPRS cellular, Ethernet or fibre to allow communication with the Host Server Software.
2) The Gateways must support communications over a regulator approved unlicensed frequency with the Meter.
3) Equipment type approval from WPC wing of DoT should be provided for the Gateways.
4) The data Communication from the meters to Gateway shall comply with the wireless Mbus and Manufacturer specific protocol supporting interoperability.
5) The Gateway shall collect the meter data from the endpoints a minimum of twice per day (configurable as per utilities requirement) and upload the information to the Host server a minimum of once per day.
6) The Gateways must be flexible with regards to installation option.
7) The Gateway shall be capable of sending alarms to the AMI Software for power loss.
8) The Gateway shall use state-of-art data security techniques to prevent unauthorized access to the data.
9) The meter to Gateway data transmission should be encrypted.
10) The Gateway must be AC powered and should have a option of switch Solar power.
11) The Gateway shall utilize an outdoor enclosure with remote antenna capability, which can be pole or wall mounted.

H. AMI SOFTWARE

1) The AMI Software Server shall act as the central collection point for the data within the system. The server collects data from all of the Gateway Collectors and stores the gathered data in a secure database. Once data is stored on the server, the data shall be available for display via an easy to use web based graphical interface.
2) The bidder shall provide a managed hosting service, where the bidder shall own and manage the server hardware and software including monitoring to ensure the server continues to work effectively, provides backup services, installation of security patches and various levels of technical support.
3) The AMI Software solution shall utilize a secure web based application user interface.
4) It shall comply with prevailing industry standards and should run on a Windows-compatible computer.
5) The AMI Software must be able to interface with handheld and mobile meter reading software to enable a mixed meter reading approach that utilizes the same technology.
6) The AMI Software must interface to the Utility's MDM/billing software using API.
7) The meter reading data communicated to the Utility's MDM/billing software shall be provided in a xml format.
8) The AMI Software solution shall display the readout summary, meters read, routes done, reader's workload etc. information on a dashboard.
9) The AMI system shall have the facility to record the abnormalities like application of external magnetic effect, very high consumptions, water leakages, etc. along with necessary alarms in software.
10) The AMI Software server shall manage and archive data for two year such that it can be accessed by any Utility computers, handheld devices both locally and remotely via the web.
11) The AMI system software must be web browser-based and shall have defined applications with standard interfaces to allow for existing and planned software applications.
12) The AMI software shall include a GIS tool for providing a map of the meters.

The vendor will provide a complete set of operating instructions for all the components of the fixed base system. Onsite training by authorized vendor personnel or their representatives must be provided. The vendor must also arrange a pre-deployment meeting to identify the critical path items for installation and training needs.

2) **Technical eligibility criteria for AMR / AMI Meter Manufacturer:**
   1) All those Water Meter Manufacturers should have worked at least for five years in the area of design, manufacturing of water meter conforming to ISO 4064 and or OIML R49 with MID certifications from International Organization in India / Abroad shall be eligible.
   2) Manufacturer should have following test reports from FCRI.
      a. Life cycle report from FCRI for each size,
      b. IP 68 Certificate from FCRI for atleast one size,
      c. Magnetic Tamper (as per ISO 4064) Test report for atleast one size,
      d. AMR/ AMI Test report from FCRI for atleast one size.
   3) The Water Meter Manufacturer should have manufactured/supplied in India at least 25,000 Static Electromagnetic AMR/ AMI water meters of any size in the last 5 (Five) financial years. (Necessary document should be submitted)
   4) The Water Meter Manufacturer should have supplied minimum 25,000 AMR/ AMI Static Electromagnetic AMR/ AMI water meters of any size which are running satisfactorily in last 5 (Five) years. (Necessary document should be submitted).
   5) The Water meter manufacturer must possess permission to use free frequency for AMR/ AMI/AMI water meter communication system.
   6) All components of the Metering System including Smart Electromagnetic water Meters, AMR & AMI Software, AMR (Handheld Device equipped with an RF transceiver) & AMI (Gateway) components from single manufacturer to ensure end to end responsibility.
   7) The water meter manufacture shall have registered entity in India and should have direct presence with support office in India.

BRIEF DESCRIPTION OF SCOPE OF E/M WORKS

Construction of Tubewell, Supply of Pumping Plant with SCADA System of Tubewells & OHTs including integration of all Tubewells & OHTs with existing MCS.

1. CONTRACT INCLUDES:

1.1 Supply & erection of all required tools plants (T&P) for drilling of necessary Tubewell bore of required size as detailed in schedule "G", lowering of well tubes together with all excavation, pumping, all temporary masonry work, channels for samples, dressing & cleaning of site & reinstatement.

1.2 Supply& erection of all required T& P for development of Tube Well.

1.3 Supply & erection of all temporary and auxiliary plants such as derricks, hoists, etc. and other appliance required for the work.

1.4 Supply of all lubricants and oils, cotton and other material required during the drilling, developing and testing operations.

1.5 Supply of bentonite and sticky clay, if required to line up the bore and also sodium hexameta phosphate required to dislodge the stricky mud during the development of the bore.

2.0 SITES FOR TUBE WELL:

2.1 The site of tube well shall be shown to the contractor or his authorized representative before starting the work.

2.2 The contractor is strongly advised to consult strata chart of boring done in vicinity of the place. The strata chart available in the office may be seen but these can be only taken as guide. No claims shall be entertained differs from that shown on those charts.

3. TRANSPORTATION:

This includes transportation of drilling and developing equipment like rig, compressor, O.P. unit with all required auxiliary T&P and material to proposed site including carting loading, unloading etc. complete work.

4. DRILLING:

4.1 This includes installation of rig machine, drilling of bore well, up to required depth for successful construction of tube well to the satisfaction of Engineer in charge, including supply of all required material like bentonite, sticky clay and Ferrow speed electro rod/ ISI mark etc. and also, provision forwater arrangement for drilling at their own expenses.

5. PRESERVATION OF EXCAVATED MATERIAL:

As the boring work of Tube Well proceeds, the contractor shall keep carefully notes of all changes of strata after every 3 meters or earlier whenever the strata change and keep its measurement from ground level and shall preserve a sample of soil taken from every strata, each sample must be at least 200 c.c. by volume and must be carefully preserved and marked with the depth and range from which it was taken in transparent packages. The contractor shall also maintain at the site, the boring chart showing daily progress of the work, nature of soil passed through each day and the thickness of each strata and others. The strata samples shall be handed over to the Engineer.

6. LOGGING:

6.1 After completing the bore well, its logging will be within the scope of the contractor which shall be done by the departmental/U.P. Jal Nigam approved loggers on their own cost.

6.2 No compensation shall be paid to the contractor on account of any delay in electric logging of bore well.

6.3 The Contractor shall maintain the bore hole up to logging or lowering with shrouding is complete in all respect.

6.4 Depth of the bore well shall be measured while logger testing as per the reading recorded on logger machine or sounding measured prior to the lowering of the tube well assembly whichever, is deemed acceptable.

6.5 If the bore well collapse due to whatsoever the reason or phenomenon in course of bore well work. No payment shall be made to the contractor. It is the sole responsibility of the contractor to secure the borewell done successfully.

7. TUBE WELL ASSEMBLY AND ITS LOWERING:

7.1 The tube well Assembly & accessories etc. will be as per specifications related to various I.S. and make approved with U.P. Jal Nigam (Urban).

7.2 All the associated accessories as mentioned in detailed specification, of tube well Assembly, will be supplied by the contractor.

7.3 The contractor shall prepare the tube well assembly as approved by the Engineer in advance and shall arrange the same in proper sequence at site. He shall get the same checked and passed by the Engineer or his authorized representative. There after the assembly shall be painted with standard quality anti-corrosive paint.

7.4 Before lowering the tube well assembly the contractor shall ensure that the bore hole is cleared up to the required depth and shall get it checked while logger testing or before the lowering of the tube well assembly by the Engineer or his authorized representative.

7.5 The lowering of tube well assembly shall be carried out by the contractor with all materials required for proper completion of the work.

7.6 The quality of the welding Job work of jointing the tube well assembly parts should be enough to stand the entire weight of the assembly while hanging. Lowering shall be carried out in the presence of the Engineer or his authorized representative. The contractor shall ensure that lowering of assembly takes place smoothly. It will be the binding upon the contractor to bear the sole responsibility of successful lowering done.

7.7 The contractor shall take the sounding of the lowered tube well assembly to the Engineer or his authorized representative as and when lowering is complete. In case the complete sounding of tube well assembly is not found, it will be entire responsibility of the contractor to restore the sounding or revive the sounding at their own.

7.8 Carting of tube well assembly/Pumping Plant Accessories to site of tube well will be done & borne by contractor on his own cost.

DETAILED SPECIFICATION

8. **Tube well assembly:**

300 mm dia Housing pipe/Slotted pipes , 200 mm or 150 mm. dia plain Casing / slotted pipe of tube well assembly & accessories will be supplied by the contractor as per specifications laid down in various I.S. The contractor has to supply MS rings, reducer, centre guide, Bail plug, housing cover Housing clamps etc all that will be inspected by department before dispatch to individual site at works. Girder of H shape will be supplied as per size mentioned. The installation of tubewell assembly shall consist of M.S. housing pipe 300 mm and 200/150 mm dia plain pipes and M.S. slotted pipes as per IS 4270 (latest amendment) made from Fe 410 Grade 7.1 mm thick M.S. plate as per IS. The details are as given in the drawing and described below :-

i) The tubewell shall have a 200/150 mm dia bail plug at the bottom of a plain pipe having M.S. ring welded at the upper end further 200/150 mm dia slotted / plain plain pipe will be joint with the help of M.S. ring welded at upper end. The 200 mm tube thus made will be connected as per approved length will b/w connected to the 300 mm dia housing pipe with the help of 300x200 mm or 300x150mm dia enlarger by electric welding. The housing pipe may be increased depending upon the spring level and strata. Housing pipe will be welded with 300 mm dia M.S. ring subsequently as per approved length of tube well assembly. Pipes available may be in 4 m to 6 m length.

ii) The housing pipe shall have to be placed vertically and a tolerance of not more than 50 mm in 25 meters. Through the length of housing pipe will be accepted for any deviation from the plumb. The 300 mm dia and 200/150 mm dia pipe shall be connected with a reducer. The bail plug shall consist of the lower maximum 6 meter of 200/150 mm dia blind tubes with the bottom plug capped. The cap shall be fitted with an Iron U

hook at least one meter long of 22 mm dia mild steel rod suitably fixed to the bottom bail plug cap. The tube shall finally rest on clay bottom Girders clamps or lending of gravel having a thickness of about 2 meter. All 200/150mm dia tube both blind and slotted pipes shall be electrically resistance welded conforming to Indian standard specifications. The weight of tubes shall be as per B.I.S. The M.S. ring will be 12 mm thick sheet welded and shall confirm with Indian standard specifications. The housing pipes will be MSERW/ fabricated from SAIL/TATA steel plate in 4 to 6 meter length the without any circumferential weld with Plain ends.

iii) The 200/150 mm dia tubes shall centered in the holes by means of mild steel welded spiders at 10 meter of intervals on the blind pipe 200/150 mm pipes with linear slots of suitable sizes to have water way area of 16% of total pipe area will be used. The slotted pipes may be used in any lengths required by the water bearing strata but no piece shall be less than one meter in length. The slot should be milled and not punched previously. No slotting with any acetylene flame for perforation of the liner will be accepted.

9. Tubewell Accessories :

a. Well Cap :- Well cap made out from 150x12mm M.S. Flat, 6mm thick top sheet with a handle on top suitable for M.S. housing pipe 300mm dia.

b. Housing Pipe Clamp :- Housing pipe clamp made out from 16mm M.S. Flat, with 300mm long arm on both ends having drilled holes and fastened by means of 4 Nos. ½ dia 6" long nut, bolt &washers suitable to clamp 300 mm dia M.S. Pipe.

c. M.S. Ring 300 mm dia :-

d. M.S. Ring RING made out from 150x12 mm M.S. Flat, suitable for M.S. pipe. The rings has to be tapered with 'V' grove at both ends and seat in between. 300 dia M.S. Pipe` Bail Plug: - M.S. BAIL plug made out from 150x12mm flat with 'U' hook of 25mm dia M.S. Rod 500mm long high bolted at bottom of BAIL PLUG suitable for

e. (i) 200/150 mm dia M.S. Pipe

f. Centre Guide: - Centre guide length 900mm dia, 220 mm made from 40mm thickness of M.S. flat strip IS code- 226 : 1975

g. MS Fabricated Tubewell support:- Tubewell support made up of 200x100 mm size MS girder having 2.5m long and in I- shape as per departmental design.

10. Gravel Packing:

Gravel packing shall be done by suitable method approved by the Engineer or his authorized representative. The placing of the gravel in the annular space between the well pipe and the hole shall start at the bottom of the well and extend upward to ground level. The construction of the gravel filter once started will be continuous operation until it is finished.

The following specifications are to be followed for supply of Pea Gravel for Tubewell.

1. The Gravel has to be supplied from Lalkuan, Query Haldwani and conforming to IS 4097-1967 and as latest amendments.
2. The average particle size of Gravel shall be 1.6 to 4.8mm.
3. The Gravel shall consist of hard quartz (about 96% SiO2) or other suitable material, with an average specific gravity of not less than 2.5. Not more than 10% by weight of the material shall have a specific gravity of less than 2.25. The Gravel shall contain not more than 2% by weight of thin flat or elongated

   pieces. In case of such pieces, the larger dimensions shall not be more than 3 times the smallest dimensions. The quartz shall be of sub rounded to rounded grains with minimum angular features.
4. The Gravel shall be free from impurities, such as shale, mica, feldspar, clay, sand, dirt, loam hematite and organic materials.
5. The particle size distribution of Gravel may be Determine by screening through standard sieve accordance with IS: 460.

6. The gravel shall have a hardness of not less than 5 in Moh's scale.
7. Voids @ 5% shall be deducted from quantities measured at site.
8. Any tax, Royalty shall be included in the offered rates.

11. PEA GRAVEL AND ITS SHROUNDING:

11.1 The gravel packing shall be done by a suitable method approved by the Engineer or his authorized representative.

11.2 The packing of gravel in the annular space between the well pipe and the bore shall start at the bottom of the well and terminate until the ground level.

12. VERTICALITY:

12.1 The formal test is not required due to proposed Pumping Plant is of submersible type, although constructed tube well should be vertical and having clear cylindrical space within the housing pipe to accommodating the O.P. Unit for development of Tube Well and also submersible Pumping Plant of requisite capacity with its proper installation and working.

12.2 If the housing pipe is so much non-vertical that it could not accommodate a submersible pumping plant of requisite capacity with its proper working up to desired depth then the tube well will be rejected outright, and all expenditure if any done by department on tube well should be recovered from contractor. If there is any dispute in this regard the final decision authority will be chief Engineer and whose decision shall be binding to contractor.

13. <u>Development by Air Compressor:</u>

The tubewell shall be developed either by surging, including washing and agitation by air compressor or by over pumping and back washing with or without an air lift. The development of tubewell by air compressor process shall be continued until

(i) The tubewell ceases to absorb further gravel.

(ii) The depression ceases to improve.

(iii) The discharge ceases to improve.

(iv) The water is reasonably sand free.

The analysis of sand content will be carried out by the contractor as per written instruction by the Engineer. The sounding of T/W will be taken after development by air compressor and OP unit.

The contractor shall over develop so as to yield a discharge 20% in excess of the rated discharge or to depress the well to 50% higher than the nominal depression at which the tube well is pumped on continuous duty which ever may be more.

The discharge during development shall be measured at minimum intervals of 6 hours over a V-Notch weir or by other suitable method may be accepted and record kept as previously provided. The development will continue till no further feeding of gravel is found necessary and the discharge is free of sand within the requirement of specifications.

The discharge shall be sand free i.e. sand contents will be less than 10 ppm in the final discharge of the tube well obtained after 05 minutes of starting and clear/traces within 10 minutes.

The discharge of tubewell shall be measured by means of water meter or orifice meter or rectangular V-notch chamber constructed according to ISS such that the full size discharge from the outlet pipe the plumb will fall into the first compartment of V-notch chamber. In order enable the collection of water in a bucket for measuring the sand contents of water a bib cock shall be provided in the delivery pipe away from the discharge outlet. The contractor will also provide necessary measuring jars.The yield of the tube well will be carried out as under:-

Firstly, the discharge of the tube well will be increased in stages at an interval of one hour and relevant readings at each stage will be recorded by checking these readings. The most suitable discharge will be selected and the tube well will be run for about 6 hours and the readings of depression and discharge will taken after every half an hour for ensuring the figure of discharge and depression remain steady during the entire period of test. The specified discharge of the tube-well shall be obtained at a depression not exceeding 20 ft. Thereafter the recoupment test of the tubewell will be conducted by noting the readings of recumbent of water level in the

housing pipe by noting the depth of water level from the top of the housing pipe after suitable intervals/ Cleaning of water after stopping pumping.

14.0 DEVELOPMENT:

14.1 The development of the tube well shall be done first by the proper size & capacity air Compressor preferably 250/350/600 PSI incorporated to around 650/1250/600 CFM which shall be followed by O.P. Unit of 01/02/03 cusec capacity as per relevant I.S. and code of practice running with the U.P. Jal Nigam.

14.2 Assumption of successful completion of development by compressor should have the following indicators:

(i) Gravel should not shrink even after the blow back of air compressor as per relevant standard while contering each stratum.

(ii) Range of permissible PPM in between 3000 to 4000 ppm while starting and 100-200 ppm later on while running.

(iii) Bore well should soak water freely and continuously. Failing which, bridging phenomenon shall be treated as running with the bore well and development of the tubewell by compressor shall have to be carried out a fresh until the bridging phenomenon is somehow, removed/ eliminated.

14.3 The development of the tube well by O.P. Unit shall be done by 01/02/03 cusec VT type O.P. Unit until the water level and discharge becomes steady and sand free within five minutes which is subjected to starting less than 100 ppm.

14.4 Discharge shall be selected at 60% of the water discharge quantity free from sand within 20 minutes.

14.5 Yield of the Tube well is required as per depth of strata length taped and recommendation 60% discharge of the yield conforming to relevant IS. Failing which, construction of tube well shall be considered to have done workmanship / quality of work not conforming to relevant IS, and deduction shall be made pro-rata in terms of discharge.

15. LIMITS OF CONTRACT:

The work included in this contract shall be deemed to be completed finally when all the specifications laid down herein and conditions of contract attached have been completed and tube well having been successfully tested and handed over to the ULB.

16. DESIGN, MATERIAL AND WORKMANSHIP:

The specification as laid down in tender document for the execution of the various parts are to be followed. Any suggestions with a view to effect the economy or to increase reliability in operation which the tenderer may wish to offer must be set forth in the schedule as addendum for consideration.

17.0 RESPONSIBILITIES OF CONTRACTOR:

17.1 The contractor shall maintain Chaukidar at his own cost to watch T&P and also provide materials for protection of work if necessary. He shall arrange for storing of T&P and materials for accommodation of supervising staff engaged on the work by him. The contractor shall also arrange his own supplies of water, fuel etc. for the use of his workman and also for the execution of the work.

17.2 Until the test specified herein have been applied and the installation have been passed and formally accepted by the Engineer the contractor shall be entirely responsible for the working or performance, whether such working as for the propose of testing or in the service of Nigam.

17.3 As each part of the construction of the tube well is completed, it shall be checked over by the Engineer or his authorized representative. The representative of contractor shall ascertain with the Engineer's representative from time to time, what parts he wished to check over and pass but such passing shall be no way relieve the contractor from his responsibility, until the entire work has been completed according to the contract and taken over by the Engineer.

