NOIDA METRO RAIL CORPORATIONLTD.

CONTRACT NO: AMC-STP-01

"Operation and maintenance of the Sewage Treatment Plant, Effluent Treatment Plant and Ultra Filtration Unit at the Depot and Staff Quarters on the Noida-Greater Noida Corridor."

EMPLOYER'S REQUIREMENTS

TENDER DOCUMENTS

NOIDA METRO RAIL CORPORATION LTD.
Block-III, 3rd Floor, Ganga Shopping Complex,
Sector-29, Noida, Gautam Budh Nagar
UTTAR PRADESH-201301

EMPLOYER'S REQUIREMENTS

1 **Objective:** The objective of the contract is the operation, maintenance, completion, testing and commissioning of the permanent works by the Contractor (including without limitation, the maintenance and removal of the Temporary Works) and the rectification of defects appearing in Permanent Worksin the manner and tothe standards and within the time stipulated bythe Contract. In full recognition of this objective, and with full acceptance of the obligations, liabilities and risks which may be involved, the Contractor shall undertake the execution of the Works.

2 GENERAL

2.1 The operation and maintenance of the Permanent Works shall be done in accordance with Employer's Requirements and the other requirements of the Contract.

2.2 The operation and Maintenance Works shall be executed to the highest standards available using proven up-to-date good Engineering practices. The Specification shall in any case not specify standards which, in the Engineer's opinion, are less than or inferior to those described in the Technical/Maintenance Specifications contained in the Tender Documents.

3 SCOPE OF WORKS

3.1.1 Brief Scope: The contractor will execute the work of Contract: **AMC-STP-01: "Operation and Maintenance of the Sewage Treatment Plant, Effluent Treatment Plant and Ultra Filtration Unit at the Depot and Staff Quarter on the Noida – Greater Noida Corridor.**
Contractor shall prepare the drawing/work method /bar chart and get it approved by NMRC as per requirement.

3.1.2 The above-mentioned work shall be carried out with contractors own material &labour as per the specification & drawings.

The Brief scope of work is mentioned in DSR/BOQ and as per site requirement.

The work under this contract shall consist of, but not limited to, all materials, labour, equipment's, tools, plants and necessary machinery as required to completely execute any or/ and following works within NMRC premises/ scope:

a. The Contractor shall attend regular coordination meetings convened by the employer/engineer for interface and adhere to the decisions taken in the meeting.
b. The Contractor shall attend day to day complaints received from the residents and complaint register record.
c. The work shall be carried out during day/night/shadow power block hours. No extra payment for work done at heights or during block hours shall be paid, except wherever specified in BOQ.
d. To provide manpower for routine day to day maintenance as per BOQ and as per site requirement.
e. Provision of all necessary labours, maintenance equipment, instruments and appliances in connection with all above mentioned work as specified or as directed by Engineer-in-Charge or the representative of Engineer.
f. In case of major addition/alterations the drawings including details of structural drawings may be supplied by agency.
g. The specification and manufacturer of material will require approval byNMRC before start of work.

3.1.3 The capacity/ rating of pumps and equipment, parts etc. Shall hold good for the capacity of STP/ETP (in cubic meter / day or litre per day as applicable) and shall be good for meeting the treated parameters requirement as follows:

i. Permissible limit as prescribed in IS: 2490 (Part-I) – 1974.
ii. Water (Prevention and Control of Pollution) Act, 1977 & 1978.

iii. Environment (Protection) Act, 1986.
iv. Environment (Protection) Rules, 1986.
v. Hazardous Wastes (Management & Handling) Rules, 1989.
vi. Manufacturer, Storage and Import of Hazardous Chemicals Rules, 1989.
vii. Manufacturer, use import and storage and hazardous Micro-Organizers, Genetically Engineered organizations or Cell Rules, 1989.
viii. Manual on Sewage & Sewage Treatment /ETP/RO/UF.

All standards as laid down by Central Pollution Control Board and any other relevant statutory authority.

3.1.4 The STP/ETP/UF Unit plant shall be made fully operational.Under this Contract, following works of STP/ETP/UFare covered for which firm/ agency/contractor has to be replaced/rectified the whole component to bring it to the original condition:

1. Cleaning of all tanks of STP/ETP/UF Unit.
2. Supply and installation of new pumps in place of damaged/unserviceable pumps as and when required.
3. Repairing and Servicing of pumps including winding of motor and replacing any electrical and mechanical parts etc complete.
4. Air blower's service and repair for containing oil leakages, replacing worn out blower parts and necessary electrical repairs.
5. Replacing the following with providing new one including removing the old etc and making connection with existing line/system complete.

    a) Fresh media supply & change activated carbon filter
    b) Supply and change dual media filter
    c) Anthracites, Filtration sand, Silex, Gravel and pebbles
    d) Supply and replacement of filter cloth for filter press
    e) Reconditioning of filter press
    f) DWPE dosing equipments of STP/ETPs
    g) Butter fly valves, Pressure Gauge, Cable trays etc.