17.4 Contractor shall take all safety measures at site. He shall arrange first aid box at site. in the event of any accident, he should make arrangement for primary & higher medical facilities to labour engage by him. Jal Nigam shall not bear any liability about accident at site. The entire liabilities about first aid, higher medical facilities and compensation if arises have to be borne by the contractor.

17.5 The contractor shall submit daily report of the work done by him each day to the Engineer on the prescribed format to be obtained from the Engineer. These reports shall be handed over to the Engineer's representative

stationed at site or/also posted to the Engineer (in case there is no representative stationed at site) every day after close of the day. Postage changes for the same shall be borne by the contractor.

17.6 Work done of any kind to the designated site for the construction of Tube Well or any other material such as fuel etc consumed by the contractor shall not be paid out in case of failure of tube well however contractor can retrieve them.

18. TESTS:

During the progress of the work and after its completion the contractor shall carry out such tests, as in the opinion of the Engineer are necessary to ensure that the installation compile with the conditions of these specification whether under test conditions or in ordinary working.

All pipe connections and other apparatus required for the tests shall be provided by the contractor at his own cost.

19. REINSTATEMENT:

After completion of work the contractor shall remove all surplus material and dresses the ground disturbed during the operation of the excavation boring and construction of the well to the satisfaction of the Engineer.

20. YIELD TEST:

The official yield test shall be conducted by department as per departmental norms, but all arrangements for that shall be provided by contractor on his own cost.

21. COMPLETION OF TUBE WELL:

21.1 After giving the official test as above, the contractor shall give sounding of the tube well to the Engineer or his authorized representative. In case the complete sounding is not found and it is observed that sand is plugged more than half the length of the bail plug, than it will be responsibility of the contractor to clear the tube well at his own cost and risk.

21.2 Just after giving the sounding and accepted by the Engineer or his authorized representative, the contractor shall cap the tube well duly welded.

22. FAILURE OF TUBE WELL:

If the tube well fails due to bad workman ship/accident or any other reason on account of contractor, except that non availability of suitable strata, the department will not make any payment to the contractor for that T/W and if any expenditure done by department on that tube well will be recovered from the contractor's Security Money Deposit/payments out standing in this division or any other divisions in Jal Nigam.

23. Abandonment of Tubewell:

During construction it may be required to abandon the tubewell due to negligence of the working staff of the contractor, in such case no payment of the executed work will be made to the contractor. If during drilling very hard rock or boulders or uncontrollable caving strata is met and also if due to any natural reason i.e. connecting the well with any nearby natural well and it is not possible to drill further or no strata is met, payment of the actual depth drilled will be made. However the contractor for at least 48 hours in case of hard rock, try to penetrate it in presence of the Engineer in-charge for 24 hours and if the progress is less than 1 feet in 24 hours and sufficient strata has not been met to yield required discharge, the bore may be declared as abandoned and payment of actual work executed will be made.

23. Quality of Water:

In the construction of the tubewell, due precautions shall be taken by the drilling agency to maintain the premises in a sanitary condition and to avoid as much as practical, the entrance of contaminated water into the safe water bearing formations, any water or materials used shall be free of contamination and, if their nature permits, should be adequately disinfected with chlorine before use. The slush pit should be constructed so that no material there from will enter the well, except mud reused when the construction is by rotary method. In such cases the slush pit and mud return channels should be protected against contamination from surface water or any other sources.The well shall be disinfected after completion of test for yield. All the exterior parts of the pump coming in contract with the water shall be thoroughly cleaned and dusted with powdered chlorine compound.

TECHNICAL SPECIFICATIONS OF PUMPING PLANTS

24. SUBMERSIBLE PUMP SET:

Submersible pumping set suitable for 300x200mm OR 300X150 mm. dia T/W Bore fitted with dynamically balance bronze or SS impellers mounted on a stainless steel pump shaft with shaft protection sleeves having stage bowls of closed grained cast iron. The pump will be fitted with built in non-return valve and shall be suitable for direct coupling to the squirrel cage electric induction, water cooled type submersible motor suitable to operate on 400 ± 10% V, 3 phase, 50 cycles/sec. A.C. Power Supply and 2900 rpm (nominal) speed and capable to give a discharge and headas is mentioned in NIT. Other specifications shall be as per following:

25. PUMP SET:

24.1 A Standard hydrostatic test on all pressure containing parts shall be made at 1.5 times the maximum discharge pressure.

24.2 The bowls shall be equipped with replaceable casing bearing.

24.3 The bowl assembly shall bear a name plate preferably embossed information as per following:

a) Name of the manufacturer or trade mark.
b) Serial number of the pump set.
c) Pump type.
d) Number of stages.
e) Total head.
f) Shut off head.
g) Capacity.

Note: Shut off head must be above 25% of the total head required.

24.4 The impeller shall be of enclosed type equipped with seal rings on their hubs. Seal rings shall be provided either with impeller or in the bowl.

24.5 The pump shaft shall be guided by bearing provided in each bowl of above and below the impeller shaft assembly. The shaft without sleeves shall have a surface finish 0.75 micron Ra Max.

24.6 The opening in the suction case for the entrance of water shall be of proper size and shape to avoid eddy currents.

24.7 The suction case shall be fitted with a strainer made of corrosion resistant material.

24.8 Suitable sand guard shall be provided just above the suction case bearing to prevent the entry of foreign matter into the suction case.

24.9 Non return valve shall be provided above the pump discharge case.

26. SUBMERSIBLE MOTOR:

25.1 The submersible motor shall be squirrel cage induction motor.

25.2 The winding of motor shall be wet type.

25.3 The motor shall be suitable for operation voltages and frequency confirming to IS 585-1962 (revised) "Voltages and frequency for A.C. transmission and distribution system"

25.4 The earthing of the motor shall comply with IS: 3043-1966 code of practice for earthing.

25.5 The Thrust bearing shall be of adequate size to withstand the weight of all rotating parts as well as the imposed hydraulic thrust. These shall be lubricated suitably.

25.6 The Motor winding and nearing bushes of the rotor shaft shall be cooled/lubricated by pure water filled in the motor before erecting the pump set.

25.7 The motor shall be protected by means of cable glands, rubber seals etc. from ingress of tubewell water, sand and other foreign matter.

25.8 The thrust bearing housing shall be provided with a drain plug to empty the pure water filled into the thrust bearing housing/Motor.

25.9 The rotor shaft in copper strip shall be provided with shaft protecting sleeves having a surface finish of 0.75 micron Ra max.

25.10 The Motor shall be provided with a breathing attachment like bellows, diaphragm etc. to compensate the Volumetric variations due to change in temperature.

25.11 The motor shall be made of corrosion resistant materials or suitably treated materials to resist corrosion.

25.12 The motor shall have a name plate preferably embossed on body of motor giving the following information :

a) Induction Motor;
b) Name of Manufacturer;
c) Manufacturer's number and frame reference;
d) Type of duty;
e) Frequency in Hz;
f) Number of Phases;
g) Rated output in HP/KW;
h) Rated voltage and winding connections;
i) Current in amperes at rated output.
j) Speed in RPM at rated output.

25.13 DATA OF PUMP SET:

These shall be furnished in the following manner: s

a) Model of motor.
b) Model of pump.
c) Discharge in LPM.
d) Total head.
e) Nett effective head.
f) Number of stages.
g) Pump outlet size in mm.
h) O.D. of pump in mm.
a. MOC of each and every component of the pump set.
i) Speed of pump set.
j) Method of starting.

The performance details as per enclosed schedule 'E' are to be submitted as per enclosed sheet separately.

27. TESTING OF E/M EQUIPMENTS:

The contractor shall submit the drawing of the pump set, Switchgear control panel , SCADA Automation related all equipments and Other required E/M Equipments for approval of the competent authority thereafter contractor shall conduct & arrange the factory inspection or testing of all such E/M Equipments after getting approval at the O.E.M. place is done in the presence of Engineer in -charge and also perform testing at the site, which shall be witnessed by department at site after the installation of the E/M Equipments as specified in the approved datasheet or drawing/Q.A.P./schedule 'E' of the tender document or approved documents. Other material/accessories will be checked as per relevant ISS. Test certificate of the all E/M Equipments concluded at works of the manufacturer is obligatory to be furnished and submitted in the department and in case of pumping set, test certificate with characteristic curve stipulating the discharge, head or pump efficiency etc that it could ensure duties of the pump set is well suited to need of the pumping system.

TEST DUTIES AND EFFICIENCIES:

The contractor shall state in the tables attached with tender documents the efficiencies and duties of the pumping plants when working at specified conditions of the pumping and the guaranteed performance in K.W. hour input per water horse power output under various conditions of working. The guaranteed performances are also to be specified under following conditions i.e. variation in head discharge and power consumption in the following cases:

a) When available voltage decreases from 415 volts to 380 volts or increases from 415 volts to 440 volts.

b) When there is fluctuation of ±3% in the frequency of the AC power supply from 50 C/S.

c) When there is above change in voltage and frequency of the AC power supply simultaneously.

The official tests shall be conducted in two stages. Preliminary tests may be conducted at the manufacturer's works. The final tests shall be conducted at site. Pumps shall be run so as to obtain the range of heads specified in the performance tables by means of throttling or opening valves of the pumping mains and tests results will be compared with those guaranteed by averaging the units consumption per water horse power hour.

- The guaranteed figures stated above shall be subjected to no tolerance and the average results shall be obtained during official test of plant. If the results lack average guaranteed figures the contractor shall forfeit followings ascertained damages relating to each set installed.
- If BOT unit (KWI) per WHP, the consumption is above the average guaranteed figure under the specified Q and H, the liquidated damages will be recovered as the capitalized cost of the Extra Energy Consumption during the useful life span 15 years of the pumping set. The liquidated damages shall be calculated as below :-

Cost of extra power consumption
to be recovered shall be equal to =Cost of extra power per annum × capitalization factor for 15 years at an interest rate of 9%.

- No damage will however, be recovered if the consumption is less than 0.05 BOT units per WHP above the guaranteed.
- If on testing the discharge of pumps is found to be within the permissible limit of ±4% then the pumping plant will be accepted without imposing any penalty. If discharge is less by 5% to 10% then pro rate deduction @ 1% of the cost of pump and motor for less percentage of discharge shall be made and further if the discharge is less than 10%, plant will be rejected.
- It may be noted carefully that no privilege shall be given to any offer for evaluation purposes considering the efficiency of the pump and Motor. Better efficiency pump and motor however shall be preferred. For evaluation purposes the maximum efficiency of pump and motor shall be considered as 72% & 84% respectively but these will be tested on the efficiency quoted by the firm in **schedule-E** of their tender

  The pump efficiency offered below the efficiency quoted shall be considered for evaluation as follows:

  (i) Electric charges shall be based on 16 hours of operation per day for 15 years at the prevailing rate of Electric Charges and interest of the rates of 9% per annum for cumulative cost difference in 15 years. day.

  (ii) All future costs of yearly power consumption will be capitalized to present value at capitalization factor @ 9% interest.
- The tenderers shall have to consider the condition of pumps being run at shut off head under the pump duty variation condition as narrated above. The tenderer should ensure selection of pumps considering shut off head at least 25% more than the duty head. However the motor should be selected as per tender specification and scope of work defined. The possibilities of change of duty point of each pump in parallel operation cannot be ruled out under such condition tenderer should select the pump carefully. Penalty for delay in supply and installation-0.25% per day of the total tendered cost subject to a maximum of 10%.

28. SWITCH GEAR MATERIAL:

Complete switch gear with all equipment, accessories shall be supplied and erected by the contractor with the provision for connecting to the 415V, 3 phase 50 Hz A.C. supply system incorporated with PLC panel & other associated equipment required for Automation at tubewells pump house. Under the item construction features as follow:

29 CONSTRUCTIONAL FEATURES

29.1 The control panel shall be completely metal enclosed and shall be dust, moisture and vermin proof. The enclosures shall provide a degree of protection not less than IP-54 in accordance with IS:2147 and conforming to IS 61439 strictly.

29.2 Panels shall be wall mounting type and shall comprise rigid welded selected, smooth finished, hot rolled sheet steel of thickness not less than 3 mm for front and rear portions and 2.5 mm for sides top and bottom portions. There shall be sufficient reinforcement to ensure a plain surface to limit vibration and to provide rigidity during installation and when panel put in service.

29.3 The control panel shall be assembled on channel/angle base plates with anti-vibration mountings. The vertical panel shall be wall mounting type with removable covers at front. All bolts, nuts, and screw etc., appearing on panel shall be so arranged as to present a neat appearance. Lifting hooks shall be provided such that no openings are left when hooks are removed. All hooks, bolts and nuts exposed to external atmosphere shall be chromium plated or zinc plated.

29.4 Operating handles of the doors shall have locking arrangement. There shall be no sharp door covers to avoid injury to personnel.

29.5 The switch gear panel shall be provided with hinged door on the front and removable access cover on the front. The door of the panels shall be gasketed all around with neoprene gaskets. Ventilating covers if provided shall have screens, fittings and due collecting devices. The screens shall be made or either brass or G.I. wire mesh if required.

29.6 Design, material selection and workmanship shall be such as to result in neat appearance inside and outside with no welds and reverts apparent from outside, will all exterior surfaces free and smooth.

29.7 Switch Gear Panel shall be suitable for wall mounting control cubicles as specified in data sheets in the form of metal channels property drilled shall be furnished along with anchor bolts and necessary hardware for mounting the panels. These shall be dispatched in advance so that they may be installed and leveled.

29.8 Switch gear panel shall be liberally sized so as to provide spacious layout of equipment and devices with sufficient working space in between.

29.9 The maximum and minimum height of the operating equipment on the panel shall be 2100mm and 900mm respectively from the floor level. If the panel height is small then it should be mounted on separate support so that the operating height of the equipment comes within the above limit. The proper supporting arrangement shall be provided by the tenderer.

The following features are also required:-

(i) MCCB, bus bar, instrumentation and protection equipment and cables shall be inbuilt within cubical panel.

(ii) The panels shall be so constructed that failure of one equipment does not effect that adjacent units. Suitable vent shall be provided to release gas pressure developed due to short circuits or any burn.

(iv) Bus bar connections, joints and taps shall be silver plated; connections shall be as short as possible.

(v) Each cubical shall be provided with HRC fuse and plug sockets.

(vi) Wiring for instrumentation, protection relay and lead indicating lamps in each switch gear panel shall be grasped and brought out to easily accessible terminals for external connections.

30. MOTOR STARTER APPLICABLE AS PER ACTUAL REQUIREMENT:

It is a binding effect as per statuary rules of U.P. Jal Nigam that motor starting of different HP's shall be as per provision of electricity rules for squirrel cage induction motor at power supply 415V ±6%, 50 C/S, 03 phase AC supply associated to Soft starter which is incorporated with PLC Panel and interface with SCADA system and MCS.

31. MOTOR PROTECTION RELAYS/THERMAL OVERLOAD RELAYS :

Motor protection Relays/Thermal overload relays 03 pole type shall be separate from each other. Starter shall be complete with three element positive acting, ambient temperature compensated, time lagged thermal overload relay with adjustable setting. Overload reset push button shall be brought out on front of door cover. Overload relays shall be provided with 02 NO / and NC auxiliary contact.

32. CT OPERATED RESIN CAST MAGNETIC OVERLOAD RELAY or DIGITAL OVER CURRENT RELAY:

CT operated resin cast thermal over current relay or Electro Magnetic overload relays with CTs 03 pole type shall be hand reset. It can be managed with the combination of thermal time lagged relays with CT operated magnetic overload relays. Adjustment of both time setting & current setting shall be provided with easily accessible. Over current relays with CTs shall be procured with switch gear panel in built Star delta starter separately or cumulatively. Over current relay shall be mounted within switch gear panel. Over current range shall be suitable to HP of the motor at full load and over load.

33. SINGLE PHASING PREVENTER:

Single phasing preventer relay shall be provided with current operated type. The relay shall not operate for supply unbalance; of 5%, but shall positively operate for unbalance more than 5%. The relay shall operate in the event of single phase fuse blowing even though motor emf in the concerned phase is order of the 85%. After sensing a single phasing, the delay shall operate with a time delay of 02 or 03 seconds. The relay shall not operate for 03 phase power supply failure. The relay shall be hand reset of push button. Resetting shall be instantaneous and independent of the adjusted time delay in the tripping of the unit. Visual indication for the relay shall be provided such as for 03 Nos. Pots at input for power supply, 02 Nos pots for auxiliary supply and 03 Nos pots for common, NO and NC

The relay shall be suitable for application to protect reversible and non-reversible motors. The relay operation shall be independent of HP rating and RPM of the motor. The relay shall be of fail-safe type and shall operate to trip the motor when the relay internal wiring is accidently open circuit. Reference voltage for the supply shall be available even when supply has lost one phase.

34.` ELECTRO MAGNET TYPE CONTACTS:

The motor starter contactor shall be of the electromagnet type, rated for uninterrupted duty as defined in IS 2959, class applicable is I or II unless otherwise specified by the Engineer in charge, class I is up to 30 operations per hour and class II is up to 150 operations per hours. It shall be decided by the Engineer in charge as per site conditions after the award of contract.

Contactors shall be of double break, non-gravity type. Each contact shall be provided with 02 NO, 02 NC auxiliary contact. Insulation class of opening coil shall be E or better. Uninterrupted duty draws the inference that duty in which main contacts remain closed without interruption while carrying a steady current for a period of more than 08 hrs. This type of duty is taken care by a de-rating factor as the accumulation of dirt and oxides have adverse effect on the performance of the contactor. It is closed by an electromagnet. It opens under the action of gravity or spring when the coil is de-energized. The principal component of magnetic contactor is as below:

Note: Main contact, Delta contact & tapping contact shall be of 200 Amp. at the minimum regardless of whether rating of the pump set is 10 HP to 40 HP or so.

1. Magnetic frame.
2. Magnetic or holding coil.
3. Moving armature which is attracted by the electromagnet frame and moving armature are of laminated steel in the AC contactor for preferred rating 415V±6% for the main circuit.
4. Stationary contacts.
5. Moving contacts and spring mounted on the armature frame.
6. Are chute or arc snuffers for extinguishing the arc.
7. Flexible shunts for electrical connection to the moving contacts.
8. Auxiliary or inter locking contacts.

There shall be the circuits associated with electromagnet. The main circuit and the control circuit. The contacts shall be copper alloy silver coated to the main contacts in addition to the main contacts. There are auxiliary &arcing contacts close Ist, then the auxiliary contacts and last of all the main contacts while opening. The order of operation is reverse, arcing contacts prevents the concentration of arc on small area and results in increased life for the main contacts and arc boxes. The arcing contacts are replaced with when they are too worn to make contact ahead of main contacts.

35. CAPACITORS:

Motor shall be provided with separate capacitors to correct the power factor of the machines to 0.9 lagging or close to upf. The capacitor shall be of scaled unit pattern comprising paper, foil or plastic, impregnated with oil or synthetic electrolyte. Capacitors shall comprising assemble of units mounted on frame with suitable trucking, screening, interconnections or shall be housed in ventilated sheet steel, enclosures. If either cases capacitors shall be complete with all necessary interconnections, discharge devices, protective fuses and terminals for the connections of a 3 core supply cable. A removable un-drilled cable gland shall be provided. Its rating shall be in the range of 1/3 to 1/4 KVAr of HP of the motor unless otherwise specified by the Engineer in charge to improve power factor 0.9 lagging.