6. Providing and fixing of multiport valve for dual media filter for STP/ETP plants.
7. Repairing of electric panels accessories/fittings (like cable wire of required gauge, switch set, MCB set, cable tie, thimble and other operating panels accessories etc. complete) for STP/ETP/UF Unit.
8. Repairing and replacing damaged internal pipes, fittings, cable tray, valves and pressure gauges for suction and delivery pipe for making the system complete.
9. Repairing and replacing pump impellers, body, bearings shafts column pipe etc.

3.1.5 **Sampling and Analysis**:
Sampling and analysis of the effluent of STP/ ETP should be done to check the quality of waste and performance of each unit.Samples should be taken and analyzed at the following points:

Effluent at the inlet of FAB reactor
At the outlet of Tube Settler
At the outlet of Chlorine contact Tank
At the outlet of Dual Media Filter
At the outlet of Activated Carbon Filter

3.1.6 **SEWAGE TREATEMENT PLANT/ EFFLUENT TREATMENT PLANT**

Sampling points should be selected where waste water is homogenous in nature. Composite samples are required to see the performance of the units. The samples thus collected shall be then mixed together for making a composite sample.

SAMPLE VOLUME

About one to two liters of sample are adequate for testing the parameters required of outlet/waste water of STP/ETP for process control. Samples should be immediately transported to laboratory for analysis. In case there is some delay, proper preservation like keeping the samples in ice box should be kept.

Analysis

The Samples shall be analysed for various parameters on quarterly basis. The samples can be analysed/tested from nearest NABL accredited laboratory or in-house laboratory if available. Testing charges will be borne by the contractor.

Outlet Sewage/Effluent is considered as below:

Ph value: 7-8

BOD: < 20 ppm COD: < 100 ppm TSS: <30 ppm

O & G: < 10 ppm

Above technical parameters of outlet sewage/waste water should be maintained. If the above parameters are not fulfilled by the contractor then suitable penalty as per **clauses** mentioned below:

LIQUIDATED DAMAGES AND PENALTIES FOR O/M WORKS:

The basis for applying penalties is to restrict Contractor from deviating from disposing all raw/treated waste water efficiently from the service area – as per fixed schedule and as per stipulations prescribed in the tender. The Contractor is also expected to carry out the instructions of the Engineer or its representative from time to time, maintain the System in accordance with good Operating Practices attend to Customer complaints, refrain from offering operations without due authorization where so required and follow other requirements under this Contract. The Contractor shall be subject to the following liquidated damages and penalties for its failure to carry out its operations as indicated below:

Basis of Penalty	Penalty Benchmark	Penalty Value till the sample is within prescribed limit
Failure to maintain BOD/COD/TSS/Oil & grease/pH levels within prescribed limits. Detected as per reports of quarterly samples sent to approved lab and outlet quality to be achieved as per tender provisions	BOD > 20 mg/L	Rs.1000/- per Day
	COD > 100 mg/L	Rs.1000/- per Day
	TSS > 30 mg/L	Rs.1000/- per Day
	Oil & grease < 10 mg/L	Rs.1000/- per Day
	pH>9 and pH<6	Rs.1000/- per Day

Routine Inspection

Remove accumulation of debris from inlet channel and outlet V-notch Chamber. All the tanks, baffles and weirs should be inspected and cleaned daily.

i. All the vertical walls and channels should be cleaned by squeeze.
ii. All the mechanical equipments should be inspected for normal trouble free operation.
iii. If the colour of the wastewater is changed in any unit. Samples should be taken immediately to investigate the cause of the problem.
iv. Inspect sludge collection and other equipment annually for the indication of corrosion.

Emergency Inspection

In case of any serious problem with any unit, feeding should be stopped immediately to that unit. Drain all the wastewater from the unit and inspect carefully the structure, unusual deposition, each and every part of mechanical equipment, etc. All the mechanical equipments should be maintained in good working condition. Unit should be cleaned properly before making the same operational again.

Plant Shutdown

In case plant needs to be shut down for a considerable period of time, following points should be observed:

a) Close inlet valve to plant and open bye-pass valve if any. Thus effluent will not be received in the plant.

b) Pump out effluent from intermediate sump. Open drain valves of tank and drain out the contents.

c) The equipment then should be flushed with clear water.

3.1.7 **Comprehensive Maintenance Chart**

S. No.	EQUIPMENT	COMPREHENSIVE MAINTENANCE INSTRUCTIONS
1.	Bar Screen	Remove material arrested at screen - Once in 2 or 3 days
2.	Oil & Grease Trap	Remove oil floating at surface -Once in 2 or 3 days
3.	Equalization Tank	Verify uniform Air bubbling in the equalization tank
4.	Air grid in Equalization Tank	Adjust the inlet valve for medium air bubbling in the equalization tank while commissioning.
5.	Feed Pump	Changeover from one pump to another daily Provide lubrication regularly.
6.	Air Blower	1. Changeover from one blower to another daily. 2. Maintain the lubricating oil level in the Air blowers properly. 3. Clean the Air Filter regularly. 4. The dead weights provided on the air blowers should be kept Free by applying grease periodically.
7.	FAB Reactor & Tube settler unit	Drain the Sludge from FAB Reactor once in a month for 5. Minutes by keeping air blowers off. This will avoid choking of air grid. Pressure at Blower discharge should be checked while starting the system fresh. Any increase in the pressure over a period of time would indicate choking of air grid and would need to be cleaned. The screenings from Screen Box at 2nd FAB reactor inlet shall be removed periodically to avoid the foreign material, solids etc. entering the FAB Reactor so as to avoid choking of Air Grid of the reactor.
8.	Air Grid for FAB Reactors	Adjust the inlet valve for proper air bubbling in the FAB reactor while commissioning. Verify uniform Air Bubbling in the FAB regularly. The Air Grid of the reactor shall be cleaned once in 15 days. For cleaning the grid allow full air to flow for 5 minutes through the grid to be cleaned by stopping the air to the other reactor. This will also provide the higher fluidization velocity resulting in higher friction between FAB media, which in turn removes the excessive Biological growth over media.
9.	Tube Settler Sludge Drain Valve	The Sludge from the Tube Settler shall be drained once in 2-3 hours for 2 minutes. However this frequency depends upon the actual plant load. Adjust the timer-while commissioning. Verify the sludge withdrawal regularly. The Tube Media can be washed with low-pressure jet of raw water if required. The media shall not be removed from tube settler tank while washing it.
10.	Sludge Digester	Remove digested sludge bed every half yearly or yearly.
11.	Dosing Tank with Constant Head Box	Adjust the dosage – while commissioning Normally 5 to 7 mg/l Chlorine dose is required.
12.	Filter Feed Pump	Changeover from one pump to another daily, Provide lubrication regularly.
13.	Dual Media Filter	Backwash the Filter twice a day-every 12 hrs.for about 15 Minutes.
14.	Activated Carbon Filter	Backwash the filter twice a day-every 12 hrs. For about 15 Minutes.

3.1.8 The dead weights provided on the air blowers should be kept free by applying grease periodically.

3.1.8.1 This will avoid chocking of air grid.

3.1.8.2 Pressure at blower discharge should be checked while starting the system fresh.

3.1.8.3 Any increase in the pressure over a period of time would indicate chocking of air grid and would need to be cleaned.

3.1.8.4 The screenings from screen box at 2nd FAB reactor inlet shall be removed periodically to avoid the foreign material, solids etc. entering the FAB reactor so as to avoid chocking of air grid of the reactor.

3.1.8.5 Air grid for FAB reactors, Adjust the inlet valve for proper air bubbling in the FAB reactor while commissioning .verify uniform Air bubbling in the FAB regularly.

3.1.8.6 The Air Grid of the reactor shall be cleaned once in 15 days. For cleaning the grid allow full air to flow for 5 minutes through the grid to be cleaned by stopping the air to the other reactors. This will also provide the higher fluidization velocity resulting in higher friction between FAB media, which in turn removes the excessive Biological growth over media.

3.1.8.7 Adjust the timer –while commissioning.

3.1.8.8 Verify the sludge withdrawal regularly.

3.1.8.9 The tube media can be washed with low pressure jet of raw water if required. The media shall not be removed from the tube settler tank while washing it.

3.1.8.10 Sludge Digester removes digested sludge bed every half yearly or yearly as per site requirement.

3.1.8.11 Dosing tank with constant head box, adjust the dosage – while commissioning normally 5 to 7 mg/l chlorine dose required.

Other miscellaneous items as per instructions of engineer in-charge

a. No extra cost shall payable for work executed during block/night hours or work at height unless specified in BOQ.
b. The contractor shall plan & execute the work in such a way that the work proceeds smoothly to the satisfaction of engineer.
c. Any other item of work as may be required, to be carried out as per CPWD Specifications, for completing the job in all respects in accordance with the provisions of contract and or to ensure the structural stability and safety of the work during and after maintenance.

3.1.9 In case of discrepancy among Standard codes of Practice, Technical Specifications and provision in sub-clause in this NIT, the order of precedence will be as below:

(i) Provision in NIT/BOQ.
(ii) Technical Specifications
(iii) CPWD Specifications
(iv) Standard Code of Practice.

In case of discrepancy among Standard Codes of Practice, the order of precedence will be IRS, IRC, IS, BS, DIN.

3.1.10 **Time Schedule:**

The contract period for execution of the above mentioned work is 3 years from the date of commencing of work.However; the emergency works arisen should be attended promptly.

3.1.11 **Specifications:**

CPWD Specifications/IS code Specifications are applicable.

4 Interface Work

In addition, the Contractor shall be required to accommodate requirements of miscellaneous works as per interfacing requirements. The Contractor shall carry out necessary coordination's with Civil Contractor, E&M Contractor and various system contractors pertaining to traction power supply, signaling, telecommunication, etc. for keeping provisions pertaining to cut outs, shafts, raceways, concealed conduits, other conduits, fixtures, inserts clearances etc all complete for the scope of work.

5 STRUCTURES

The maintenance of structures will have to be planned in such a manner that they do not obstructer interfere with existing roads/railways and other utilities. Where work is required to be carried out at locations adjacent to such roads/ railways, utilities, structures, monuments etc. suitable safety and protection arrangements will have to be ensured for which nothing extra will be payable. It should be ensured that no damage is caused to any such element and Engineer/ Employer shall be indemnified against such damage at no extra cost.