36. SUBMERSIBLE CABLE FOR PUMPING PLANTS:

Conforming to IS 694:1990Tested at 1100 V, ***PVC flat submersible cable*** for pumping plant shall be in ***three core*** working as power cable suitable for voltage and current rating of the motor at inrush current of the motor starting. The size of conductor close section of the cable shall be in copper only sufficient enough to withstand rigors of motor starting or short circuit fault taking in to account the type of starters used for starting the motor. The cable shall be laid down from control panel/ starter to the pump sets and therefore, length of cable should be sufficient considering the loops of suitable length at certain points in the route of cabling. Cable joint with motor shall be done with IP-68 water sheath in order to make water type joint as prescribe in IER. The cable must be checked for continuity of the jointing and no. of copper stands and its gauge must be conforming to IS or manufacturer's code of practice failing which, cable shall be rejected.

Note: The entire length of the cable must be adequately enough to connect pump set and panel, starter etc. and margin in loop shall be given to recover the need of future. It will have to be extended by the contractor in the event of length of cable fall short in course of SICT.

37. CABLE ENTRY:

The panels shall have provisions of cable entry from bottom. The removable cable gland plate shall be provided to make entry dust tight and vermin proof.

The panels shall have provisions inside for fixing the multicore cable glands. The cable glands support plate shall be 4 mm thick.

Cable entries to the panel shall be from the bottom unless otherwise specified. When called for, necessary number of cable glands of sizes to suit purchaser's internal cables to the panels shall be supplied. Cable glands shall be screwed type and made of brass.

38. MOUNTING:

38.1 All equipment in front of panel shall be of flush mounting type.

38.2 All equipment shall be so mounted that the removal and replacement may be accomplished individually without interruption of services to others.

38.3 All equipment inside the panel shall be so located that their terminals and adjustments are readily accessible for inspection or maintenance.

38.4 No equipment shall be mounted on the doors without prior approval Engineer in charge.

38.5 Wherever applicable Auxiliary bus bars for AC and P.T. circuits and other common service shall be provided near the top of the panels running through the entire length of the panels, shall be suitably insulated and along their run.

38.6 Fuses and links shall be provided for isolation of individual circuit from bus wires/bars without disturbing other circuits.

38.7 Wherever practicable, wiring shall be accommodated on the sides of the panel. Sharp bends shall be avoided.

38.8 Wiring shall be neatly bunched in groups by non-metallic cleats or bands. Each shall adequately supported along its run to prevent sagging and strain on the termination.

38.9 Wire termination shall be made with solder less compression type of tinned copper lugs which grip the conductor and insulation. Insulated sleeves shall be provided at all the wire terminations. Wire shall not be spliced between terminal points.

38.10 Tenderer shall be solely responsible for the completeness and correctness of the internal wiring and for the proper functioning of the connection equipment.

39 WIRING:

Panel shall be supplied completely wired indicating to equipment devices and terminal blocks and relays for external cable connections at the terminal blocks all the internal wiring shall be furnished by contacts / MCB/ MCCB. Panel wiring shall be securely supported neatly arranged readily accessible and connected to equipment's terminals and terminal blocks. Spare contact of auxiliary relays and switches shall be wired up to the terminal blocks and wiring shall be carried out with 650 volts grade PVC. Insulated single core,

standard copper conductor shall be 1.5mm for potential circuit and 2.5mm for current and control circuit. The minimum number of strands per conductor shall be three, flexible wires shall be used for wiring devices mounted on moving parts as swing panel door. Auxiliary bus bars for AC supply shall be provided inside the panel near the top of the panel running through the entire width of panel to accommodate 03 Nos rings CTs for instrumentation/ protection- fuses and links shall be provided for isolation of individual circuit from bus bars without disturbing other circuits. Wherever practicable wiring shall be accommodated on the sides of panel. Wiring shall be neatly bunched in groups by not Metallic cleats or bands, each shall be adequately supported along its running to prevent sagging and strain on the termination.

Wiring termination shall be made with solderless compression type of tined copper lugs which grips the conductor and insulation. Insulation sleeve shall be provided at all the wire terminations. Wire shall not be spliced between terminal points. Each wire shall be identified by both ends by plastic ferrules with wire designation in accordance with wiring diagram fitted inside the panel.

40 Instruments:

40.1 Indicating Instruments

(a) All electrical indicating instruments shall be circular 270° scale, 96 mm square electro- magnate coil instruments suitable for semi-flush mounting with only flange projecting on vertical panels.

(b) Instrument dials shall be white with black numerals and lettering knife edge painters and parallax fee dials shall be preferred.

(c) Instrument shall conform to IS:1248 and shall have an accuracy class of 2.0 or better.

(d) The number of digits provided shall be adequate to cover 1000 hours of operation.

(e) Current coils of meters shall have a continuous over load capacity of 200% for both accuracy as well as thermal limits. Also the coil shall withstand at least 10 times rated current for 0.5 seconds without loss of accuracy.

41 RELAYS:

40.1 All relays shall conform to IS:3231 or equivalent. They shall be suitable for semi-flush mounting with only flanges projecting on the front with connections from the rear.

40.2 Relays shall be rectangular in shape and shall have dust tight, transparent covers removable from the front.

40.3 All protective relays shall be in draw out cases with built in test facilities. Test block and switches shall be located just below each relay for testing unless otherwise specified. All auxiliary relay and timers shall be supplied in non-draw-out cases.

40.4 All relays shall be suitable for operation at 50 Hz, 415V, A.C. voltage operated relays and current operated relays shall be suitable for operation. A.C. auxiliary relays and timers shall be designed for the A.C. voltage and shall operate satisfactorily between 70% and 110% of rated voltage. Voltage operated relays shall have adequate thermal capacity for continuous operation.

40.5 All protective relays shall be provided with atleast two pair of potential free output contacts. Relays case shall have adequate number of terminals for making potential free connections, to the relay coils and spare contacts. Paralleling of contacts if any shall be done at the terminals on the casing of the relay.

40.6 All protective relays shall be provided with externally hand reset positive action operation indicator.

40.7 Timers shall be electromagnetic or thermal of latest improved type only. Short time delays in millisecond may be obtained by shading with copper lugs on auxiliary relays. This shall not affect the continuous rating of the relays.

40.8 All relays shall be self-next type unless otherwise specified.

40.9 Each relay shall have provision for easy isolation of trip circuit for the purpose of testing and maintenance.

40.10 All relays shall with stand a test as per relevant I.S.IO. code and standard.

40.11 Auxiliary seal in units provided on the protective relay shall be shunt reinforcement type.

41 CONTROL SWITCHES:

Control and instrument switches shall be rotary type suitable for semi flush mounting with access to connection from the back by the removal of the cover. It should not be possible to close the switch gear / MCCB with the door of it is when open and it should be possible to open the door of it only when the switch is in the off position. Mechanical position indicator on/off shall be provided.

MCCB shall be provided with facility for locking the panel with visible indication to show that panel is in operation.

Neutral link shall be disconnected type. All connection shall be preferably be done with spring washers and accessible for inspection.

42 MOULDED CASE CIRCUIT BREAKER –MCCB

MCCB should automatically isolate the electrical circuit under sustained overloads or short circuits. The constructional features shall be as per details given below:

Operating mechanism shall be quick make, quick break and trip free, independent of manual operation contacts. Housing shall be made of resistance insulating material having all parts of it enclosed in moulded housing. Terminal should be accessible for external connections.

Magnetic thermal release should have three bimetals given thermal overload protection and electromagnetic for short circuit protection. All releases should operate on common trip bar so that all the phases gate disconnected even when faults occur on only one of them. Silver alloy contacts should have long electric life. The mechanism should be so designed that they should be no arcing on the current carrying part of the contact system. There should be strong wipe action of the contact system for keeping the contacts surface clear of site films. It terminal should have large sufficient dimension to accept links or cable lugs. Adjacent phase terminals should be separate by insulating various with adequate clearances. Terminal configuration should permit straight through cabling.

43 BUS BARS:

03 Nos. Bus bars of adequate preferably 1.0 amp. for aluminium and 1.6 for copper Per squire mm at inrush current of motor starting shall be located in air insulated encloser. Direct or accidental contact should not be possible with bus bars and primary connections. Bus bars shall be silver / tinned faced. Spring washer shall be provided to ensure good contacts. In case aluminum connection are required, suitable bimetallic connections or all bus bars joints shall be silver faced.

Bus bar shall be adequately supported on cast resin insulators to withstand dynamic stresses due to short circuit. The bus bars support insulator shall conform to IS 2544. Bus bar shall be insulated with external PVC sleeves or other insulating material. The PVC used shall be of high temperature grade, 50-0 and shall possess good die electric properties- high tensile strength and good finish. The joints shall be covered with insulating tap's covering able to withstand temperature 85 degree size of bus bars shall be selected making them suitable to withstand high large current for 30 second.

Note: Miniature circuit breaker (MCB) is denied in place of MCCB MCB is meant for lighting purpose whereas isolator switch is forbidden.

44. MAIN PIPING AND VALVES:

Sl.No.	Particular	Unit
1.	MSDF Column pipe each available in 03mtr. long	Nos.
2.	MSDF Pipe 1.5mtr. long	Nos.
3.	MSDF Pipe 1.0mtr. long	No.
4.	CI DF bend (ISI mark)	No.
5.	CI AF Tee (ISI mark)	No.
6.	CI DF Sluice valve (ISI Mark)	Nos.
7-	CI DF Reflux valve (ISI Mark))	No.
8.	MS Fabricated DUMDUM	No.
9.	Nut Bolts & Packing.	Set
10.	SI column pipe clamp	Pairs
11	Orifice hole size as per design	No.

Note : Size of the main piping & valves must be corresponding to the velocity range from 0.90m/s to 2.0m/s and valves shall be preferably IVC / Kirloskar make.

45 M.S. COLUMN PIPE:

This shall be 150/100/80MM dia 7.1/5.4/4.8MM thick 3M long threaded and welded double flanged M.S. column pipe.

The flange shall be made up of 16/12/12MM thick M.S. flat respectively for 150/100/80MM sizes.

The flange shall have OD as 225/165 /155MM respectively for 150/100/80MM sizeswith cable grove.

The flange shall have 8/6/4 holes respectively suitable to 12MM bolt.

46 M.S. D/F PIPE:

This shall be 150/100/80MM M.S. Double flanged (D.F.) Pipe having thickness 7.1/5.4/4.8 MM respectively.

The flange size shall be standard having standard numbers of holes.

The length of D/F pipe shall be 1.5/1.0M.

The thickness of flange shall be 16 MM respectively for 150/100/80MM size.

47 D/F BEND:

This shall be 150/100/80MM Size 90 D/F ISI marked CI/DI bend.

48. A/F TEE:

This shall be 150/100/80MM size A/F (all flanged) ISI marked CI/DI Tee.

49. SLUICE VALVE:

This shall be 150/100/80MM size CI D/F Jal Nigam approved make ISI marked clockwise closing, non-rising stem type, sluice valve with hand wheel. Rating of the valve PN1.0

50. REFLUX VALVE:

This shall be 150/100/80MM size CI D/F Jal Nigam Approved make ISI marked reflux valve. Rating of the valve PN1.0

51. DUM DUM:

This shall be 350X200MM or 350X150MM or 300x150MM or 200x100MM & 200x80MM size M.S. fabricated adjustable height, twist & lock Dumdum having 7.1/5.4/4.8 mm pipe thickness, 10mm thick cover plate, 10mm thick 100mm wide ring, lower flange same as item No- 2 and upper flange same as in item No-3, also having provision for pressure gauge, depth gauge, double earthing & cable suitable to 200/300/350MM housing pipe.

52. NUT BOLT AND PACKING:

H.T. Rust resistant quality 12 MM size nut bolt for column pipe, Standard quality 5/8" size nut bolt for other flanges and 5mm thick Standard quality suitable size rubber picking for fitting .

53. COLUMN PIPE CLAMP:

This shall be 150/100/80 MM size S.I. column pipe clamp made up of 12mmx100mm flat having 4 holes suitable to 5/8'' bolt and 600mm total length including suitable length bolt

54. AUTOMATIC (SERVO) VOLTAGE STABILIZER FOR CONTINEOUS VOLTAGE SUPPLY AND REGULATION AT VARIATION ±1% :

Copper wound auto operated at input 250–500V & output 415V at ±1% correction accuracy Servo Type voltage stabilizer at each Tube well shall be provided as per details attached sheet at each Tube well filled with transformer oil conforming to relevant IS including PVC copper conductor cable in 3.0 core of suitable size conforming to relevant IS 1554 Part-1 heavy duty voltage grade 230V to 1100V from stabilizer to control panel/ starter as directed by Engineer in charge.

1.	Mode of operation	:	Auto operated
2.	Input supply voltage	:	250 Volt-500 Volt
3.	Output voltage	:	415 Voltat ±1% correction accuracy
4.	Type	:	Unbalance type, suitable for submersible motor, Industrial voltage stabilizer.
5.	IP	:	45
6.	Material of whole winding	:	Copper
7.	Material of core	:	Silicon 92 grade/ CRGO
8.	Material of body	:	2mm thick M.S. sheet
9.	Base	:	C.I. wheel mounted (detachable)
10.	Cooling	:	Oil immersed
11.	Cooling/ Insulation	:	Transformer oil cooled
12.	Voltage control arrangement	:	In each phase
13.	Votmeter with Indicator	:	In each phase

14. Painting : Double coat spray painting

15. transformer oil to be filled : Oil level di-electric filled as per IS 335

16. Additonal feature : Bypass / two earthing terminal/ auto and manual operational mode

16. The stabilizer should be guaranteed against manufacturing defect due to bad material faulty design and workmanship for a period of one year from the date of commissioning. Any item or part found defective during the shall be replace free of cost.

17. Main line at : 3 Steps

Step up : 5.0 Parts

Step down : 2.0 Parts

18. No of Volt meter of suitable range : 3 Nos.

No. of Toggle switch : 3 Nos.

No. of Rotary switch : 3 No

55. TOOLS:

This shall be a set of tools comprising of following items:

(i)	D-spanner set (6-17 mm)	1 Set.	(ii)	Hand air pump	1 No.
(iii)	Ring spanner (6-17mm)	1 Set	(iv)	Insulated cut Plier	1 No.
(v)	Pipe wrench 18"	1 No.	(vi)	Screw driver 12"	1 No.
(vii)	Hammer (500gm) with handle	1 No.	(viii)	Screw driver 8"	No.
(ix)	Tool box suitable size	1 No.	(x)	Tonge tester (AC/DC- 500A)	1 No.
(xi)	Electric safety hand gloves	1 Set	(xii)	Multimeter (AC/DC- 500A)	1 No.
(xiii)	Megger (AC/DC- 500V)	1 No.	(xiv)	Crimping tools	1 No.

56. LIFTING TACKLE:

This shall be 2.0 Tone capacity (tested at 3.0 tone) 4.5 mtr. lift INDEF/MORRIS make spur-gear chain pulley block. The chain pulley block shall be operated on the lower flange of the bridge girder and load chain shall be of alloy steel as per IS 2429 part-II. It shall be heat treated to give the ductility and toughness it shall be welded construction with a factor of safety not less than 5. The lifting hook shall be forged steel, he treated alloy or carbon steel. It shall be of single hook type provide with standard depress type safety latch. Hook shall be conforming to IS 3815. The brake for the lifting gear shall be screw and friction disc type and shall offer no resistance during hoisting. Overload test at 150% of raises load for chain pulley block and trolley, overload test of 125% of rated load and defection test with 100% of rated load. Test certificate of the manufacturer has to be submitted by the contractor.

57. POWER WIRING AND EARTHING

PVC insulated 3.5 core round aluminum power cable of required size, 1100 V grade confirming to IS 1554 part I heavy duty voltage grade 230V to 1100V accessible to earthing shall be supplied to connect UPPCL energy meter and 02 meter leads shall be left in spare for making connections . The size of cable shall be adequate to bear the brunt of in rush current at 45 degree ambient temperature. It shall also include 12mm thick sunmica top board size of board 3' x 1.5 and 4 Nosporcelien cutout of required capacity duly grouted on the wall is of paramount importance as per IER.

58 EARTHING:

Double plate earthingas of the entire electrical system shall be carried out and connected to permanent earthing plates buried in ground and surrounded with coke salt upto adequate depth where earth is encountered. It shall be consisting of the following:

GI Earth plates of 600 X 600 X 6 mm size as per latest relevant ISS/IER.

GI water pipes of required length and 40mm dia. As per latest relevant ISS/IER.

Aluminum Earth strip of adequate size as per relevant ISS/IER and in required quantities to cover complete installation in double run. The strip shall be without kinks and without any joints.
Necessary quantities of lugs and clamps etc. for proper earthing.
Necessary quantities of salt and coal shall be supplied at the time of erection.
Earth chamber CI box 300 X 300 mm as per ISS/IER.

NOTE:

i) The digging of pits for earthing and construction of suitable size earth chambers shall be done by the tenderer.

ii) The whole of the above work of power wiring and earthing shall be carried out to the entire satisfaction of Engineer Incharge and subject to the approval of UPPCL and also be accordance with IER and other Govt. regulations prescribed/amended upto date.

iii) The power wiring shall be done properly on MS clamps to be grouted on the wall. The submersible cable/copper lead will run through MS conduits on wall and floor through entire route.

59. TESTING OF EARTHING SYSTEM

59.1 Purchaser may ask to carry-out earth continuity tests earth resistance measurements and other tests in presence of Engineer in charge which in his opinion are necessary to prove that the system is in accordance with design and specifications. Contractor shall bear cost of all such tests.

60. EARTHING SYSTEM (APPLICABLE AS PER ACTUAL REQUIREMENT)

60.1 Sizes and number of earth leads for earthing various items and other technical particulars shall be as specified.

60.2 Earthing conductors are shown diagrammatically. Exact location of earthing conductors, earth electrodes and test pits, and earthing connections may be changed to suit the site conditions.

60.3 Earthing conductors in the building, running parallel to walls and columns shall not be less than 1500 mm away from the wall/column.

60.4 Suitable earth risers shall be provided if the equipment is not available while carrying out earthing connection.

60.5 Wherever earthing conductor passes through walls, galvanized iron sleeves shall be provided for the passage of earthing conductor. Water stop sleeves shall be provided, wherever earthing conductor enters the building from outside.

60.6 Wherever the conductors are to be buried, contractor shall coordinate with other civil contractors to ensure that the conductors are installed before concreting.

60.7 All connections shall be of low resistance. Contact resistance shall be minimum.

60.8 Steel conductors, above ground level shall be galvanized. All conductors shall be free from any defect. Earthing conductors shall not run in direct contact with control and other cables. Single core cable amounting shall be earthed at one end. The cable trays shall be earthed to main grid at least at two points and every 25 mt interval.

60.9 Earth testing at site is necessary to be demonstrated in the presence of engineer in charge. Earth resistance is restricted to less than 2 ohm. Failing which, payment shall not be paid.

61. PAINTING:

All sheet metal work shall be phosphated in accordance with the following procedure and in accordance with I.S. Code of Practice for Phosphating Iron and Steel after application of the primer, two coats of finishing synthetic enamel paint shall be applied, each coat followed by stoking. The colour of the finishing coat shall be as per purchaer approval. Finished painted appearance of panels shall present an aesthetically pleasing appearance free from dents and un-even surface. A small quantity of finishing paint shall be supplied for minor touching up required at site after the installation of panels. Main piping & valves and what's not, existing within pump house are also covered.