6 REFERENCE TO THE STANDARD CODES OF PRACTICE

All Standards, Technical Specifications and Codes of practice referred to shall be latest editions including all applicable officials amendments and revisions. The Contractor shall make Available at site all relevant Indian Standard Codes of practice and IRSCCodes as applicable.

Wherever Indian Standards do not cover some particular aspects of maintenance, relevant British, German Standards will be referred to. The Contractor shall make available at site such standard codes of practice.

In case of discrepancy among Standard codes of practice, Technical specifications and provisions in sub clauses in this NIT, the order of precedence will be as below:

i) Provision in NIT
ii) Technical Specifications,
iii) CPWD specifications
iv) Standard Codes of Practice.

In case of discrepancy among Standard Codes of Practice, the order of precedence will be IRS, IRC, IS, BS, DIN

7 DIMENSIONS

7.1 As regards errors, omission sand discrepancies in Specifications and Drawings, relevant clause of Special Conditions of Contract will apply.

7.2 The Contract shall utilise the SI system of units. Codes and Standards in imperial units shall not be used unless the Engineer has given his consent.

7.3 Conversion between metric units and imperial units shall be in accordance with the relevant Indian Standards.

7.4 The levels, measurements and other information concerning the existing site as shown on the conceptual/ layout drawings are believed to be correct, but the Contractor should verify them for himself and also examine the nature of the ground as no claim or allowance whatsoever will be entertained on account of any errors or omissions in the levels or strata turning out different from what is shown on the drawings.

8 SPACE FOR TEMPORARY OFFICE & STORAGE

Deleted.

9 STANDARDS

9.1 Equipment, materials and systems shall be designed, manufactured and tested in accordance with the latest issue of International and/or National codes and standards.

9.2 Reference to standards or to materials and equipment of a particular manufacturer shall be regarded as followed by the words “or equivalent”. The Contractor may propose alternative standard materials, or equipment that shall be equal to or better than those specified. If the Contractor for any reason proposes alternatives to or deviations from the specified standards, or desires to use materials or equipment not covered by the specified standards, the Contractor shall apply for the consent of the Engineer. The Contractor shall state the exact nature of the change, the reason for making the change and relevant specifications of the materials and equipment in the English language. The decision of the Engineer in the matter of quality will be final.

9.3 The Contractor shall establish and maintain a Quality Assurance System in accordance with Appendix-3 to these Employer's Requirements for design and maintenance procedures and the interfaces between them. This Quality Assurance system shall be applied without prejudice to, or without in any way limiting, any Quality Assurance Systems that the Contractor already maintains.

10 SITE INFORMATION

10.1 Work Site

10.1.1 The Maintenance work site is located at Metro Train Depot Noida-Greater Noida &Staff Quarters of NMRC.

10.1.2 The Contractor shall plan his works keeping in view restriction of approach and availability of space and time.

10.2 Climatic Conditions

NCR experiences extreme climatic conditions and tenderers must acquaint themselves about the same before submitting the tender. The Employer shall in no way be responsibleon this account.

11 CONTRACTOR'S SUPERINTENDENCE

11.1 The Contractor shall submit a Staff Organization Plan in accordance with the Clause 6.8 of GCC and C7 of ITT. This plan shall be updated and resubmitted whenever there are changes to the staff. The plan shall show the management structure and state clearly the duties, responsibilities and authority of each staff member.

11.2 The site agent and his associates/supervisors shall have experience and qualification appropriate to the type and magnitude of the Works. Full details shall be submitted of the qualifications and experience of all proposed staff to the Engineer for his approval.

12 THE SITE

12.1 USE OF THE SITE

12.1.1 The Site or Contractor's Equipment shall not be used by the Contractor for any purpose other than for carrying out the Works in the scope of this contract, except that, with the consent in writing of the Engineer, the Site or Contractor's Equipment may be used for the work in connection with other contracts under the Employer only after consent of employer.

12.1.2 The location and size of each stockpile of materials, including excavated materials, within the Site shall be as permitted by the Engineer. Stockpiles shall be maintained at all times in a stable condition.

12.1.3 Entry to and exit from the Site shall be controlled and shall be only available at the locations for which the Engineer has given his consent.

12.2 ACCESS TO THE SITE

12.2.1 The Contractor shall make its own arrangements, subject to the consent of the Engineer, for any further access required to the Site.

12.2.2 In addition, the Contractor shall ensure that access to every portion of the Site is continually available to the Employer and Engineer.

12.3 ACCESS TO OUTSIDE THE SITE

The Contractor shall be responsible for ensuring that any access or egress through the Site boundaries are controlled such that no disturbance to residents or damage to public or private property occur as a result of the use of such access or egress by its employees and subcontractors

12.4 BARRICADES AND SIGN BOARDS

12.4.1 The Contractor shall erect barricades as per requirement& wherever necessary around its areas of operations to prevent entry by unauthorised persons to his Works Areas. No work shall be commenced in any Works Area until the Engineer has been satisfied that the barricades installed by the Contractor are sufficient to prevent, within reason, unauthorized entry.

12.4.2 Barricades shall be maintained in clean and good order bythe Contractor until the completion of the Works.

12.4.3 All Barricades installed by the Contractor shall be removed by the Contractor upon the completion of the Works, unless otherwise directed by the Engineer.

12.4.4 Barricades can be reused after removing from one place to other locations/sites provided they are in good condition and approved by Engineer.

12.4.5 Damage/worn-out barricades shall be replaced by contractor within 24 hours. Engineer‘s decision regarding need for replacement shall be final and binding and if no action is taken by contractor, the Engineer may get itrepaired through other agencyand the cost of any repairs will be deducted by the Engineer from any payment due to the Contractor. -

12.5 CLEARANCE OF THE SITE

All Temporary Works which are not to remain on the Site after the completion of the Works shall be removed prior to completion of the Works or at other times instructed by the Engineer. The Site shall be cleared and reinstated to the lines and levels and to the same condition as existed before the works started except as otherwise stated in the Contract.

13 SURVEY OF SITE AND INVESTIGATIONS

Deleted.

14 SAFETY, HEALTH AND ENVIRONMENTAL REQUIREMENTS

The Contractor shall comply within the conditions stipulated in the Conditions of contracts on Safety, Health &Environment (SHE).

14.1 Use of" Tractor Transmission type" Pick and Carry Hydra crane: -

"Tractor Transmission type" Pick and Carry Hydra Crane–1st Generation model is prohibited at NMRC works. Contractor shall mobilize "Truck Transmission type" Pick and Carry Hydra Crane – 2nd Generation model or higher version.

14.2 Other Safety Measures

14.2.1 Stand by Equipment

The Contractor shall provide adequate stand-by equipment to ensure the safety of personnel, the Works and the public.

15 Technology Transfer

The Contractor shall ensure that all local contractors engaged in the works are given training, guidance and the necessary opportunity for transfer of technology in various areas of maintenance such as instrumentation, safety, quality assurance, viaduct and station etc.

16 CARE OF THE WORKS

(a) Unless otherwise permitted by the Engineer all work shall be carried out in dry conditions.

(b) The works, including materials for use in the works, shall be protected from damage due to water. Water on the Site and water entering the Site shall be promptly removed by temporary drainage or pumping systems or by other methods capable of keeping the Works free of water. Silt and debris shall be removed by traps before the water is discharged and shall be disposed of at a location or locations to which the Engineer has given his consent.

(c) The discharge points of the temporary systems shall be as per the consent of the Engineer. The Contractor shall make all arrangements with and obtain the necessary approval from the relevant authorities for discharging water to drains watercourses etc. The relevant work shallnot be commenced until the approved arrangements for disposal of the water have been implemented.

(d) The methods used for keeping the Works free of water shall be such that settlement of, or damage to, new and existing structures do not occur.

(e) Measures shall be taken to prevent flotation of new and existing structures.

17 PROTECTION OF THE WORKS FROM WEATHER

Work shall not be carried out in weather conditions that may adversely affect the Works unless proper protection is provided to the satisfaction of the Engineer.

Permanent Works, including materials for such Works, shall be protected from exposures of weather conditions that may adversely affect such Permanent Works or materials.

During maintenance of the Works storm restraint systems shall be provided where appropriate. These systems shall ensure the security of the partially completed and on-going stages of maintenance and in all weather conditions. Such storm restraint systems shall be installed as soon as practicable and shall be compatible with the right of way, or other access around or through- out the Site.

The Contractor shall at all times, make programme and order progress of the work and make all protective arrangements such that the Works can be made safe in the event of storms.

The finished works shall be protected from any damage that could arise from any activities on the adjacent site/ works.

18 DAMAGE AND INTERFERENCE

(a) Work shall be carried out in such a manner that here is no damage to or interference with:

(i) water courses or drainage systems; (ii) utilities; (iii) structures (including foundations), roads, including street furniture, or other properties; (iv) public or private vehicular or pedestrian access; (v) monuments, trees, graves or burial grounds other than to the extent that is necessary for them to be removed or diverted to permit the execution of the Works. Heritage structures shall not be damaged or disfigured on any account. The Contractor shall inform the Engineer as soon as practicable of any items which are not stated in the Contract to be removed or diverted but which the Contractor considers need to be removed or diverted to enable the Works to be carried out. Such items shall not be removed or diverted until the consent of the Engineer to such removal or diversion has been obtained.

(b) Items which are damaged or interfered with as a result of the Works and items which are removed to enable work to be carried out shall be reinstated to the satisfaction of the Engineer and to at least the same condition as existed before the work started. Any claims by Utility Agencies due to damage of utilities by the Contractor shall be borne by the Contractor.

(c) The Contractor shall immediately inform the Engineer of any damage to structures, roads or other properties.

(d) The Contractor shall take all necessary precautions to protect the structures or works being carried out by others adjacent to and, for the time being, within the Site from the effects of vibrations, undermining and anyother earth movementsor the diversion of water flow arising from its work.

19 SITE ESTABLISHMENT

Deleted.

20 QUALITY ASSAURANCE

The Contractor shall establish and maintain a Quality Assurance System in accordance with Appendix-3 to the Employer's Requirement. This Quality Assurance system shall be applied without prejudice to, or without in any way limiting, any Quality Assurance Systems that the Contractor already maintains.

21 TESTING

General

(a) The Contractor shall provide and perform all forms of testing procedures applicable to the Works and various components and the interfacing of the Works with the other Contract works and shall conduct all necessary factory, site and acceptance tests.