62. ERECTION:

The contractor shall undertake complete installation of the pumping plant along with associated

works such as switch gear, power wiring & earthing, main piping and valves, pressure & depth guage with air line and other things of the same types whatsoever, are required for proper completion of the installation, commission & testing in the presence of at least one approved senior English or Hindi speaking working erector to supervise the erection of the plant in the capacity of contractor representative. The contractor shall also provide sufficient Erectors skilled and good at mechanical, electrical and instrumental Engineering, such skilled, semiskilled, and unskilled laborer are necessary to ensure completion of the various sections of the installation works well in time. The contractor shall not remove any supervisory staff or laborer from site without prior approval of the Engineer's representatives. Installation work also make necessarypetty civil works such as cutting of wall and brick work/ concrete work dismantling and repairing with restoration works satisfaction of the Engineer in charge including watch and ward of the pumping plant until the commissioning and handing over proceedings are complete. Such works are to be completed without making the claim of extra payment.

63.TESTING:

Required mechanical and electrical equipment shall be tested at the place of OEM by UPJN OFFICIALS/THIRD PARTY,The contractor shall carry out the final tests on the pumping plant to ensure power consumption is as per schedule "E" furnished and all requirements as mentioned in respective specification if any. The contractor shall also carry out all other tests required either by himself and/or the Engineer to complete the plant etc. to supply systems and delivery of all works. The contractor shall maintain on the log book in English/Hindi of all test carried out and will handover certified copy of the same to the Engineer at the time of completion of the works.

65. SCOPE OF WORK (E&M) for 24x7 work

The E&M Scope of work includes but not limited to as per following

- Construction of required no of tube wells of different sizes and depth as per boq.
- Supply, installation, commissioning and testing of pumping plant with complete accessories for newly constructed/rebore/existing tube wells.
- Design, supply, installation, commissioning of SCADA automation of all tube well consisting of tube well, pumping plant, OHT, E&M Equipment used for 24x7 in DMAs & 3 months trial run of system. SCADA automation shall be required to operate the submersible pumps of suitable capacity installed in existing/rebore/new tube wells details described in SCADA scope specification. The work includes providing redundant PLC's / RTU's to collect the data and transmitting it on GSM/GPRS backbone to LCS/MCS.
- The work also includes supply of electromagnetic flow meter, Residual Chlorine analyzer, smart pressure transmitters, ultrasonic water level sensor, depth sensors, valve with actuators, smart energy meters, HMI web based Mobile app for viewing all parameters on real time, for tube wells and for delivery line for distribution outlet at OHT's, auto-phase reversal units are to be installed in each soft starter panel, actuated isolation valves, electromagnetic flow meter, flow control valves , pressure transmitter battery fitted or electricity based or both as per requirement in best engineering manner for DMAs.
- The quantities mentioned in schedule "G" are amended upto that limit as per actual design and requirement.
- Bidder have to arrange interconnection facilities with different control and commands center situated at District level/State level or any other platform without any extra cost. Whole responsibility will be of bidder on the direction of Engineer in charge.
- Before starting of work bidder have to take prior approval from the department for Design Drawing and Data sheet of SCADA architecture, SCADA screens, Logic, Mimics, Graphics, Report generating format, Historian activity etc. in coloured copy.
- All Running charges/recharge for GSM/GPRS system, internet broad band connection will be responsibility of bidder up to the defects liability period which shall be 24 months including operation & maintenance work with consumable items.

66 . General Scope of work (E&M) equipment:

Some General scope of above work for all district have mentioned herewith.

- Establishment of the SCADA system.

- Linking with existing billing system of concerned ULB if available and permitted or Development of a computerized billing system for concerning ULB, including supply, testing and installation of handheld /automatic biller of water charges from the consumers.
- Achievement of the performance targets for Network Pressure, 24x7 Continuity of water supply, Billing efficiency,
- redressal of customer complaints and reduction of NRW as per AMRUT 2.0 guidelines and UFW (Unaccounted for water) etc.
- NRW reduction and other project outcome bench mark must be achieved as per latest Amrut 2.0 24x7 guidelines
- Achieving 24X7 DFT Bench mark circulated by Government of India.

i) Design, supply, installation, testing & commissioning of direct online full-bore electromagnetic type flow measuring device, pressure transmitter equipment suitable for clear water, communicable to RTU and control station.

ii) Supply of required tools and spares for proper operation and maintenance of electrical-mechanical works.

iii) Design, supply, installation, testing & commissioning of SCADA/PLC operated chlorination system including dosing regulator with RTU, injector and chlorine sensor, leakage detector, alarm and other safety devices etc. for automation, operation, control, supervision and data acquisition of all residual chlorine sensor and operation accordingly.

iv) automation of existing OHT with supply, installation, testing and commissioning of required motor operated sluice valves (with positioning card), automatic level sensors, tank water outlet pH and TDS measurement unit and all communicable with RTU and LCS/CONTROL ROOM.

v) Supply of equipment layout drawings, technical specification and catalogue etc.

vi) Supply of Operation & Maintenance manual including manufacturer's manuals of the equipment supplied.

vii) Defect Liability period (DLP) with Operation and maintenance of all works (Civil and E&M) executed under this contract shall be 24 Months after trail and Run period, including consumables items except electricity consumption charges.

viii) Painting and protection of all buildings plant and equipment.

ix) Design, supply, installation, testing & commissioning of campus smart street LED lights, internal & external electrification of all buildings with fittings etc. all complete.

i) Application and arrangement of power connection from state power corporation. However necessary deposit or Charges shall be borne by department

x) Design, supply, installation, testing & commissioning of power factor correction equipment's.

xi) Design, supply, installation, testing & commissioning of all inter connecting cabling, pipe work, fittings, hardware fixing etc. which are required.

xii) Design, supply, installation, testing & commissioning of Local Control Station for SCADA with operation of all equipment's at the location intimated by the engineer including design, supply, installation, testing and commissioning of all required sensors, meters, RTU, SCADA Software, relevant equipment's for SCADA operation, Latest configuration computer, CPU, 600 DPI colour

inkjet A4 dual side Printer, black and white laser printer, UPS, Large Video screen of 65 inch of 2*1 matrix with required UPS, LED Display and other mandatory arrangements.

xiii) Design, supply, installation, testing & commissioning of 24*7 security surveillance IP Camera with required LED 32-inch display, 2 TB* 2 Nos. HDD, furniture and others required accessories at control room.

xiv) Design, supply, installation, testing & commissioning of sufficient capacity UPS at each OHTs as well as Tubewell for transferring data 24x7 at the time of electricity/power failure.

xv) Bidder has to arrange at least 2 nos leak detection tools as required in each ulb.

xvi) Factory testing of all required E/M equipment before dispatch as per direction by engineer in charge and as per prior approval of datasheet and QAP.

xvii) Bidder has to provide minimum 03 laptops to concerning e/m division separately for online monitoring of scada and other e/m equipment otherwise 50000 per laptop shall be deducted from the running bills of contractor

xviii) Handing over of all the system to concerning ULB after successful completion of the work.

The contractor shall also train the O&M staff provided by the Engineer for further operation & maintenance.

Supply of completion drawings of work done as per direction of Engineer-in-charge.

Defect liability period for work (including O&M) of twenty-Four (24) months after trial and performance run period of 3 months. Any defect occurred during this period shall be rectified by the contractor at his own cost.

The word "Supply" (or provide) as contained in this specification shall include the manufacture, insurance, purchase and acquisition of the plants, testing before dispatch, packing and protection, delivery to site, storage onsite, erection and installation, painting, testing when constructed and installed, commissioning and providing all skilled and unskilled personal, together with all the tackle, tools, transport and other items or supplies necessary for the complete installation and the execution of the work required and the supervision of the work.

67. MINIMUM STAFF REQUIRED PER ULB DURING TRIAL RUN, DLP:

SN	CATEGORY OF STAFF	MINIMUM QUALIFICATION	DEPLOYMENT PATTERN	AMOUNT TO BE DEDUCTED FROM BILL/MONTH/SHIFT IF NOT EMPLOYED
1	TECHNICIAN (MECHANICAL)	ITI	1 IN EACH SHIFT OF 8 HOURS	18000
2	TECHNICIAN (ELECTRICAL)	ITI	1 IN EACH SHIFT OF 8	18000

			HOURS	
3	TECHNICIAN (ELECTRONIC)	ITI	1 IN EACH SHIFT OF 8 HOURS	18000
4	SCADA OPERATOR AT MCS/LCS	EXPERIENCE IN SCADA OPERATIONS	1 IN EACH SHIFT OF 8 HOURS	25000

SPECIAL CONDITIONS OF CONTRACT FOR DLP (INCLUDING OPERAION AND CONSUMABLES EXCEPT ELECTRICITY) ALSO APPLICABLE FOR OPERATION & MAINTENANCE PERIOD OF 3 YEARS FOR WHICH SEPARATE COPNTRACT BOND WILL BE SIGNED BETWEEN BIDDER AND JAL NIGAM/ULB:

1. The activities proposed for O & M proposed are as follows:

Operation & Maintenance of Automation and SCADA system:

This will include operation & maintenance of all software, hardware, sensors, analysers, monitors, electrical equipment & wiring, actuators, flow meters, pressure sensors, energy meters, automated chlorinators etc. installed or repaired under this contract.

- Operation, Maintenance, Manage, Repairs of the water supply system (instrumentation and SCADA system as per BOQ) and Monitoring and Service Delivery Period during the contract period
- O & M of monitoring & control of Water network from master control station
- Responsible for providing Qualitative water supply to the connected facilities and maintaining the SCADA related infrastructure.
- Day to Day Operation & Maintenance of the system.
- Programming of PLC/RTU, repairs & calibration of instruments as and when needed.
- Operation & Maintenance of portable download devices as required.
- Weekly data to department on demand.
- Operation & Maintenance of the online calibration validation equipment
- Planned Preventive Maintenance of Instruments & PLC Panels and other accessories on monthly basis.
- Remote monitoring setup by technology.
- Training & awareness by presentations, meetings, etc once every year.
- Intensive maintenance training at site shall be given. Contractor shall arrange minimum 2 training programs per year to benefit its employee and the staff on good engineering practices and development in water supply and O&M.
- The primary objective of this project is real time remote monitoring & operation of proposed water supply to up to distribution network of all ulb on parameters like NRW reduction ,Flow, Pressure, Levels, Energy Consumption, Motor and Pumps control over existing infrastructure.

  The objectives of this initiative are following:

- Timely availability of real time operating parameters.
- Real time assessment of water supply.

- Reliable real time data for service level parameters
- To provide alert & alarm in case of deviation to set parameters
- To use latest technology effectively and efficiently to yield significant improvements in efficiency, productivity, profitability and competitive advantage to Society.
- To enable better decision making by providing real time data and a technological platform for effective integration with other communications and information management technology
- To provide significant opportunities for item-based process improvement and innovation in the functioning of Water network
- To provide consumption of water household wise through AMR/AMI meter linked with software to mcs and to generate bill as per requirement of engineer in charge

Current project is aimed at

- Real time Dashboard view of Overall system on healthiness
- Efficient utilization of water.
- Ease of coordination for maintenance activities from the source to the consumers-end.
- SCADA would enable Centralized control and monitoring of distribution and collection system which would in turn provide data for water modelling and energy use optimization, as well as predictive maintenance of distributed equipment. The central control room which would be established for automation of water Distribution ensures constant communication from the server to the remote units. The system will have configuration to support fail safe design for round the clock monitoring

2. MONTHLY & ANNUAL REPORTS AND MEETINGS

2.1 MONTHLY & ANNUAL REPORTS

Monthly production reports shall be prepared by the tenderer and submitted to the Department in three copies. The first monthly report shall cover the period up to the end of the first calendar month following the commencement date. There after every monthly report shall be submitted in the prescribed format within 7 days after the last day of the month to which it relates.

Reporting shall continue until the contractor has completed all work, which is known to be outstanding at the completion date.

Each Report shall include the following but shall not be limited to:

(1) Daily water flow meter reading at pumping stations, along with KWH meter reading at pumping stations and /water meter reading through AMR/AMI mete at scheduled time in formats prescribed by engineer in- charge.

(2) Monthly return of total production of the month & power consumed, power breaks down report, reason for low production etc.

(3) Annual reports in the prescribed format ▪ Review of the last months work production figures & program for next month’s production

▪ Payment issues if any

▪ Disputes if any

▪ Any other issues deemed necessary.

2.2 MONTHLY MEETINGS:

Monthly meeting shall be held in the office EE Jal Nigam as mutually fixed in advance. The proposed agenda for the meetings shall be exchanged at least 1 week in advance. It is required that a decision maker of the Contractor is present at the meetings so that binding decisions can be taken about outstanding issues. Generally, the following issues shall be discussed.

3. RIGHT OF ACCESS TO THE SITE DURING EXECUTION

The UPJN shall give the contractor right of access to all parts of the site. The site for execution of the work will be made available as soon as the work is awarded. In case, it is not possible for the UPJN to make the entire site available on the award of the work, the Bidder shall arrange his working.

Program accordingly. No claim, whatsoever, for not giving the site in full on award of the work or for giving the site gradually in parts will be tenable.

However, if and to the extent that the UPJN's failure was caused by any error or delay by the contractor, including an error in, or delay in the submission of, any of the contractor's documents, the contractor shall not be entitled to such extension of time.

The contractor shall be responsible for the adequacy, stability and the safety of all site operations, of all methods of construction and of all the works.

Procurement of spares for O&M :

For the pumping stations which awarded for O&M Contractor shall normally procure the genuine spares from the original manufacturer/sole distributor/authorized dealer of the make/equipment which is being replaced. Prior approval shall be obtained from UPJN in case of procurement from any other source.

4. THE SAFETY PROCEDURES

Adequate safety precautions against fire, flooding, lightening, electrical shocks and accident due to moving/ non-moving heavy equipment's shall be strictly observed by the contractor at his own cost. Suitable safety measures like boots, gloves, insulated tools, alarms, Chequered rubber sheets etc. shall be provided by the contractor at his own cost. A fully equipped necessary medical first aid box should be available at pump house at all time. In absence of observance of above safety precautions, the contractor shall be responsible for any unforeseen loss of the equipment or persons dealing with these equipment’s.

The contractor shall

• Comply with all applicable safety regulations.

• Take care for the safety of all persons entitled to be on the site.

• Make reasonable efforts to keep the site and the work clear of unnecessary obstruction so as to avoid danger to the persons deployed on O&M.

5. UN-FORESEENABLE DIFFICULTIES:

• The contractor shall be deemed to have obtained all necessary information as to risk, contingencies and other circumstances which may influence or affect the works.

• By signing the contract, the contractor accepts the total responsibility for having ascertained all difficulties and costs of successfully completing the works and

• The contract price shall not be adjusted to take account of any unforeseen difficulties or costs.

6. RIGHTS OF WAY AND FACILITIES The contractor shall bear all costs and charges for special and/or temporary rights of Way, which he may require, including those for access to the site. The contractor shall also obtain, at risk and costs, any additional facilities outside the site which he may require further purposes of the works.

However, the contractor shall be provided the site and all pump house campus to undertake the work of repair / renovation / rehabilitation.

7. SECURITY OF THE SITE

Unless otherwise stated in particulars conditions:

• The contractor shall be responsible for keeping unauthorized persons off the site, offices, campus etc. within the scope of works.

• Providing adequate manpower for the security of the material brought to the site for which payment has been made to the contractor.

8. RULES AND REGULATIONS APPLICABLE ON STAFF ENGAGED BY CONTRACTOR

Staff engaged for entire operation/ maintenance etc. shall have to be in accordance with the rules and regulation laid down by the Ministry of Labour Welfare, Govt. of India, The wages and other essential amenities, group insurance, compensation etc. shall be paid as per Government rules and all expenditure on this account shall be contractor's responsibility. The necessary registration under rules shall be mandatory.

The compensation due to loss of lives/ retrenchment etc. shall be borne by the contractor. The Department shall not bear any liability of the labours, as it is the entire responsibility of the contractor. He will be employer under labour/ factory act 1948 etc. and UPJN is only concerned with O&M through this contract.

The contractor is liable for engaging sufficient skilled staff for proper O&M of all machinery and pumping station as directed by Engineer in-charge.

SITE BOOKS

For the purpose of quick communication between the Engineer in Charge and the Contractor, site books shall be maintained at all sites, where work is being carried out, so as to be readily available. Any instructions or order which the Engineer in Charge may like to issue to the Contractor may be recorded by him in the site book and two copies thereof taken by him for his record.

9. TESTING OF PUMPS, FLOW METERS, and ENERGY METERS ETC.

The contractor shall submit test certification from the manufacturer for all new flow meter brought by him before installation at Pumping Stations and Tube Wells of design duty condition. Inspection/ testing charges for all Equipment(s) and material(s) if required for the work, the arrangement for inspection/testing and expenses thereto shall be borne by the contractor. All sorts of tools & plants required for operation and maintenance of the project shall be arranged by the contractor at his own cost. The UPJN will not provide any T&P. No extra payment will be allowed to contractor on this account. Contractor has to arrange all T & P required for O & M at his own cost and no claim on this account will be entertained.

1. In the event of any damage/loss of life and property during the O&M of the project, the contractor shall be solely responsible and liable for compensation and damages.

2. In the event of strike by the operation and maintenance staff employed by the contractor the UPJN shall be empowered to operate and maintain and pumping stations at the sole risk and cost of the contractor.

3. The contractor shall be responsible for any breakdown and appropriate amount will be recovered from his bill if the breakdown happened due to negligence of the contractor's staff. If breakdown is not attended within 12 hours for tube wells and 2 Hours for the pumps Houses, appropriate amount

i.e. @ Rs. 1000/- per hour per occasion will be recovered from his bill.

5. Contractor is responsible to maintain at least 90% of the desired flow in all the Zones, in event of contractor failing to maintain production with 90% of desired production in any zone, due to non-operation of pumps or pumping system he shall be penalized @ Rs.1000 per day per zone. In case if the production is less than 75% of desires flow for a particular day than a penalty of Rs. 2000 per day will be imposed for a particular zone. If contractor fails to maintain production less than 50% of desired flow than a penalty of Rs. 5000/Day will be imposed. If the contractor fails to produce 75% flow of desired flow for a consecutive three days, he shall be penalized Rs. 5000/Day additionally.

The period of non-availability of power at the sources shall be accounted for proportionately for comparison against the base line production in different zone during these days when power failure has occurred. Contractor will not be responsible if water is not available from water sources, or if there is failure in pipe lines or CWR/OHSR, Rising mains etc.

Leakage, if any, observed in pipeline shall be repaired within 6 hours and in no case should water supply remain interrupted more than 8 hrs a day.

Such occurrence of water supply interruption for 8 hrs a day shall not exceed twice a month, failing to which proportionate cost per day, derived from the quoted O&M rate for corresponding year in proportion to the affected households shall be deducted. Further, penalty @Rs 1000/such occurrence shall be recovered from dues payable to the contractor.

For initial 2 years proportionate cost per day derived from the retention amount to be released per year shall be deducted and further, penalty @Rs 1000/such occurrence shall be recovered from dues payable to the contractor.

6. Contractor has to carry out minor civil repair of pumping stations, building etc. as directed by Engineer in charge for which no extra payment shall be made. It also includes white washing, colour washing and painting of pump house, CWR etc. twice during the contract period first after completion of one year of the contract period and second after completion of fifth year.

7. Lighting inside and outside the pump houses shall be maintained by the contractor. The faulty tube lights & HPSV lamps or lighting fixtures/LED shall be repaired/ replaced by the contractor at his own cost. Failing to do the same, a compensation amounting to Rs. 100/- per day per site or as deemed suitable by Engineer in charge would be charged from the contractor.

8. Spares requirement for maintenance of pumping system including electrical installation at each pumping station should be kept normally in the stock. However, if found not available in stock then contractor shall have to arrange it immediately. Whenever any pump machinery or electrical accessories goes out of order the stock maintained by the contractor shall be accessible to the Engineer in charge all the time for inspection.

9. In case of sudden break down Engineer In-charge will decide whether the break down or losses is attributable to contractor's poor preventive maintenance or not. If break down is found on the part of contractor then suitable cost of repair/ breakdown /losses shall be recovered from his due payments. If not rectified / replaced the losses shall be recovered from his due payments.

10. Records of repair and spares consumed

10.1 Machinery History Sheet Register

Contractor shall maintain a register of History Sheet of all machinery at pumping station. Contractor shall enter periodical checking, preventative maintenance, break down maintenance, material consumed, old material received back for vertical turbine pump sets, energy efficient pump sets, switch gear. Contractor shall also enter total break - down hours of pump sets before any preventive or running maintenance of centrifugal pump sets/mono blocks. History sheet register shall be get verified by representative of Engineer in charge in a month.

10.2 Inspection Register

The contractor shall maintain an inspection register at Pumping Station. Contractor should produce the register whenever UPJN visit the head works. Compliance with date and time shall have to be recorded.

10.3 Register for Recording Maintenance Work at Pumping Station

The contractor shall maintain a register at pumping station showing details of work done at pumping station, other than preventive and maintenance. The contractor shall also enter the material consumed for that work.

All the pumping sets installed at pumping station shall be operated as per the schedule prescribed by Engineer-In-charge and as per the availability of the electrical power at adequate voltage. The engineer in charge, may also pre fix time schedule of 'start & stop" of any of the pumping set according to the demand of water or to facilitate repair & maintenance of the pipelines or to preventive maintenance.

SCOPE OF WORK FOR O&M OF PUMPING STATIONS, TUBE WELLS & OVER HEAD TANKS:

2.2 The scope of work for operation and maintenance of Various Pump Houses, Tube Wells &over Head Tanks as list attached in this RFP is on turn - key job and shall basically comprise of the following but not limited to:

(a) Operation and maintenance of equipment at tube well , oht , network and other places in the scheme.

• (b) Operation and maintenance (including preventive & periodical maintenance) of all Items installed, Tube Wells as stated above.

• (c) The contractor shall be responsible for operation and maintenance of all the materials under the project.

• (d) The contractor have to carry out routine check-up and preventive/ periodical maintenance of all the equipment/ machinery as per schedule, all the routine check- up & periodical/preventive maintenance of equipment/ machinery shall be undertaken as per manufacturers manual/ instructions and standard Engineering practice.

2.3 Arrangement of Spares

The contractor shall procure the spares for plant & machinery and to maintain an inventory of spares for likely requirement. Any spares required/ directed by Engineer in-charge shall have to be kept in stock.

2.4 Damages to U.P. Jal Nigam Equipment

Normally there should not be any break down. However if break down is found to happen because of damaged/ burning of any part of equipment then same shall have to be replaced/ repaired by the contractor at his cost without any loss of time.

2.5 Replacement of equipment and their parts Any

Any part of equipment is found necessary to be replaced during the preventive maintenance, which in the opinion of contractor may result break down, shall be replaced immediately under intimation in writing to the Engineer in-charge. The cost of such part/ equipment shall be borne by the contractor.

2.6 Period of Running Pump House in a Day

The pump sets in the pumping station are to be operated for 24 hours a day or as per direction of engineer in charge. The contractor shall have to keep his operating staff round the clock in three shifts so that pumping can be done round the clock. Contractor shall also be responsible for safety & security arrangements of all MEI equipment's at the pumping stations.

2.7 Up keeping of log Books and Records:

The following records shall be maintained and produced periodically by the contractor for proper monitoring by Engineer in-charge (As per performa to be decided by the UPJN)

- (a) Daily Log book showing pressure, discharge, voltage, current, temperature of rewinding, temperature of bearing of motors, level in CWR, interruption of power if any, hourly PF (to be recorded on basis of U.P. Jal Nigam meter) etc.
- (b) History sheets of overhauling / maintenance/ replacement electrical/ mechanical equipment's, which will be duly verified by the in-charge of pumping station. 2.8 Inspection/ Observation register will be maintained at each pumping station by the contractor. Instruction recorded in the register shall be complied immediately under the direction of Engineer in charge & compliance shall be recorded in the books.

The observations in the log book should be recorded on hourly basis, printed log books shall be provided by the contractor at his own cost. The log books shall be securely kept in the pump house under the charge of a responsible person and shall be made available to any officer of the U.P. Jal Nigam meter on demand. Log books of previous month shall be deposited to the BSCL/ U.P. Jal Nigam meter concern every month. All the log books will be deposited to the Engineer in charge after completion of the contract. .

2.9 For the purpose of operating pumps as above, it shall be the responsibility of the contractor to properly control, operate, maintain and safely keep all electrical/ Mechanical/ instrumentation units such as pump, motor, HT/LT panel, battery charger, ICP panels, capacitors etc. in working order.

2.1**0 Periodically maintenance and overhauling of equipment**

Pumps / motors / cranes, exhaust fans, diesel generating set/ dewatering pump and all other equipment fitting etc. shall be operated and periodically overhauled as prescribed in the manuals provided by the manufacturer's standards, as per direction of Engineer in charge and schedule in RFP document.

2.11 All electrical installations shall also be operated and maintained periodically and checked for its performance as per manual provided by the manufacturer's standards, as per directions of Engineer in-charge and schedule.

2.12 All type of valves and other apparatus shall also be operated and periodically maintained as per manufacturers manual & standards.

2.13 All measuring equipment/devices for measuring pressure discharge/levels etc. shall be operated and periodically maintained as per manufacturers manual.

2.14 Measuring equipment/devices relay etc. Requiring calibration or testing will be get tested and calibrated from manufacturers, authorized/reputed firms for which no extra payment shall be given to the contractor it is deemed to be included in the financial offer of the tender.

2.15 Contractor shall prepare maps of schematic arrangement of Pumping Station and display in Pump House building and within a period of 3 months' time after award of contract.

COMMUNICATION SYSTEM

3.1 Contractor will have to keep control room 24 hours operational during the contract period.

3.2 In the entire 3 shifts, personnel will have to be provided by contractor at control room for keeping all the information & record regarding running of project i.e., Pumping machinery, power failure, total production, level of OHT as well as any type of break down in system.

3.3 All necessary stationary for record keeping at control room and log books etc. will have to be provided by the contractor free of cost.

4. O&M OF PUMPING MACHINERY

4.1 PUMP

A. OPERATION

Running of pumps through motors as and when required to meet out the required quantity of water.

B. PREVENTIVE MAINTENANCE

B.1 Daily Observation

1. Check for any undue noise or vibration.

2. Reading of pressure, voltage and current is to be entered in log book after each hour.

B.3 Annual Inspection

1. All instruments and flow meters if installed, should be recalibrated.

2. Pump should be tested to determine whether proper performance is being obtained.

C. BREAK DOWN MAINTENANCE

1. Opening of the casing, rotor assembly and find out the reasons for break down.

2. All modification, rectification, replacement shall be done except impeller. The impeller shall be referred to original manufacturer and get it repaired or replaced.

C. BREAK DOWN MAINTENANCE

6 L.T. PANEL

A. OPERATION

Making of circuit breakers ON/OFF of all the motors, fans, lights, and other fittings equipment's as and when required.

B. PREVENTIVE MAINTENANCE

B.1 Daily Observation

1. Check the phase indicating lamps.

2. Note reading of voltage, current, frequency etc.

3. Note energy meter readings.

4. Checking of all ACB/OCB/MCCB and its functioning, mountings etc.

B.2 Monthly Observation

1. Examine contacts of relay and circuit breaker. Clean, if necessary.

2. Check setting of over current relay, No volt coil and tripping mechanism and oil in dashpot relay.

B.3 Quarterly Observation

1. Check fixed and moving contacts o the circuit breakers/switches. Check and smoothen contacts with fine glass paper or file.

2. Check condition and quantity of oil/liquid in circuit breaker, auto transformer starter and rotor controller.

B.4 Semi Annual Observation

1. Check for corrosion and take remedial measures. Check by megger the insulation resistance of switches, bus bar, starter-terminals, autotransformer, etc for phase to - earth and phase - to - phase, resistance.

B.5 Annual Observation

1. All indicating meters should be calibrated.

2. Checking of control voltage at panels, and rectification.

3. Checking of all chutes its cleaning, greasing and replacement if needed.

4. Checking of operation mechanism for closing tripping etc.

5. Checking of dust, moisture, discoloration in chassis and checking of electrical connection.

C. BREAK DOWN MAINTENANCE

1. Do operating mechanism replacement if found defective.

2. Replace push buttons, switches, meters etc. if found defective

8 DISCONNECTING SWITCHES

A. OPERATION

It is operated by hand level as and when required OR ON/OFF POSITION.

B. PREVENTIVE MAINTENANCE

1. Checking for nuts, bolts, conductor connections on insulators etc. tightening if found loose/and do replacement if found broken.

2. Checking of contacts its greasing and replacement if found burnt out or damaged.

3. Lever mechanism springs, locking etc. are to be checked.

4. Check the earth switch for satisfactory working.

C. BREAK DOWN MAINTENANCE

1. Replacement of the part/complete items as required/needed.

2. Check and replace the earth switches completely.

NEVER DO WHEN SOME REPAIR IS GOING ON THE OUTGOING CIRCUITS.

9 SLUICE VALVE /BUTTER FLY VALVES

A. OPERATION

Making the valve open and close as and when necessarily.

B. PREVENTIVE MAINTENANCE

1. Checking for full travel/rotation of the gate of the valve

2. Checking of the Lubrication and removal of leakage or other defect if found.

3. Placing of the gland in the stuffing box and lighting of nut & bolts.

10 ZERO VELOCITY VALVE

A. PREVENTIVE MAINTENANCE

1. Checking of noise and vibration hydraulic pressure.

2. Checking of bye pass valve operation.

3. Checking hydraulic control of gate.

4. Calibration of spring.

B. BREAK DOWN MAINTENANCE

Replacement of any broken part if found with good one or repair one.

11 EXPANSIONS JOINT

A. PREVENTIVE MAINTENANCE

1. Removal of leakage of zero velocity valves.

2. Tightening of nut and bolts.

B. BREAK DOWN MAINTENANCE

Removal of Leakage by replacing gland packing including replacement of damaged nut bolt.

12 NON RETURN VALVES

A. OPERATION

Checking of the noise, vibration etc. when the valve gates open close during the pump operation.

B. BREAK DOWN MAINTENANCE

1. Replacement of any broken parts if found with good one or repaired one.

2. Replacement of nut and bolts if found defective/broken etc.

13 SUCTION/ DELIVERY PIPING

A. OPERATION

1. Checking of line pressure, suction pressure, and delivery pressure and valve position.

2. Doing ON/OFF position of dismantling joints while replacement of any requirement in the assembly line if needed.

B. PREVENTIVE MAINTENANCE

1. Checking of tightening of nut bolts etc.

C. BREAK DOWN MAINTENANCE

1. Replacement of nuts, bolts, pressure gauges, associated pipeline installations on assembling if found defective.

14 EARTHING AND LIGHTENING PROTECTION UNIT

A. PREVENTIVE MAINTENANCE

1. Checking of terminals, joints of conductor strips and connection with pits.

2. Checking of unit series resistance, shunt capacitance, leakage current etc. as and when required.

B. BREAK DOWN MAINTENANCE

1. Replacement of parts/items, jointing of conductor strips, terminals if found defective.

15 CABLES AND CABLES TRAYS

A. OPERATION

1. Checking of heating of cables by digital thermometer.

B. PREVENTIVE MAINTENANCE

1. Cleaning of cables and cables trays from dust, dirt, oil, grease etc.

2. Entries in the pump house should be restricted from mouse and other small insect/animals/birds etc.

C. BREAK DOWN MAINTENANCE

Replacement of damaged one with good one if found.

NEVER USE SHARP IRON BLADES ON CABLES

16 LIGHTING/ ILLUMINATION SYSTEM

A. OPERATION

Making ON/OFF through switches the necessary illumination required in the pump house switch yard and around campus.

B. PREVENTIVE MAINTENANCE

Checking of the terminals, electrical connection, mechanical fittings/fixtures in position for its satisfactorily.

C. BREAK DOWN MAINTENANCE

Replacement of parts, items etc, if found defective/damaged/burnt out with good one of reputed equivalent make.

NEVER ON THE SWITCHES WHEN PARTICULAR FEEDER LINE IS UNDER REPAIR.

17. During O&M Period Charges for Electric consumption will not be in scope of bidder .it will be responsibility of ulb.

SCHEDULE OF PREVENTIVE MAINTENANCE

NOTE:

1. All the routine checkup, Preventive/periodicals maintenance of equipment's shall be under taken as per manufacturer manuals/instruction and standard Engineering practice.

2. General cleanness, removal of dust, dir, grease, oil etc, from the equipment's and pump houses shall have to be carried out daily.

3. Frequency of works to be undertaken is marked by asterix in appropriate column.

SCHEDULE OF MAINTENANCE

Daily	Weekly	Fort month	Three months	Six months	Yearly
PUMP					
Cooling					
Water flow					
Vibration					
MOTOR					
Installation					
Earthing					
Terminal box with					
cable					
Vibrations					
I.R. Value					
L.T. PANEL					

List of Preferred Makes

IMPORTANT:

Instructions issued by Chief Engineer (Purchase) letter no. 2291/Karya/General/2121-52/2019/82 dated 16.08.2019 and its subsequent amendments will form part of the Agreement. The salient features of instructions are as under-

i. The requirement of registration of suppliers of pipes is waived. The contractors shall buy ISI marked pipes directly from the manufacturers of ISI marked pipes directly. Such manufacturers shall have to get their factory inspected by M/s Crown Agents (India) Pvt. Ltd, 405, International Trade Tower, Nehru Place, New Delhi. The contractor will have to submit the certificate of successful inspection within a month of obtaining consent of divisional officer. The firm will be eligible to supply only after successful inspection as above.

- The manufacturers who have got their factory successfully inspected will not be required to have such inspection again. In other words it will be a onetime arrangement.
- Third Party pre-delivery inspection of shall be got done by any of the following firms- M/s SGS India Pvt. Ltd. Gurugram, M/s Crown Agents (India) Pvt. Ltd, New Delhi/M/s Elites India Pvt. Ltd. New Delhi/ M/s CIPAT, Lucknow.

ii. ISI Mark 'fittings and specials' shall be directly procured from manufacturers of ISI marked 'fittings and specials'. However pre-delivery inspection shall be required from third party inspecting agencies mentioned above.

iii. Electrical and Mechanical equipments shall be procured from the manufacturers/brands approved by Chief Engineer (E&M), U P Jal Nigam, Lucknow. However pre-delivery inspection shall be carried out by concerned Superintending Engineer (E&M), Executive Engineer (E&M) or Assistant Engineer (E&M).

iv. If a contractor desires to use E&M equipments not listed above he shall proceed as below-

a. In case such manufacturer is from India, it should have a valid ISI License for the product, its testing lab should be accredited by NABL and equipments should be properly calibrated. The contractor shall submit all these documents/credentials with the divisional officer who will then upon his satisfaction allow the materials to be supplied at site.

b. In case such manufacturer is from outside India, it should have a valid License equivalent to ISI License for the product, its testing lab should be accredited by an agency equivalent to NABL belonging to the particular country and their equipments should be properly calibrated. The contractor shall submit all these documents/credentials with the divisional officer who will then upon his satisfaction allow the materials to be supplied at site.

c. The products manufactured in India shall be inspected by concerned Superintending Engineer (E&M), Executive Engineer (E&M) or Assistant Engineer (E&M) before delivery. The divisional officer may seek advice from Nodal Chief Engineer.
Under no circumstances any material will be brought at site without pre-delivery inspection.

Some of the makes approved by CE E/M up jalnigm (nagariya) lucknow are below for ready reference:

ई–मेल : ceiwupjn@gmail.com

कार्यालय मुख्य अभियन्ता (वि०/याँ०)

उ० प्र० जल निगम (नगरीय), लखनऊ
प्रधान कार्यालय 6, राणा प्रताप मार्ग, लखनऊ – 226 001

पत्रांक ५४५ /मु०अभि० (वि०/याँ०)/2062–0063/22 दिनाँक: ३१ /१२ /2022

समस्त अधीक्षण अभियन्ता (वि०/याँ०)
उ०प्र० जल निगम (नगरीय)
लखनऊ/प्रयागराज/आगरा/
गाजियाबाद।

विषयः–वि०/याँ० कार्यों से सम्बन्धित विभिन्न उपकरणों के मेक के सम्बन्ध में।

उपरोक्त विषयक वि०/याँ० कार्यों की निविदाओं में सम्मिलित विभिन्न उपकरणों के मेक में एकरूपता की दृष्टि से विभिन्न उपकरणों के मेक की सूची समय–समय पर जारी की गयी है। नवीनतम सूची संलग्न कर इस आशय से प्रेषित की जा रही है कि वि०/याँ० कार्यों की निविदाओं में आवश्यकतानुसार विभिन्न उपकरणों के मेक संलग्न सूची के अनुसार सम्मिलित करना सुनिश्चित करें।

संलग्नकः–उपरोक्तानुसार।

31/12/22

(अरूण कुमार)
मुख्य अभियन्ता (वि०/याँ०)

पृ०सं० एवं दिनांक उपरोक्तानुसार
प्रतिलिपि निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषितः–

1. समस्त मुख्य अभियन्ता (क्षेत्रीय), उ०प्र० जल निगम (नगरीय), लखनऊ/प्रयागराज/आगरा/गाजियाबाद/कानपुर/गोरखपुर।
2. समस्त अधि०अभि० (वि०/याँ०)/परि०प्रबन्धक(वि०/याँ०)/(गंगा/यमुना/गोमती), उ०प्र० जल निगम (नगरीय)।

मुख्य अभियन्ता (वि०/याँ०)