(b) All testing procedures shall be submitted **at least thirty (30) days** prior to conducting any Test. The Testing procedures shall show unambiguously the extent of testing covered by each submission, the method of testing, the Acceptance Criteria, the relevant drawing (or modification) status and the location.

(c) The testing Procedures shall be submitted, as required, by the Contractor during the duration of the contract to reflect changes in system design or the identification of additional testing requirements.

(d) All costs associated with the Testing shall be borne by the Contractor, unless otherwise specified, including the services of any specialised personnel or independent assessors. The Contractor shall also bear any expenses incurred due to re setting caused by defects or failure of equipment to meet the requirements of the Contract in the first instance.

(e) Unless agreed in writing by the Engineer, the personnel engaged on testing shall be independent of those directly engaged in the design or installation of the same equipment.

(f) All testing equipment shall carry an appropriate and valid calibration labels.

BATCHES, SAMPLES AND SPECIMENS

(a) A batch of material is a specified quantity of the material that satisfies the specified conditions. If one of the specified conditions is that the material is delivered to the Site at the sametime, thenmaterial deliveredto the Site over a periodof afew days maybe considered as part of the same batch if in the opinion of the Engineer there is sufficient proof that the other specified conditions applying to the batch apply to all of the material delivered over the period.

(b) A sample is a specified quantity of material that is taken from a batch for testing and which consists of a specified amount, or a specified number of pieces or units, of the material.

(c) A specimen is the portion of a sample that is to be tested.

SAMPLES FOR TESTING

(a) Samples shall be of sufficient size and in accordance with relevant Standards to carry out all specified tests.

(b) Samples taken on the Site shall be selected by, and taken in the presence of, the Engineer and shall be suitably marked for their identification. An identification marking system should be evolved at the start of works in consultation with the Engineer.

(i) Samples shall be protected, handled and stored in such a manner that they are not damaged or contaminated and such that the properties of the sample do not change.

(c) Samples shall be delivered by the Contractor, under the supervision of the Engineer, to the specified place of testing. Samples on which non-destructive tests have been carried out shall be collected from the place of testing after testing and delivered to the Site or other locations instructed by the Engineer.

(d) Samples which have been tested may be incorporated in the Permanent Works provided that:

(i) The sample complies with the specified requirements;
(ii) The sample is not damaged; and
(iii) The sample is not required to be retained under any other provision of the Contract

(e) Additional samples shall be provided for testing if in the opinion of the Engineer:

(i) Material previously tested no longer complies with the specified requirements; or
(ii) Material has been handled or stored in such a manner that it may not comply with the specified requirements.

CONDUCTING TESTING

(a) The Contractor shall be responsible for all on-site and off-site testing and for all in-situ testing. All appropriate laboratory tests shall be carried out in the Contractor's laboratory, unless otherwise permitted or required by the Engineer. Where the laboratory is not appropriately equipped and/or staffed for some tests, or if agreed to by the Engineer, tests may be carried out in other laboratories provided that:

(i) They are accredited for the relevant work to a standard acceptable to the Engineer; and

(ii) Particulars of the proposed laboratory are submitted to the Engineer for his consent.

(b) In-situ tests shall be done in the presence of the Engineer.

(c) Equipment, apparatus and materials for in-situ tests and laboratory compliance tests carried out by the Contractor shall be provided by the Contractor. The equipment and apparatus shall be maintained by the Contractor and shall be calibrated before the testing starts and at regular intervals as permitted by the Engineer. The equipment, apparatus and materials for in the situ tests shall be removed by the Contractor as soon as practicable after the testing is complete.

(d) The Contractor shall be entitled in all cases to attend the testing carried out in the Employer's or other laboratories, to inspect the calibration certificates of the testing machines and to undertake the testing on counterpart samples. Testing of such samples shall be undertaken in laboratories complying with Clause 21.4(a)(i) above and particulars of the laboratory proposed shall be submitted to the Engineer for consent prior to the testing.

(e) Attendance on tests, including that by the Engineer, Contractor and Designer, shall be as laid down in the Quality Assurance procedures.

COMPLIANCE OF BATCH

a. The results of tests on samples or specimens shall be considered to represent the whole batch from which the sample was taken.

b. A batch shall be considered as complying with the specified requirements for a material if the results of specific tests for of the specified properties comply with the specified requirements for the properties.

c. If additional tests are permitted or required by the Engineer but separate compliance criteria for the additional tests are not stated in the Contract, the Engineer shall determine if the batch

Complies with the specified requirements for the material on the basis of the results of all tests, including the additional tests, for every property.

RECORDS OF TESTS

Records of in-situ tests and laboratory compliance tests carried out by the Contractor shall be kept by the Contractor on the Site and a report shall be submitted to the Engineer **within seven (7) days**, or such other time stated in the Contract or in the Quality Assurance Programme, after completion of each test. In addition to any other requirements, the report shall contain the following details

(a) Material or part of the Works tested;
(b) Location of the batch from which the samples were taken or location of the part of the Works;
(c) Place of testing;
(d) Date and time of tests;
(e) Weather conditions in the case of in-situ tests;
(f) Technical personnel supervising or carrying out the tests;
(g) Size and description of samples and specimens;
(h) Method of sampling;
(i) Properties tested;
(j) Method of testing;
(k) Readings and measurements taken during the tests;
(l) Test results, including any calculations and graphs;
(m) Specified acceptance criteria; and
(n) Other details stated in the Contract.