Office of The Chief Engineer (E/M), U.P Jal Nigam (URBAN), Lucknow

Make list for E/M Project

Validity Status as on 31-12-2022

(A) ELECTRICAL

SL. No.	ITEMS/EQUIPMENTS	MANUFACTURER/VENDOR (Validity Date)
1	2	3
1	LT Motor, Induction Motor, AC Drive	LHP(10.06.2024), C.G. (18.07.2024)
2	LT/L.V. Electrical Control Panel &, Distribution Board/MCC/PMCC Panel	E-SQUARE SWITCHGEARS(18.02.2023), Schneider Electric(19.02.2023), UPAPL(16.02.24), SWATI (26.04.2024), Kandi (16.05.2024), Krypton (28.05.2024) SONAL(15.06.2024), CORONET ENGINEERS (09.09.2024) WUNDER(09.09.2024), UNISCADA (11.10.2024) AEC (01.11.2024), NEC (01.12.2024), TRANSCON POWER (20.12.2024), KEC (21.12.2024), SANC (30.12.2024), RST (05.08.2024) SUBTECH (06.09.2025)
3	HT Electrical Control Panel, VCB breaker	E-SQUARE SWITCHGEARS(18.02.2023), UPAPL(16.02.24), SWATI (26.04.2024), AEC (01.11.2024), KEC (21.12.2024), MEGAWIN (24.07.2025)
4	Distribution Transformer	TELAWNE(31.01.2023), Schneider Electric(19.02.2023), SERVOSTAR (12-09-24), SONAL(15.06.2024), VEI (22.10.2024), "VARDHMAN ELECTRO-MECH" (21.12.2024), ICON (23.12.2024),
5	**Switchgear-** Indicating Digital Meters, MCB, MCCB,RCCB, Motor Protection Relays, Relays, Air Circuit Breakers (LT), Fuse Conductor, Isolator	Schneider Electric(19.02.2023), E-SQUARE SWITCHGEARS(18.02.2023), RST (05.08.2024), SIMPLEX(25.08.2024), Industrial IT (29.12.2024), MEGAWIN (24.07.2025), C&S (12.12.2025), Havells (25.12.2025)
6	Servo Voltage Stabilizers/Automatic Voltage Stabilizers	SELVON (29.12.2025), SSNAB(25.03.2024), SONAL(15.06.2024), SPECTRON (25.08.2024), ICON (23.12.2024), Servocon (26.12.24), Blue Bird (04.09.2025), HPCS (11.03.2023)
7	Soft Starter/Starter	E-SQUARE SWITCHGEARS(18.02.2023), UNISCADA (11.10.2024) INNOVATIVE TECHNOMICS(10.02.23), CG (09.07.2024), SANC (30.12.2024)
8	Automatic Power Factor Control Panels	E-SQUARE SWITCHGEARS(18.02.2023), RST (05.08.2024)
9	Diesel Engines for D.G. set/Water Cooled Diesel Genset	Escort (10.08.2024)
10	Solar Water Pumps, Centrifugal Mono-Block, Open and Borewell, Submersibles and Solar powered pump set	SILCEF (31-12-2023), Falcon (13-09-2024),), JASCO (23.03.2024), FLOTECH PUMPS (06.07.2025).
11	HT/LT, Solar Panel, Solar Photo, Voltaic Module Panel, Solar PV Module	Novasys (04.02.2023), WAAREE (19.03.2023), Sun Automate (25.11.2023), INA (11.02.2024), SONAL(15.06.2024), GAUTAM SOLAR (22.06.2024), BRAWN (22.06.2024), GOLDI (25.08.2024), PREMIER (12-09-2024) NOVUS GREEN (25.03.2025), Navitas Solar (16.06.2025).
12	Deferent Type Indore & Outdoor and Solar LED Light	Instapower (17.03.2024), RST (06.08.2024)
13	ACSR Conductors	**UPPCL Approved**
14	Wires & Cables	V-Mark(11-02-2024, Swarn (28.06.2024),Cords(25-07-2024), Special Cable (02.07.2024), KVVS(28.07.2024), DARBAR (21.11.2024), NEC (01.12.2024), GEMSCAB (12.12.2024), KEC (21.12.2024), VISHAL (27.06.2025), PARAFLEX (06.07.2025) Axelon (20.12.2025) KEY (18.08.2024), GRANDLAY (13.07.2024)
15	Control Instrumentation Flexible & Submersible Cords	Cords (25.07.2024)
16	Cable trays	Udhat (04.02.23)

(B) MECHANICAL

SL. No.	ITEMS/EQUIPMENTS	MANUFACTURER/VENDOR (Validity Date)
1	2	3
0.1	**Various type of Pump Set**	
1.1	Clear Water Submersible pump Motor set	Xylem (31.03.2024), ROCKWELL (01.06.2024), UNNATI(12.08.2024), MAK (02.09.2024), LUBI (07.09.2024), Calama (30.10.2025), Aqua (09.11.2025), Chandra (29.12.2025).Flotech (06.07.2022)
1.2	Horizontal Split Casing Pumps (HSCL)	FLOWMORE(13.06.2024), Kishor (04.08.2024).
1.3	Clear Water Horizontal, Submerged Centrifugal pump, submerged Centrifugal Pumpsets (HCF)	Aqua (09.11.2025), Flowmore (13.06.2024). MBH (31.12.2023)
1.4	V.T Pumps(Raw, Clear Water)	Flowmore (13.06.2024), Chandra (29. 12.2025), Continental Indepth (24.05.2024), Aqua (09.11.2025), JASCO (23.03.2024).
1.5	Non clog Sewage submersible/V.T. Pumps	MBH(31.12.2023), JASCO (23.03.2024), Continental Indepth (24.05.2024), Kishor(04.08.2024), HET(16.08.2024), Aqua (09.11.2025).
1.6	Screw Pumps	Positive (03.03.2024), Risansi (27.01.2023).
0.2	**Various type of Main Piping & Valves**	
2.1	All Types C.I./D.I. Valves & C.I./D.I. fittings,	Sigmaflow (11-02-2024), "IVC"(Nashik) (12.09.2024), IVC KolKata (26.01.2024), IVI KolKata (26.01.2024, AV (Industrial) (21-01-2024), Parchure (12.01.2024), Infra (08.02.2024), JUPITER (05.04.2024), R.G. Industries (30.06.2024), Sachdeva (30.06.2024), PURI (27.07.2024), AARKO(02.08.2024), Cair (23.08.2024), MARSH (03.09.2024), Kartar (03.09.2024), AVK (10.07.2025), SARKER (30.10.2025), SSPR (17.11.2025).
2.2	Sluice Gate	Micro Transmission Systems (24.06.2023), Parchure (12.01.2024), IVC KolKata (26.01.2024), IVI KolKata (26.01.2024), Cair (23.08.2024), SARKER (30.10.2025) JUPITER (05.04.2024), Marsh (04.09.2024).
2.3	Electrical Actuator	Micro Transmission Systems (24.06.2023), AUMA (25.11.2024) VOLTAS (Universal MPESL) (23.07.2024), Cair (23.08.2024).
2.4	Flow Meter-Electromagnetic, Ultrasonic, Fuel, Torbine, BTU/HEAT Meter	EUREKA INDUSTRIAL(16.01.2023),TIPL (19.02.2023), Flowtech (23.03.2024), ADDMAS (25.03.2024), MANAS (All Types Flowmeters) (28.07.2024), Atlantech (01.08.2024), ABB (07.08.2024), ELECTRONET(24.08.2024), AAROHI (03.09.2024), SAPCON (22.09.2025), UPC (19.10.2025), APLISENS (29.12.2024) Dwyer , (30.12.2024) MIRRANT (23.11.2025).
2.5	Water Meter	Everest (19.01.2023), UPC (19.10.2025).
2.6	Water Storage tank	Fresh flow (07.11.2023), UROPLAST(19.01.2023, Dhara (29.01.2024)
0.3	**Various type of Anlayzer**	ABB (07.08.2024), Axis (04.08.2025).
4	**Various type of dosing Pumps & Chlorination Systems**	
4.1	Chlorinator (STP,WTP), Dozer, Dozer Pump (Electro-mechanical), GAS/Liquid Chlorination System	Supreme Technology (26.08.2024), Industrial Devies (24.08.2024), JET CLEAN (16.12.2024), PICO DOSE (28.12.2024), Toshcom Jesco (10.07.2025) Chloro Tech (22.08.2025) CMC (30.10.2025), Positive (03.03.2024).
4.2	Fluoride, Arsenic, Iron Removal & R.O. Plant	UNICARE (21.06.2024), VOLTAS (Universal MPESL) (23.07.2024, ADWYN (16.02.2024).
5	**Silver Ionization Disinfection**	Senco (23.09.2025), RUTSUN (23.09.2025), JET CLEAN (16.12.2024).
6	**Various type of Lifting Tackles & Cranes**	
6.1	Lifting Tackles, Cranes Electrics Hoists & Chain Pulley Block	Abhay (27.07.2024).
7	**Scada Automation & Instrumentation**	
7.1	Analytical, Process Control, Scientific Instruments & Accessories	TOSHCON (10.07.2025).
7.2	PLC,SCADA /Automation	Emerson (17.02.2023) Schneider Electric(19.02.2023), Cimcom (14.12.23), iCAM(08-02-2024), ABB(17.03.2024), SWATI (26.04.2024), MCOM Technology(23.08.2024), PHOENIS CONTACT (22.11.2023), UNISCADA (11.10.2024), YOKOGAWA (26.09.2024), Industrial IT (29.12.2024), Axis (04.08.2025)
7.3	Large Video Screen, Industrial Video Screen,CCTV Systems	Delta (17.02.2023),TIPL (19.02.2023), SAN TELEQUIP (11.12.2025)
7.4	Level Instrument, Process Automation System	TIPL (19.02.2023), SAPCON (22.09.2025). Vega (22.12.2025)

7.5	Temperature Transmitter, Temperature Sencor,Pressure Transmitter level, Pressure/ Temperature Gages	TIPL (19.02.2023), ABB (07.08.2024), MASS (23.08.2024), ELECTRONET (24.08.2024), SAPCON (22.09.2025), APLISENS(29.12.2024) Dwyer (30.12.2024), Vega (22.12.2025).
7.6	Process Equipment/Software	Parchure (12.01.2024).
8	**Various type of STP & Equipments**	
8.1	Degrittor mechanism, Clarifier, Thickener, Clarifloculator, Diffuser, Decantor Centrifuge & Moving weir, Agitator,	Parchure (12.01.2024) W2P (14.12.2025).
8.2	Mechanical/Manual/Fine screen, Grit Mechanism/ Sludge thickener	Micro Transmission Systems (24.06.2023) Parchure (12.01.2024), Appllo (04.04.2024), VOLTAS (Universal MPESL) (23.07.2024).
8.3	Mechanical Multi Rack & Step Type Screens, Conveyers, Belt Filter Press with Sludge Thickner, Aerators/Mixers, Odor Controls Systems, Grit Separator	EUROTEK (28.02.2023), Micro Transmission Systems(24.06.2023) Parchure (12.01.2024), VOLTAS (Universal MPESL) (23.07.2024), Positive (03.03.2024), W2P (14.12.2025).
8.4	Sludge Dewatering Machine (Screw Press), Sludge Dryer's Clarifier, DAF System, Sand & Carbon Filters/ Screw dehydrator	SNP (15.12.2024), WELCOME (24.10.2024), AVALON (01.11.2024) Micro Transmission Systems(24.06.2023)
8.5	Model UV500, UV500-Compact, UV600, CHLSET, TURB200, ELPH-etc COD, TOC, BOD, pH, TSS, NH4, NO3, Clour, TDS, Silica, Iron etc.	TETHYS (19.12.2024)
8.6	Liquid Waste Handling Equipment of Various Types & Capacities, Solid Waste Collection and transportation Equipment of Various Types and Capacities, Range of Sweeping Machines and other special purpose equipment of Various Types and Capacities.	BES Engineering Solution (27.12.2024)
8.7	Compressor, Turbo ,Roots & Lobe Blower, Air Blower	Airvac (17.02.2023), Gardner BETA BLOWERS (16.08.23), TMVT (01-02-2024), ACME AIR Equipments(05.08.2024) TurboMAX (22.08.2025)
8.8	Cloth Disc Filters	"EUROTEK" (28.02.2023)

N.B.:- 1. Any other equipment whose make is not mentioned above may be considered subject to approval by the Chief Engineer (E/M).
2. Any make approved by U.P. Jal Nigam (Urban) missing in this list whose validity still exist shall be included in this list after representation received and considered by this office.

31/12/22

(Arun Kumar)
Chief Engineer (E/M),
U.P. Jal Nigam (Urban), Lucknow.

SECTION – 6

SCHEDULES

PROFORMA OF SCHEDULES

SCHEDULE-"A"

LOCATION OF SITE:"

"Survey, Soil investigation, Design, Supply of all materials, T&P etc. required for completion of 24X7 Water Supply Scheme in selected wards of 23 towns on TURNKEY basis: namely Ward 25 (Partial), Modipone Colony and Kaveri Enclave), Modi Nagar, Distt Ghaziabad; Kavinagar (Operational Zone-1), Ghaziabad; Ward No.-18, NPP Baraut, Distt. Baghpat;, Ward-03 (Yamuna Puram), Bulandshahar Ward-22, NPP, Khurja, Distt. Bulandshahar; Ward-20 (partial of Ramgarhi and Rafiq Nagar), Hapur; Ward-32, Meerut. Ward-30, Muzaffarnagar; Ward-8, Shamli; Ward-21, Partially 37 & 39, Saharanpur; Ward 16, (Buddi Vihar), Moradabad; Ward 04, (Krishna Vihar), NPP, Rampur; Ward 04, (Shahzadi Sarai), NPP, Sambhal; Ward 15 (Power House) NPP, Chandausi; Ward 08, (Peergarh), Amroha; Awas Vikas Colony (Sector 9 & 10), Sikandra, Agra; Suresh Nagar Operating Zone, Firozabad; Mainpuri Ward No. 2, Avas Vikas, District – Hathras; Kasganj; Shanti Nagar Operating Zone, Etah. Ward 33, Aligarh."The scope of work includes, but not limited to:

(i) GIS survey of the selected wards for Direct From Tap (24x7)water supply. Validation and Condition assessment of the existing water supply components, including distribution network. Updating of the network map: GIS map of the network.

(ii) Formation of Zones/ District Meter Areas.

(iii) Consumer survey, number of current consumers, location of consumers and assessment ofZones/ District Meter Area wise water demand.

(iv) Development of the Hydraulic Model and Hydraulic design and analysis through Water Gems.

(v) Identification of Average Zonal Pressure (AZP) and Critical Pressure Points (CPP) for eachof the DMAs and providing of data logger on the same.

(vi) Setting up of baseline levels for 24 x 7 water supplies.

(vii) Rehabilitation of existing tube well/ Construction of tube wells, procurement & erection ofpumps, execution of associated Electrical, Instrumentation and Mechanical works. IncludingPLC, SCADA automation of all tube wells.

(viii) Rehabilitation of existing rising main/ Laying of new rising main.

(ix) Rehabilitation of existing pump house/ Construction of new pump houses.

(x) Rehabilitation of existing Over Head Tank/ Construction of new Over Head tanks of varyingcapacities.

(xi) Rehabilitation of existing feeder, distribution network system/ Laying of New feeder,distribution network system.

(xii) Supply and installation of flow meters in zones/ district meter areas and consumer watermeters (AMR) at both existing and new house service connections.

(xiii) Rehabilitation of existing SCADA building/ Construction of new SCADA building.

(xiv) Rehabilitation of existing boundary wall/ Construction of new boundary wall.

(xv) Development of existing water works campus/ New water works campus.

(xvi) Rehabilitation of existing water recharge unit/ Construction of new water recharge unit.

(xvii) NRW/ UFW assessment and leakage reduction activities.

(xviii) SITC of Isolation valve, FCV, PCV, Bulk meters, Level sensors, Residual Chlorine DetectorPressure transmitter etc. required for 24 x 7 supply system.

(xix) Establishment of monitoring points for quantity & quality.

(xx) Development of Volumetric consumption-based computerized billing system.

(xxi) Achievement of the performance targets for Network Pressure, Continuity of Supply, redressof customer complaints and reduction of NRW and UFW etc.
(xxii) Customer awareness programs to educate customers to avoid the waste of water.
(xxiii) Trial run of 03 months and defect liability period of 24 months for civil work and 24 monthsfor E&M work after completion of successful trial run. All completed and commissionedwork shall be handed over to respective ULBs after 03 months successful trial run period.
(xxiv) Provide As-built drawings of all the works implemented, preventive and breakdownmaintenance plan for instruments, analyzers etc.

SCHEDULE - "B"

Schedule of materials to be issued to the contractor:

S. No.	Description of item	Qty	Rates in figures and words at which the material will be charged to the Contractor.	Place of Issue
1	2	3	4	5
NIL				

SCHEDULE "C"

Civil Works-

Drawings to be submitted:

- OHT Design & drawing , Soil Bearing Capicity to be prepared by IIT / NIT / reputed state and central/
- private engineering institutions/organisation to be submitted by contractor at its own cost.
- Soil testing of O.H.T. Site will be done by contractor himself, by a reputed NABL approved laboratory.
- Charges for soil testing will also be borne by contractor.
- Design & Drawing of O.H.T. will be get done by contractor. Vetting charges will be borne by contractor.
- Vetting is required be done by any IIT / NIT / reputed state and central engineering institutions. Vetted
- design will be submitted by contractor.
- The Contractor shall submit 1 (one) reproducible copy and 3 (three) prints of all As-Built Drawings (as

- per GIS mapping) clearly named as such to the Engineer for approval for the respective Section of the
- Works. After approval of the As Built Drawing the Contractor shall supply an electronic copy of the
- drawing in together with a licensed copy of the drafting software, and uploaded on portal as per
- prevailing govt. rules and as per direction of engineer in charge.

E&M Works-

List of the drawings to be provided by the contractor to the Engineer during the course of contract.

1. Boring charted as per format provide by Engineer.

2. Proposed Tube Well assembly chart for Engineer's approval.

3. GA drawing and data sheet of pumping plant with discharge-head characteristic curve and its

QAP and PLC SCADA related E/M equipment for approval of the competent authority.

SCHEDULE "D"

LIST OF SAMPLES TO BE SUBMITTED:

Tenderer whose offer is accepted has to submit the following samples in

seven days before starting up the work.

1. Local Sand(Ganga Fine Sand) : 0.01 M_3

2. Coarse Sand : 0.01 M_3

3. Coarse aggregate : 0.01 M.

4. Stone Ballast 25 mm to 40 mm gauge : 0.01 M_3

5. Cement 43 grade : 1 Bag

6. Reinforcement : 1 M Piece

7. 20 mm medium class G.I. Pipe : 1 M Piece

8. Epoxy Paint of approved make : 1 Liter

9. Weather Coat of approved make : 1 liter

10. Pipe of approved vendors for each dia : 3 X 1 m

11. Sample for pipes and specials/SV/NRV/CI/DI DF pipe of approved vendor etc

Any other samples required by the Engineer from time to time returnable after the close of the contract

but no payment shall be made if it perishes during this period.

In addition to the above the contractor may be required to submit any other sample that may be required by

the engineer before the commencement or during the progress of the work. As regard specials the contractor

shall submit list of manufacturers to be finalized by the engineer in charge. The materials of only approved

manufacturers shall be brought at site for use in work.

As described under chapter special conditions of contract.

E&M Works List of samples to be submitted by the contractor to the Engineer during the course of contract.

The contractor shall deliver following samples. Either at the site of work or at the office as desired by the Engineer.

(i) Sample of strata met with during boring.

(ii) Any other samples if required by the Engineer.

SCHEDULE "E"

Tests to be conducted:

TESTS : All the necessary and required tests before commencement of the work, during the construction and after the construction regarding material and work shall be conducted as per latest IS code/Manual on Water supply specifications or as desired by the Engineer as per terms and conditions of the contract documents. Contractor will also arrange for third party inspection and test certificate from the Manufacturer. All testing charges shall be borne by the contractor. Following test reports shall have to be submitted by the contractor. As the work proceeds the following tests shall be carried out by the contractor at the time and in the manner desired by the Engineer-in-charge. All the materials, labour, T&P etc. shall be arranged by the contractor. The expenditure, which is incurred by him in this connection, shall be deemed to have been included in the respective rate and no extra claim whatsoever shall be admissible.

(a) Tests of pipe and valves supplied shall be as required by relevant IS Code. Contractor shall have to submit third party inspection report from desired agency as sanctioned by UP Jal nigam (urban).

I/We have read, under stood and accept for compliance, the above mentioned (Schedule-D to E) instructions and conditions of this schedule and have taken these factors into account while quoting rates in BOQ.

E&M Works-

(Furnished with respect to Submersible Pump Set)

Discharge in LPM
2 Total head in mtrs.
3 WHP at total head
4 Guaranteed Pump Effic. %
5 HP input to Pump
6 Guaranteed Motor Effic. %
7 Overall efficiency %
8 HP input to motor
9 KWI to Motor
10 Guaranteed KWI/ WHP
11 Motor HP/ Stage
12 Make/ Model

Schedule 'E' has to be filled and uploaded in terms of discharge (Q)- head (H) & efficiency of pump and motor from the selected characteristic curve of model and make of the pumping plant. Any deviation or speculation in terms of discharge (Q)- head (H) & efficiency of pump and motor is observed that may be treated as ineligibility for qualifying the tender, liable to be turned down.

(ii) **Discharge and head may vary which is subjected to yield of the borewell and actual site conditions during the course of execution for which no extra payment shall be made.**

SCHEDULE "F"

GENERAL RULES & DIRECTIONS :

Officer inviting Tender — Superintending Engineer, Construction Circle U P Jal Nigam,Urban Meerut.

Maximum percentage for quantity of items of work to be executed beyond which rates are to be determined in accordance with Clauses 12.2 & 12.3: See below.

Definitions:

2(v)	Engineer-in-Charge	Executive Engineer,Construction division , U P JalNigam (Urban) Meerut
a)	Civil	----------as above----------
b)	Elect. & Mech.	Executive Engineer,(E&M) Division, U P JalNigam,Ghaziabad
2(viii)	Accepting Authority	MD ,U P Jal Nigam, Urban
2(x)	Percentage on cost of materials and labour to cover all overheads and profits	10%
2(xi)	Standard Schedule of Rates	
a)	Civil	UPJN (URBAN) SOR 2022-23
b)	Elect. & Mech.	UPJN (URBAN) SOR 2022-23
2(xii)	U.P. Jal Nigam	U P Jal Nigam Urban
9(ii)	Standard Contract form	As attached.

Clause 1

(i)	Time allowed for submission of performance guarantee; programme Chart (Time and licenses), registration with EPFO, ESIC and BCOW Welfare board or proof of applying thereof from the date of letter of acceptance.	15 days
(ii)	Maximum allowable extension with late fee @0.1% per day of performance guarantee amount provided in (i) above:	7 Days
Clause 2	Authority for fixing Compensation under clause-	Superintending Engineer/General Manager
	Deleted	
Clause 4	Deleted	

Clause 5	Number of days from the date of issue of letter of as mentioned in letter of acceptance.	Acceptance for reckoning date of start

Table of Milestone (s)

Sl no	Physical Progress/Financial progress	Cumulative time allowed (from date of start) in month	Liquidated damages per day for delay in completion of activity/ milestones
1	Completion of works of 10% of contract value stipulated in the signed contract	2	INR 10000.00
2	Completion of works of 20% (cumulative)of contract value stipulated in the signed contract	4	INR 10000.00
3	Completion of works of 40%(cumulative) of contract value stipulated in the signed contract	6	INR 20000.00
4	Completion of works of 60%(cumulative) of contract value stipulated in the signed contract	8	INR 20000.00
5	Completion of works of 75%(cumulative) of contract value stipulated in the signed contract	10	INR 35000.00
6	Completion of works as per contract in all respect	14	0.05% of the value stipulated of the contract value for every day of delay

Time allowed for execution of work 15month

Clause 5.4: Authority to decide:

1	Extension of Time	1.Upto 50% of the time of completion- by signing authority of contract. 2. By next higher authority beyond the limit of 50% of time of completion.
2	Rescheduling of milestones	As above
3	Shifting the date of start in case of delay in handing over the site	Superintending Engineer
Clause 6	Clause Applicable- (6 or 6A)	As per direction of Engineer-incharge.
Clause 7	Gross work to be done together with net payment/adjustment of advances for material collected , if any, since	5% of contract value or approved mile stone from competent authority.
Clause 7A	Whether clause 7A shall be applicable	As decided by Engineer-in-charge
Clause 10 A	**List of testing equipment to be provided by the contractor at field testing laboratory:**	As mentioned in scope ofworks

Whether clause 10B	(i & ii) shall be applicable	If contract value is more than 500.00 Lacs

Clause 11	Specifications as described under Chapter Specifications shall be followed	
Clause 12	**Original work**	
12.2 & 12.3	Deviation limit beyond which clauses 12.2 &12.3 shall apply	100% (One hundred percent)
Clause 16	**a) Civil** **b) Elect. & Mech**	Superintending Engineer (Civil) Superintending Engineer (E&M)

List of testing equipment to be provided by the contractor at field testing laboratory:

(A)CIVIL

(B)Electrical &Mechanical:-

Clause 10B (i& ii)

Whether clause 10B (i& ii) shall be applicable If contract value is more than 500.00 Lacs

Clause 11

Specifications as described under Chapter Specifications shall be followed.

Clause 12

Type of work Original work

12.2 & 12.3	Deviation limit beyond which clauses 12.2 &12.3 shall apply.	100% (One hundred percent)

Clause 16

Competent authority for deciding reduced rates	a) Civil b) Elect. & Mech	Superintending Engineer(Civil) Superintending Engineer(E&M)

Clause 18

a)Civil :-

List of mandatory machinery, tools & plants to be deployed by the contractor at site:

The bidder must have sufficient machinery, tools & plants that are necessary for carrying out this work. The bidder shall provide minimum T & P at site of work as follows:-

1.	**Concrete Mixer**	**-**	**2 Nos.**
2.	**Vibrators (Needle Type)**	**-**	**5 Nos.**
3.	**Compression testing machine**	**-**	**1 No.**
4.	**Slump test apparatus**	**-**	**1 No.**
5.	**Steel tape**	**-**	**2 Nos.**
6.	**Sieve set for coarse aggregate**	**-**	**1 No.**
7.	**Sieve set for fine aggregate**	**-**	**1 No.**
8.	**Cube moulds**	-	8 Nos.
9.	Jar for silt test	-	1 No.
10.	Vernier caliper	-	1 No.
11.	Precision levelling instrument with staff	-	1 No.
12.	Water tanker	-	1 No.
13.	Tractor with trolley	-	1 No.
14.	Winch machine for lifting the concrete	-	1 No.
15.	Pump set for pumping of water for curing	-	1 No.
16.	Hydraulic testing machine for sectional testing	-	1 No.

b)Elect. & Mech.

Clause 25

Place of arbitration shall be decided by the arbitrator.

Clause 30(B)

The contractor shall make his own arrangement of water as per clause 30.

Clause 32

Requirement of technical representative(s) and recovery rate

S.No.	Requirement of technical staff		Minimum experience(years)	Designation of technical staff	Rate of which recovery shall be made from the contractor in the event of not fulfilling provisions of clause 36(i)	
	Qualification	No.(of Civil/E&M)			Figures	Words
1	B.E. (Civil)	1	5	Graduate Engineer		
2	Diploma (Civil)	2	5	Diploma Engineer		

Clause 38

i) a Civil:-

i)(a) Schedule / statement for determining theoretical quantity of cement & Bitumen	On the basis of UPJN/UPPWD consumption schedules

ii) Variations permissible on theoretical quantities

a) Cements for works with estimated cost put to tender above 5 lakh	As per UPJN/UPPWD Norms
b) Bitumen for all works	As per UPJN/UPPWD Norms
c) Steel reinforcement and structure steel sections for each diameter section and category	As per UPJN/UPPWD Norms
d) All other materials	As per UPJN/UPPWD Norms

Clause 44

Contractor shall provide insurance as per clause 44.

Note: Technical pre-qualification conditions in the bid document shall be laid as per provisions given in office order no. 5024/ihlh/tujy/(2121-52)/2018/192, Date- 16/11/2018 issued by Managing Director, U.P. Jal Nigam.

The completed in all respects, passes to the satisfaction of Engineer- in-charge and tested as per latest relevant U.P. Jal Nigam/U.P. P.W.D. or I.S. specifications/codes and provisions of latest CPHEEO Manual, on the subject within

- **15** calendar months from the date of written order to the contractor for commencement of the work which will include three-month trial & test run including all labour, material, T&P, chemicals and consumables including electricity.

- After successful completion of three-month trial & test run and issue of completion certificate by the Engineer including all labor, material, T&P, chemicals and cosumablesincluding electricity.

The contractor's responsibility shall, however, not end till the defect's liability period of **24**months for Civil Works and 24 months for E/M works form the actual date of completion and 3 months trial testing. All the defects or damages, if any, found during the defect liability period shall be rectified by the contractor at his own cost for which no claim whatsoever shall be entertained by the department. However responsibility of the contractor shall not end till the taking over of the work done by the local body/Nagar Nigam, and contractor shall be liable to handover all works under this contract in good working condition to the local body.

I/We have read, under stood and acceptfor compliance, the above mentioned instructions and conditions of this schedule and have taken these factors into account while quoting rates in schedule-G

SCHEDULE-G

BILL OF QUANTITIES(Refer Schedule 'A')

Preamble

1. The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, Conditions of Contract, Special Conditions of Contract, Technical Specifications and Drawings.

2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. These are liable to change upto any extent for which no claim shall be admitted whatsoever except as provided under the contract. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Engineer and valued at the rates and prices tendered in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Engineer may fix within the terms of the Contract.

3. The rates and prices shall be quoted in percentage terms and resultant contract price will be entirely in Indian Currency.

7. General directions and descriptions of work and materials are not necessarily repeated or summarized in the Bill of Quantities. References to the relevant sections of the contract documentation shall be made before entering % age against the Bill of Quantities.

8. The method of measurement of completed work for payment shall be in accordance with the UPJN/UPPWD/CPWD Specifications unless otherwise provided in contract.

10. Rock is defined as all materials which, in the opinion of the Engineer, require blasting, or the use of metal wedges and sledgehammers, or the use of compressed air drilling for its removal, and which cannot be extracted by ripping with a tractor of at least 150kw with a single rear mounted heavy duty ripper.

Price Bid

The scope of work includes capital works and O&M works. For capital works BOQ is uploaded on e-tender portal whereas for O&M works the bill of quantities is mention under schedule H of bid document

2. The rates quoted by the bidder for capital works (% above/below) shall be applicable for O&M the bidders are requested to take Congnigence of the departmental rates for O&M mentioned in schedule H while quoting the rates for capital works.

SCHEDULE- H1

MANDATORY OPERATION & MAINTENANCE OF WORKS FOR FIVE YEARS

1	Kavinagar Ward-91, Ghaziabad	Qty.	Unit	rates include cess exclude GST
1.1	O&M for IIIrd year	1	Job	53.62
1.2	O&M for IVth year	1	Job	56.30
1.3	O&M for Vth year	1	Job	59.11
2.0	Modipon Colony, Modinagar Ward-25			
2.1	O&M for IIIrd year	1	Job	32.47
2.2	O&M for IVth year	1	Job	34.09
2.3	O&M for Vth year	1	Job	35.80
	Distt- Bulandshahar			
1	Yamunapuram Ward-3, Bulandshahar			
1.1	O&M for IIIrd year	1	Job	66.19
1.2	O&M for IVth year	1	Job	69.40
1.3	O&M for Vth year	1	Job	72.87
2	Ward-22, Khurja			
2.1	O&M for IIIrd year	1	Job	67.66
2.2	O&M for IVth year	1	Job	70.94
2.3	O&M for Vth year	1	Job	74.49
	Distt-Meerut			
1	Ward-32, Meerut			
1.1	O&M for IIIrd year	1	Job	62.41
1.2	O&M for IVth year	1	Job	65.52
1.3	O&M for Vth year	1	Job	68.81
	Distt-Baghpat			
1	Ward-18, Baraut			
1.1	O&M for IIIrd year	1	Job	57.93
1.2	O&M for IVth year	1	Job	60.83
1.3	O&M for Vth year	1	Job	63.88
	Distt-Hapur			
1	Ramgarhi Ward-20, Hapur			
1.1	O&M for IIIrd year	1	Job	68.32
1.2	O&M for IVth year	1	Job	71.73
1.3	O&M for Vth year	1	Job	75.32
	Distt-Saharanpur			

1	Ward-21 and Partially 37 & 39			
1.1	O&M for IIIrd year	1	Job	70.65
1.2	O&M for IVth year	1	Job	81.40
1.3	O&M for Vth year	1	Job	92.22
	Distt-Shamli			
1	Ward-08, Shamli			
1.1	O&M for IIIrd year	1	Job	61.83
1.2	O&M for IVth year	1	Job	68.46
1.3	O&M for Vth year	1	Job	75.16
	Distt-Muzaffarnagar			
1	Ward-30, Muzaffarnagar			
1.1	O&M for IIIrd year	1	Job	61.70
1.2	O&M for IVth year	1	Job	68.37
1.3	O&M for Vth year	1	Job	75.09

KEYPERFORMANCE INDICATOR FOR O&M

KEY PERFORMANCE INDICATORS AND PAYMENT CONDITIONS

The performance indicator given in this section shall be used to measure the performance of the operator during the post-construction operation and maintenance period. The performance indicators shall be measured for every billing cycle starting from the first billing cycle after the completion of construction period (5 years). However, a six (6) months grace period shall be given during which no penalty (reduction in performance payment) shall be levied.

The Water Loss indicator shall be measured starting from the last billing cycle of 2ndconstruction year itself on cluster wide basis. This will set a baseline water loss level ofexisting system based on which the contractor would draw its plan to reduce the water loss annually such that it would achieve the target of 15% at the end of construction phase.

KEYPERFORMANCEINDICATORS

The Key Performance Indicator under this Contract shall be as follows

1. Extent of Water Loss
2. Continuity of water supply (24/7)
3. Efficiency in redressal of customer complaints
4. Quality of supplied water
5. Meter reading, billing & distribution efficiency
6. Response time for providing new water supply connections
7. Functioning of consumer water meters installed
8. Efficiency in power consumption

PAYMENT CONDITIONS FOR O&M

Payment for O&M cost during the construction period shall be Fixed payment only based onthe work done or quoted cost as applicable with deployment of requisite staff as per thecontractdocument.

Payment Conditions during post-construction O&M period shall be split into fixed payment and performance based payment as per following ratio.

Category	Payment as % of O&M cost	Remarks
Fixed Payment	**60%**	The deduction will be applicable for non-deployment of requisite staff As per tender document
Performance Based Payment	**40%**	As per calculation against the KPIs

However, there will be a six (6) month's grace period during which no reduction in the Performance Payment will be done even if the KPIs fall short of target, and the contractor/ operator is required to do all sorts of work required for achieving the KPIs, wherever it is falling short, at no additional cost to the Employer.

Target for KPIs and Payment Break down

TheTarget of KPIs and their weightage of performance-based payment under this contract shall be as follows.

S.N.	KPI	Target	Max. Payment as % of agreed O&M Cost	Remarks
1	Extent of Water Loss Total Water Loss (Transmission + Distribution Loss)	15%	15%	Incentive shall be given in caseof exceeding the target and penalty for falling short of target. Deduction of certain percentages(given below under separate section) from“max.payment as % agreed O&M cost” for falling short of target below 15 % to 25 % and penalty for performance below 25%. This penalty is applied by deducting the corresponding % (from graph) from the fixed payment of O & M cost
2	Continuity of Water Supply (24Hrs)	100%	5%	Deduction of certain percentages (given below under separate section) from “max. payment As % agreed O&M cost” for Falling short of target upto 80% And penalty for performance Below 80%. This penalty is applied by deducting the Indicated % from the fixed Payment of O&M cost
3	Efficiency in redressal of Customer Complaint:	90%	5%	Deduction of certain percentages (given below under separate section) from “max. payment As % agreed O&M cost”for Falling short of target upto 75% And penalty for performance below75%. This penalty is applied by deducting the Indicated % from the fixed Payment of O&M cost.
4	Qualitys of Water upplied	100%	5%	Target is 100% but no reduction in payment until 99%. Deduction of certain percentages (given below under separate section) from“max.paymentas % agreed O&M cost” for fall short of target upto 94 % and penalty for performance below 94%. This penalty is applied by deducting the indicated % from The fixed payment of O&M cost.

5	Meter Reading, billing and distributio nefficiency	100%	5%	Deduction of certain percentages (given below under separate section) from"max. payment as % agreed O&M cost" for fall short of target upto 90 % and penalty for performance below 90%. This penalty is applied by deducting the indicated % from the fixed payment of O&M cost.
6	Response Time for new Water Supply Connections	100%	3%	Deduction of certain percentages (given below under separate section) from"max. payment as % agreed O&M cost" for fall short of target upto 85% and penalty for performance below 85%. This penalty is applied by deducting the indicated % from the fixed payment of O&M cost.
7	Extent of Functional Water Meters	100%	2%	Target is 100 % but no reduction in payment unti l98%. Deduction of certain percentages (given below under separate section) from"max. payment as % agreed O&M cost" for fall short of target upto 94 % and penalty for performance below 94%. This penalty is applied by deducting the indicated % from the fixed payment of O&M cost.
Total			**40%**	
8	Efficiency in power consumption	Power Factor of 0.98 or more	As covered separately under the provision in'Power Guarantee'	

Penalties for non-deployment of specified minimum staff for O&M works

Default in compliances on staff attendance falling short of minimum requirement specified shall be as per table below.

#	Description	Deficiency	Penalty/day
1	Manager	Not present on duty	Rs.15,000
2	Asstt. Manager/SCADA cum Inst.Engineer	Not present on duty	Rs.10,000
3	Water Supply Engineer (International).	Not present on duty	Rs.,20,000
4	Foreman /Revenue Officer	Not present on duty	Rs.5000
5	Accountant/ Jr. Accountants/ Safety Officer	Not present on duty	Rs.5000
6	Supervisor / Chemist /Bacteriologist/ Asstt.Chemists	Notd present on uty	Rs.5000
7	Mechanic / Drivers	Not present on	Rs3000

		Duty	
8	Bill Clerk / Cashier / MeterReaders/ Bill Distributor /Operators/ Fitters/ Welder/ Electrician/ Attendant/ Asstt.Fitters	Notd present on uty	Rs.3000
9	Helpers/Watchman/Cleaner/ Horticulture Staff	Not present on duty	Rs.2000

Penalties for default in safety and other compliances

Default in compliances on safety, routine/preventive maintenance works and other works shall be as per table below.

#	**Description**	**Deficiency**	**PenaltyinRs.**
1	Cleaning of Site	Not attended upto 1day	1000/-
2	Non-compliance with safety measure (e.g. not wearing Safety shoes, elmets,etc.) and first aid facilities	Any time on duty	1000/-
3	Non-observance of preventive maintenance schedule	Any time on duty	5000/-
4	Delay in getting the equipment repaired with specific period	To be specified by the considering type of equipment	5000/-

SCHEDULE-J

Mode of Payment (if applicable)

SCHEDULE OF PAYMENT

1. Mode of Payment for Over Head Tanks:

The interim payment shall be regulated as below as per **Cost**:

Sl. No.	Particulars	Percentage of Lump Sum Amt. of the Works.
1	**2**	**3**
1	Excavation in foundations, casting of raft foundation, pile foundation, beam and columns up to G.L. including construction of site office & Lab.	20%
2	Refilling of the excavated earth and completion of staging up to bottom ring beam.	15%
3	Casting of bottom ring beam, tank base (i.e. bottom dome, conical dome etc. including starter for cylindrical wall), balcony and RCC stair case completed.	15%
4	Casting of cylindrical walls of tank, top dome and top ring beam including fixing of manhole.	15%
	Supply & fixing of DI-DF K-9 vertical column pipes and Sluice valves (size of pipes & valves as per Part-II Schedule of Works/BOQ) including rising main pipe complete and also including bends and duck foot bends with all required specials complete.	10%
6	Completion of misc. items such as Digital W.L. indicator, lighting conductor, fixing of ventilator, S.S. ladders, S.S. Gate with cage & railing and fitting, testing for water tightness.	10%
7	After Apex Painting, construction of R.C.C. floor & apron and construct sluice valve chambers as per prescribed drawings for inlet, outlet, washout & overflow and finishing of complete work as per Part-II Schedule of Works/BOQ and detailed specifications to the satisfaction of Engineer-in-charge.	10%
8	After successful 03 month trial run period and handing over to Nagar Nigam.NPP	5%
	Total	**100%**

2. Mode of Payment for Rising Main/distribution system:

Payment will be made after completion of individual item as per measurement basis & following percentage will be deducted from each running bill:

Pipe supply in first lot should not be more than 50% of the total quantity

Sl. No.	Particulars	Percentage of Lump Sum Amt. of the Works.
1	Supply of pipes	70%
2	Carting, laying & jointing of pipes including refilling of trenches	10%
3	For testing and commissioning of Zone wise pipe line	5%
4	For three (3) month trial run period	7%
5	After completion of 1st year operation & maintenance work (1% for each quarter)	4%
6	After completion of 2nd year operation & maintenance work (1% for each quarter	4%

3. Mode of Payment for Building Works:

(i) Payment will be made after completion of individual item as per measurement basis.