Reports of tests shall be signed by the site agent or his assistant, or by another representative authorised by the Contractor.

If requested, records of tests carried out by the Employer's staff or by the Engineer shall be given to the Contractor.

22 RECORDS

DRAWINGS PRODUCED BY THE CONTRACTOR

Drawings produced by the Contractor including drawings of site layouts, Temporary Works, etc. for submission to the Engineer shall generally be to ISO A1 size. The number of copies to be submitted to the Engineer shall be as stated in the Contract, or as required by Engineer.

PROGRESS PHOTOGRAPHS

(a) The Contractor shall provide monthly progress photographs which have been properly recorded to show the progress of the works to the Engineer. The photographs shall be taken on locations agreed with theEngineerto record theexact progress of the Works. Two sets of photographs shall be provided on CD ROM format with two sets of colour prints of 175mm x 125 mm size.

(b) The Contractor shall ensure that no photography is permitted on the Site without the agreement/ permission of the Engineer. Contractor should be aware of the local regulations and conditions with regard to Photography in some “RESTRICTED AREA’ in Noida.

23 MATERIALS

Materials and goods for inclusion in the Permanent Works shall be new unless the Engineer has consented otherwise. Preference shall be given to local materials where available. Approved Manufacturers/Suppliers of few important items have been given in Appendix-4 of this Employer's Requirement. These materials shall be procured only for these manufacturers/Suppliers.

Certificates of tests by manufacturers which are to be submitted to the Engineer shall be current and shall relate to the batch of material delivered to the Site. Certified true copies of certificates may be submitted if the original certificates could not be obtained from the manufacturer.

Parts of materials which are to be assembled on the Site shall be marked to identify the different parts.

Materials which are specified by means of trade or proprietary names may be substituted by materials from a different manufacturer which has received the consent of the Engineer provided that the materials are of the same or better quality and comply with the specified requirements.

Samples of materials submitted to the Engineer for information or consent shall be kept on the Site and shall not be returned to the Contractor or used in the Permanent Works unless permitted by the Engineer. The samples shall be used as a mean of comparison which the Engineer shall use to determine the quality of the materials subsequently delivered. Materials delivered to the Site for use in the Permanent Works shall be of the same or better quality as the samples which have received consent.

EMPLOYER'S REQUIREMENTS

APPENDIX 1

DELETED

EMPLOYER'S REQUIREMENTS

APPENDIX 2A

DELETED

EMPLOYER'S REQUIREMENTS

APPENDIX 2B

DELETED

EMPLOYER'S REQUIREMENTS

APPENDIX 3

QUALITY ASSURANCE

1. General

The Contractor shall implement a Maintenance Quality Management Plan in accordance with ISO9001"Quality System - Model for Quality Assurance in Design/Development, Production, Installation and Servicing" to ensure that all materials, workmanship, plant and equipment supplied and work done under the contract meets the requirements of the contract. This plan shall apply to all activities related to the quality of items, including designing, purchasing, inspecting, handling, assembling, testing, storing, and shipping of materials and equipment and different elements of maintenance work and installations of system components.

The QualityPlan to beprepared bythe Contractor and submitted tothe Engineer shall follow the requirements of ISO 9001 and address each element therein.

Registration of the Contractor's organisation is not required for this work but the Work Quality Management Plan as submitted shall meet the intent of the ISO 9001 requirement in that there is a comprehensive and documented approach to achieving the project quality requirements.

2. Quality Assurance Management Plan

The Maintenance Quality Management Plan (PQMP) shall as a minimum address the quality system elements as required by ISO 9001, generally noting the applicability to the Contractor's Works Programme for the work. Procedures or Quality Plans to be prepared by others (Suppliers) and their incorporation in the overall PQMP shall be identified.

The Contractor shall provide and maintain a Quality Assurance Plan (QA) to regulate methods, procedures, and processes to ensure compliance with the Contract requirements. The QA Plan, including QA written procedures, shall be submitted to the Engineer for his review.

Adequate records shall be maintained in a readily retrievable manner to provide documented evidence of quality monitoring and accountability. These records shall be available to Employer at all times during the term of the Contract and during the Defects Liability Period and for a five-year period thereafter.

The Plan shall identify:

- Design Process: that control, check and verify the accuracy, completeness and integration of the design shall be performed by certified personnel and in accordance with documented procedure that have the written consent of the Engineer.

- Special Processes: that control or verify quality shall be performed by certified personnel and in accordance with documented procedures that have the written consent of the Engineer;

- Inspection and Test: Inspection and testing instructions shall provide for reporting non-conformances or questionable conditions to the Engineer; Inspection shall occur at appropriate points in the installation sequence to ensure compliance with drawings, test specifications, process specifications, and quality standards. The Engineer shall designate, if necessary, inspection hold points into installation or inspection planning procedures;

- Receiving Inspection: These procedures shall be used to preclude the use of non-conforming materials and to ensure that only correct and accepted items are used and installed;

- Identification and Inspection Status: a system for identifying the progressive inspection status of equipment, materials, components, subassemblies, and assemblies as to their acceptance, rejection, or non-inspection shall be maintained;

- Identification and Control of Items: an item identification and traceability control shall be provided;

- Handling, Storage, and Delivery: provide for adequate work, surveillance and inspection instructions.

The Plan shall ensure that conditions adverse to quality such as failures, malfunctions, deficiencies, deviations, and defects in materials and equipment shall be promptly identified and corrected.

The Plan shall provide for establishing, and maintaining an effective and positive system for controlling non-conforming material including procedures for the identification, segregation, and disposal of all non-conforming material. Dispositions for the use or repair of nonconforming materials shall require the Engineers consent.

3. Plan Implementation and Verification

The Plan shall clearly define the QA Organisation. Management responsibility for the QAshall be set forth on the Contractor's policy and organisation chart. The Plan shall define the requirements for QA personnel, their skills and training. Records of personnel certifications shall be maintained and monitored by the QA personnel. These records shall be made available to the Engineer for review, upon request.

The QA operations shall be subject to the Engineers, Employer or Employer's authorised representative's verification at any time, including: surveillance of the operations to determine that practices, methods and procedures of the plan are being properly applied; inspection to measure quality of items to be offered for acceptance; and audits to ensure compliance with the Contract documents.

EMPLOYER'S REQUIREMENTS

APPENDIX 4

APPROVED MANUFACTURERS/SUPPLIERS

Manufacturers/ Suppliers

All materials and products shall conform to the relevant standard specification, BIS codes and other relevant codes etc. and shall be of make as approved by Engineer.

The list of makes for products and materials is given below. Other equivalent manufacturers may also be considered with prior approval of the Engineer, if found conforming to all standards. Such requests should be made with all documents to the Engineer at least 45 days before the material is required and any order shall be placed only after receiving the written approval of the Engineer.

S. No.	Details of Materials/ Products	Manufacturer's Name
1	Aluminium Sections and panels	Alstone International
2	Sealants and Joints	Berger Paints Pvt. Ltd
3	Water Proofing. Surface Treatments, Concrete Repair, Protective coatings, Grouts and Anchors, Paints and related chemicals	PAMR Industries Pvt. Ltd., Sunanda Speciality Coatings Pvt. Ltd., Berger Paints Pvt. Ltd.
4	Wire cables and cable Accessories, General Electric Fittings	SVARN Infratel Pvt Ltd, Delton Cables, Hansel Electric India Pvt Ltd, Special Cables Pvt ltd., Synergy Systems, Surya Roshni Ltd., BMI CABLES Pvt Ltd, Vishal Electricals, Prime Cable Industries Pvt. Ltd. Jaquar and Company Pvt. Ltd., KEI Industries Ltd, KEC International Ltd.
5	Sub-station, Distribution Equipment	Socomec India Pvt. Ltd.
6	Maintenance Free earthing System, 6 Lightning Protection System, Surge protection Device	JMV LPS Limited, DEHN India Pvt. Ltd.
7	Electrodes, Cutting and wielding Accessories & Electrical Oxyacetyles	Varun Electrodes Pvt Ltd
8	All type of door and windows	NCL VEKA Ltd.
9	Aluminum Sections and panels	Virgo Laminates Limited
10	C.I., G.I. Pipes and Fittings	APL Apollo Tubes Ltd., Madhav KRG Ltd.
11	All types of Glasses	Sisecam Flat Glass India Pvt. Ltd, Hindustan Glass Work Ltd.
12	Bolts, Nuts rivets, studs and screws	TRIXEL (Axel India), SNTP Technologies (Rebar Couplers)
13	Roofing Materials	Aditya Profiles Pvt. Ltd.
14	Sealants and Joints	Cameo Inc, Asian Paints, DECG International

15	Water Proofing, Surface Treatments, Concrete Repair, Protective coatings, Grouts and Anchors, Paints and related chemicals	Asian Paints Ltd.
16	All types of Tiles	Varmora Granito Pvt. Ltd.
17	Mild Steel Sections, Plates, Sheets	Madhav KRG Ltd.
18	Bearing	DECG International
19	Adhesive and grouts	KERAKOLL India Pvt. Ltd.
20	Application of release valve, Relay valve, isolating cocks, safety valves and check	Castle Valves Ltd
21	Wire, cables and cable Accessories, General Electric Fittings	Genus Electrotech Ltd., Ambit Switchgear Pvt. Ltd., MAK Engineers Inc, Bonton Cables (India) Pvt. Ltd., Halonix Technologies Pvt. Ltd., Neptune System Pvt. Ltd., Nitya Electrocontrol Private Limited., Mandeep Cables, Power Cable Industries, ABB India Ltd., Insucon Cables & Conductors Pvt. Ltd., Ascon Engineering Industries, Apar Industries Ltd. And LS Cables India Pvt. Ltd.
22	Sub Station, Distribution Equipments	Ambit Switchgear Pvt. Ltd., MAK Engineers INC, ABB India Ltd.
23	Electrical measuring Instruments	Newtek Electricals