(ii) . Payment for operation & maintenance work will release after handing over the project to concerning Nagar Nigam /Nagar PalikaParishad.

(iii) Note:

1. Payment for all works will be made as per availability of funds in division from the concerning body. Regarding this, no claim of the contractor will be considered.

2. <u>Mode of Payment for Pump house and staff quarter</u>:

The interim payment shall be regulated as below as per **Cost**:

Sl. No.	Particulars	Percentage of Lump Sum Amt. of the Works.
1	**2**	**3**
1	Upto plinth	20%
2	Plinth to super structure	40%
3	Completion of all works including electricity fitting etc	40%

SCHEDULE – 'J'

Mode of Payment for E&M Work

Sr. No.	Item	Payment
1	**For Tubewell Work:**	
(a)	After Development of Tube well by O.P. Unit	90 %
(b)	After completion of 1 year O&M	5 %
(c)	After completion of 2nd year O&M	5%
2	**For SITC of Pumping Plant, SCADA System& E/M equipments in 24x7 Network.**	
(a)	After supply of items	70%
(b)	After Erection,	10%
(c)	After Testing & Commissioning &Trial run	10 %
(d)	After completion of 1 year O&M	5 %
(e)	After completion of 2nd year O&M.	5%
3	**For AMR/AMI meters**	
(a)	After supply of items	70%
(b)	After installation	10%
(c)	After trial run and successful implementation of billing software	10%
(d)	After completion of 1 year O&M	5 %
(e)	After completion of 2nd year O&M.	5%

SECTION – 7

GUARANTEES & FORMS

STANDARD FORM OF AGREEMENT

{Notes on Standard Form of Agreement: The Agreement should incorporate any corrections or modifications to the Bid resulting from corrections of errors as mentioned in Instructions to Bidders.}

Standard Form: Agreement

Agreement

This agreement, made the ..... day of ..... of 20. Between..... ,
(hereinafter called "the Employer") of the one part, and

[name and address of Contractor] (hereinafter called "the Contractor" of the other part).

Whereas the Employer is desirous that the Contractor execute the Work of Construction of ……..at..... District- …… (hereinafter called "the Works") and the Employer has accepted the Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein at a cost of Rupees .....(Rs..... only)

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to, and they shall be deemed to form and be read and construed as part of this Agreement.

2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all aspects within the provisions of the Contract.

3. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying the defects wherein 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.

4. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz:

i) Letter of Acceptance;

ii) Notice to proceed with the works;

iii) Contractor’s Bid including Integrity Agreement.

iv) General Conditions of Contract, Special Conditions of Contract.

v) Specification & Particular Specifications.

vi) Drawings & Schedules;

vii) Bill of Quantities; and

ix) Any other document forming part of the contract.

In witness whereof the parties thereto have caused this Agreement to be executed the day and year first before written.

The Common Seal of

…..…….

was hereinto affixed in the presence of:

Signed, Sealed and Delivered by the said to,

In the presence of:

Binding Signature of Employer's authorised representative.

…..…….

Binding Signature of Contractor

ANNEXURE-7

Form of Performance Security (Guarantee)

BANK GUARANTEE BOND

THIS GUARANTEE made this..... day of.....by ..... (hereinafter referred to as "the Bank" which Expression shall, unless repugnant to the context include its successors & assignees) of the one part IN FAVOUR of ..... , U P Jal Nigam, ... (hereinafter called "the Nigam" which expression shall, unless repugnant to the context include its successors & assignees) of the other part.

WHEREAS the Nigam having offered to accept the terms and conditions of the proposed agreement between the Nigam and MESSERS ..... (hereinafter called "the said Contractor(s)") for the work ..... (Hereinafter called "the said Contract") having agreed to production of an irrevocable Bank Guarantee for Rs ..... (Rupees ..... only) as a Security/guarantee from the contractor(s) for compliance of his obligations in accordance with the terms and conditions in the said Contract.

AND WHEREAS the Bank has accordingly at the request of the said Contractor(s) agreed to furnish this guarantee.

NOW THIS DEED WITNESSES AS FOLLOWS:

1. In consideration of Rs..... (Rupees..... only)

2. The Bank shall pay to the Nigam on demand the sum under the clause above without demur and without requiring the Nigam to invoke any legal remedy that may be available to it, it being understood and agreed FIRSTLY that the Nigam shall be the sole judge of and as to whether the said Contractor(s) have committed breach, if any, of the terms and conditions of the said Contract and the extent of losses, damages, costs, charges and expenses caused to or suffered by or that may be caused to or suffered by the Nigam from time to time shall be final and binding on the Bank and SECONDLY that the right of the Nigam to recover from the Bank any amount under this Guarantee shall not be affected or suspended by reason of the fact that any dispute or disputes have been raised by the said Contractor(s) with regard to their liability or the proceedings are pending before any Tribunal, Arbitrator(s) or Court with regard thereto or in connection therewith, and THIRDLY that the Bank shall immediately pay the sum under clause to the Nigam on demand and it shall not be open to the Bank to know the reasons of or to investigate or to go into the merits of the demand or to question or to challenge the demand or to know any facts affecting the demand, and LASTLY that it shall not be open to the Bank to require proof of the liability of the said Contractor(s) to pay the amount before paying the sum demanded under clause above.

3. This guarantee is in addition to and not in substitution for any other guarantee executed by the Bank in favour of the Nigam on behalf of the said Contractor(s).

4. The said Contractor(s) and the Nigam will be at liberty to vary and modify the terms and conditions of the said Contract without affecting this guarantee notice of which modification to the Bank hereby waived.

5. This guarantee shall not be affected by any change in the constitution of the bank or of the said Contractor(s) nor shall the guarantee be affected by any change in the constitution of the Nigam or by amalgamation or

Absorption with any other body corporate and this guarantee will be available to or enforceable by such body corporate.

6. The neglect or forbearance of the Nigam in enforcing any payments of moneys, the payment whereof is intended to be hereby secured or the giving of time by the Nigam for the payment thereof shall in no way, release the Bank from its liability under this deed.

7. This guarantee is irrevocable except with the written consent of the Nigam.

8. This guarantee shall come into force from the date hereof and shall remain valid till ..... but if the period of the said Contract is, for any reason, extended and upon such extension if the said Contractor(s) fail to furnish or renew guarantee for the extended period, the Bank shall pay to the Nigam the said sum of Rs..... or such lesser sum as the Nigam may demand.

9. The Bank further agrees with the Nigam that the Nigam shall have the fullest liberty without our consent and without affecting in any manner our obligation & hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Nigam against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor(s) or for any forbearance, act of omission on the part of the Nigam or any indulgence by the Nigam to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

10. No withstanding anything stated hereinbefore the liability of the Bank under the guarantee is restricted to Rs. ..... (Rs..... only). This guarantee shall remain in force upto ..... unless a demand or claim under the guarantee is presented to the Bank in writing within twelve months from the date or expiry all rights of the Nigam under the guarantee shall be forfeited and the Bank shall be released and discharged from all liabilities hereunder.

IN WITNESS WHEREOF

.....day of .....

For.....

(Indicate the name of the Bank)

Note: The Bank Guarantee should be verifiable and encash able from a branch situated in a city where the office of Divisional Officer is located.

ANNEXURE-8

INDENTURE FOR SECURED ADVANCES

(To be executed on stamp of appropriate value)

THIS INDENTURE made the _____ day of _____ between _____ (expression shall where the context so admits or implies be deemed to include his executors, administrators and assigns) of the one part and the Executive Engineer, ----------U P Jal nigam (urban), ----- (hereinafter called as the "Engineer" which expression shall where the context so admits or implies be deemed to include his successors in office and assigns) of the other part.

WHEREAS by an agreement no. ---------- dated _____ (hereinafter called the said Agreement) the Contractor has agreed.

AND WHEREAS the Contractor has applied to the Engineer that he be allowed advances on the security of materials absolutely belonging to him and brought by him to the site of the works, the subject of the said Agreement for use in the construction of such of the works as he has undertaken to execute at rates fixed for the finished work (inclusive of the cost of material and labour and other charges)

AND WHEREAS the Engineer has agreed to advance to the contractor the sum of Rupees_____(in words, Rupees _____) on the aforesaid security and has reserved to himself the option of making any further advance or advances on security of aforesaid nature, the quantities and other particulars of the materials on the security of which the advance or advances are made being detailed in Part-II of a running account bill for the said works signed by the Contractor on ..... and the Engineer has reserved to himself the option of making any further advances on the security of other materials brought by the Contractor to the site of said woks.

NOW THIS INDENTURE WITNESS that in pursuance of the said Agreement and in consideration of the sum of Rs. _____ on or before the execution of these presents paid to the Contractor by the Engineer (the receipt whereof the Contractor hereby acknowledges) and of such further advances (if any) as may be made to him as aforesaid, the Contractor does hereby covenant and agree with the Engineer and declare as follows.

1. That till the time such material, against which advance has been made, is utilised on the work for which it is meant, the ownership rights of material shall rest with the UPJN and the Contractor shall not have any claim whatsoever except as provided herein.

2. That the said sum of Rs. ..... so advanced by the Engineer to the Contractors as aforesaid shall be employed by the Contractor in or towards expediting the execution of the said works and for none other purpose whatsoever.

3. That the material detailed in the said running account bill which have been offered to and accepted by the Engineer as security are absolutely the Contractor's own properly and free from encumbrances of any kind and the Contractor will not make any application for or receive a further advance on the security of materials which are not absolutely his own property, and free from encumbrances of any kind and the Contractor indemnifies the Engineer against all claims to any materials in respect of which an advance has been made to him as aforesaid.

4. That the materials detailed in the said running account bill and all other materials on the security of which any further advance or advances may hereafter be made as aforesaid (hereinafter called the said materials) shall be used by the contractor solely in the execution of the said works in accordance with the directions of the Engineer and in the terms of the said Agreement.

5. That the Contractor shall make at his own cost all necessary and adequate arrangement for the proper watch, safe custody and protection against all risks of the said materials and that until used in construction as aforesaid, the said materials shall remain at the site of the said works in the Contractor's custody and on his own responsibility and shall at all times be open to inspection by the Engineer or any officer authorised by him. In the event of the said materials or any part thereof being stolen, destroyed or damaged, the Contractor will forthwith replace the same with other materials of like quality or repair and make good the same as required by the Divisional officer.

6. That the said materials shall not, on any account,,,, be removed from the site of the said works except with the written permission of the Engineer or an officer authorised by him in that behalf.

7. That the advances shall be repayable in full when or before the contractor receives payment from the Engineer of the price payable to him for the said works under the terms and provisions of the said agreement, provided that if any intermediate payments are made to the contractor on account of work done, then on occasion of each such payment, the Engineer will be at liberty to make a recovery from the contractor's bill for such payment by deducting there from the value of the said materials then actually used in the construction and in respect of which recovery has not been made previously , the value for this purpose being determined in respect of each description of materials at the rates at which amounts of advances made under these presents were calculated.

8. That if the Contractor shall at any time make any defaults in the performance or observance of any of the terms and provisions of the said agreement or of these presents, the total amounts of the advance or advances that may still be owing to the Engineer shall immediately on the happening of such defaults be repayable by the Contractor to the Engineer , together with interest thereon at 8 (eight) per annum from the date of respective dates of such advance of advances to the date of repayment and with all costs, charges, damages and expenses incurred by the Engineer in or for the recovery thereof or the enforcement of this security or otherwise by reason of the default of the Contractor and the Contractor hereby covenants and agrees with the Engineer to repay and pay the same respectively to him accordingly.

9. That the Contractor hereby charges all the said materials with the repayment to the Engineer of the said sum of Rs. ..... and any further sum or sums advanced as aforesaid and all costs, charges, damages and expenses payable under these presents PROVIDED ALWAYS and it is hereby agreed and declared that notwithstanding anything in the said agreement and without prejudice to the powers contained therein, if and whenever the covenant for Payment and repayment hereinbefore contained shall become enforceable and the money owing shall not be paid in accordance therewith, the Engineer may at any time thereafter adopt all or any of the following courses as he may deem best.

    a) Seize and utilise the said materials or any part thereof in the completion of the said works on behalf of the Contractor in accordance with the provisions in that behalf contained in the said agreement, debiting the Contractor with the actual cost of effecting such completion and the amount due in respect of advances under these presents and crediting the contractor with the value of work done as if he had carried it out in accordance with the said agreement and at the rates thereby provided. If the balance is against the Contractor, he is to pay the same to the Engineer on demand.

    b) Remove and sell by public auction the seized materials or any part thereof and out of the moneys arising from the sale, retain all the sums aforesaid repayable to the Engineer under these presents and pay over the surplus (if any) to the Contractor.

    c) Deduct all or any part of the money owing out of the security deposits or any sum due to the contractor under the said Agreement.

10. That except in the event of such default on the part of the contractor as aforesaid interest on the said advance shall not be payable.

11. That in the event of any conflict between the provisions of these presents and the said Agreement, the provisions of these presents shall prevail and in the event of any dispute or difference arising over the construction or effect of these presents, the settlement of which has not been hereinbefore expressly provided for the same shall be referred to the Superintending Engineer, ... Circle ....., whose decision shall be final.

IN WITNESS WHEREOF the said ..... and .... by the order and under the direction of the Engineer have hereunto set their respective hands the day and year first above written.

Signed, sealed and delivered by the said Contractor in the presence.

Witness

Signature

Name:-

Address

Signed by Engineer in presence of

Witness :

Signature :

Name :

Address :

ANNEXURE-9

FORM OF BANK GURANTEE FOR MOBILISATION ADVANCE

(On non-judicial paper of an appropriate value)

To,

.....
U.P. Jal nigam (urban)
.....
.....

Subject: ----------
(Name of work and Contract No.)

THIS GUARANTEE made this ..... day of .....by ..... (hereinafter referred to as 'the Bank" which expression shall, unless repugnant to the context include its successors & assignees) of the one part IN FAVOUR of ....., U P Jal nigam (urban), ... (hereinafter called "the Nigam" which expression shall, unless repugnant to the context include its successors & assignees) of the other part.

WHEREAS the Nigam, having agreed under the terms & conditions of Contract no ..... dated ..... (hereinafter called "the Contract") executed between the Nigam and MESSERS ..... (hereinafter called "the said Contractor(s)") to make, at the request of the said Contractor(s) thereunder, a lump sum mobilization advance of Rs ..... (Rs. ..... only) for utilizing it for the purpose and in accordance with the terms and conditions in the said Contract.

AND WHEREAS the Bank has accordingly at the request of the said Contractor(s) agreed to furnish this guarantee.

NOW THIS DEED WITNESSES AS FOLLOWS:

1. In consideration of Rs. ..... (Rupees ..... only).
2. If the contractor fails to utilize the said advance for the purposes of the said contract and/or the said advance together with interest thereon as aforesaid is not fully recovered by the Nigam, the Bank, hereby unconditionally and irrevocably undertakes to pay to the Nigam on merely demand and without demur or protest to the extent of the said sum on claim made by the Nigam on us against non-utilization/ mis-utilisation of the said advance and/or reason of Nigam not being able to recover in full the said sum of Rs ..... with interest as aforesaid.
3. The Bank shall pay to the Nigam on demand the sum under the clause above without demur and without requiring the Nigam to invoke any legal remedy that may be available to it, it being understood and agreed FIRSTLY that the Nigam shall be the sole judge of and as to whether the said Contractor(s) have committed breach, if any, of the terms and conditions of the said Contract and the extent of losses, damages, costs, charges and expenses caused to or suffered by or that may be caused to or suffered by the Nigam from time to time shall be final and binding on the Bank and SECONDLY that the right of the Nigam to recover from the Bank any amount under this Guarantee shall not be affected or suspended by reason of the fact that any dispute or disputes have been raised by the said Contractor(s) with regard to their liability or the proceedings are pending before any Tribunal, Arbitrator(s) or Court with regard thereto or in connection therewith, and THIRDLY that the Bank shall immediately pay the sum under clause to the Nigam on demand and it shall not be open to the Bank to know the reasons of or to investigate or to go into the merits of the demand or to question or to challenge the demand or to know any facts affecting the demand, and LASTLY that it shall not

be open to the Bank to require proof of the liability of the said Contractor(s) to pay the amount before paying the sum demanded under clause above.

4. This guarantee is in addition to and not in substitution for any other guarantee executed by the Bank in favour of the Nigam on behalf of the said Contractor(s).

5. The said Contractor(s) and the Nigam will be at liberty to vary and modify the terms and conditions of the said Contract without affecting this guarantee notice of which modification to the Bank hereby waived.

6. This guarantee shall not be affected by any change in the constitution of the bank or of the said Contractor(s) nor shall the guarantee be affected by any change in the constitution of the Nigam or by amalgamation or absorption with any other body corporate and this guarantee will be available to or enforceable by such body corporate.

7. The neglect or forbearance of the Nigam in enforcing any payments of moneys, the payment whereof is intended to be hereby secured or the giving of time by the Nigam for the payment thereof shall in no way, release the Bank from its liability under this deed.

8. This guarantee is irrevocable except with the written consent of the Nigam.

9. This guarantee shall come into force from the date hereof and shall remain valid till ..... but if the period of the said Contract is, for any reason, extended and upon such extension if the said Contractor(s) fail to furnish or renewe guarantee for the extended period, the Bank shall pay to the Nigam the said sum of Rs. ..... or such lesser sum as the Nigam may demand.

10. It shall not be necessary for the Nigam to proceed against the said Contractor before proceeding against the Bank and the guarantee herein contained shall be enforceable against the Bank notwithstanding that any security the Nigam may have obtained from the Contractor shall at the time when proceedings are taken against the said Bank hereunder be outstanding or unrealized.

11. The Bank further agrees with the Nigam that the Nigam shall have the fullest liberty without our consent and without affecting in any manner our obligation & hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Nigam against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor(s) or for any forbearance, act of omission on the part of the Nigam or any indulgence by the Nigam to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

12. Notwithstanding anything stated hereinbefore the liability of the Bank under the guarantee is restricted to Rs. ..... (Rs. ..... only). This guarantee shall remain in force upto ..... unless a demand or claim under the guarantee is presented to the Bank in writing within twelve months from the date or expiry all rights of the Nigam under the guarantee shall be forfeited and the Bank shall be released and discharged from all liabilities hereunder.

IN WITNESS WHEREOF

.....day of .....

For.....

(Indicate the name of the Bank)

Note: The Bank Guarantee should be verifiable and encashable from a branch situated in a city where the office of Divisional Officer is located.