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TECHNICAL STANDARD SPECIFICATION CIVIL

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**OMAN WASTEWATER
SERVICES COMPANY S.A.O.C**



**الشركة العمانية
لخدمات الصرف الصحي ش.م.ع.م**

OMAN WASTEWATER SERVICES COMPANY

TECHNICAL STANDARD SPECIFICATION

CIVIL WORKS

SECTION 01 GENERAL

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SECTION 01 GENERAL

1. Scope

This specification has been written in accordance with European and British Standards. Due to the introduction of new European Standards, both British and European Standards may be in force at the same time. In the case of conflict the European Standard shall apply except where British Standards have been specified in the contract then those shall apply until their official date of withdrawal.

British standards and other Standards referred to in the Contract shall be deemed to be those current 28 days prior to the date for return of Tenders.

This Specification shall be applicable for all OWSC's Projects and shall be read in conjunction with all other documents of any Contract requirements and/or Particular Specification. The Clauses in this Specification are applicable in varying degrees to each and every part of the Works.

This Specification applies to the entire Works, whether on Site or in Yards, Workshops and factories employed elsewhere in connection with the Work.

Any clause in these Specifications which relates to work or materials not required by any particular Contract shall be deemed not to apply.

2. Definitions

- a. Client/Owner/Purchaser means Oman Wastewater Services Company for whom the work to be constructed.
- b. Owner Representative/Engineer means the Firm or Company named in the Contract as appointed by the Client to supervise and administer the Contract.
- c. The Contractor means the Company or Organization responsible for the construction of the Works and who have entered into a Contract with the Client.
- d. The Site means the land allocated for the Work.
- e. Project Documents means all documents associated with and applicable to the Project Contract.

3. Site Access and Entry onto the Site

3.1 Access Roads

The Contractor shall arrange for, construct, maintain and after wards remove and reinstate any access required for and in connection with the execution of the Works.

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3.2 Site Entry

The Contractor is required to organize his operations in such a way that disruption of access to contiguous properties and interference with existing services and improvements is minimized.

Private properties shall not be entered or occupied by the Contractor, except by permission of the land owners, and in accordance will clause 8 of and clouse 2 of section 02 Eawth works.

The Contractor shall undertake a Pre and Post Construction Survey across the complete works. The thorough survey shall include extensive photographic evidence to illustrate the quality of structures across the site. An experienced Structural Engineer shall review and report on the findings of the Contractor.

The Contractor shall ensure that roads used by him for the transportation of Construction Plant, labor, materials and excavated materials are not dirtied because of his operations. If, in the opinion of the Engineer, the Contractor's operations result in dirty conditions, the contractor, upon notification by the Engineer, shall take all necessary steps to clean roads so dirtied, at no extra cost to the Employer.

3.3 Project Sign Boards

The Contractor shall provide maintain and remove, when directed by the Engineer, construction identification signs boards for the Site. These signs shall be constructed of a painted timber framed, blackboard panel, all painted with two coats of white oil paint back and front and supported with painted steel angle framing and struts painted mat black and set into the ground and fixed in concrete foundations for adequate support.

The board shall be lettered in both Arabic and English by a skilled, professional sign writer to include the information as approved by the Engineer.

The locations and size of the signs shall be approved by the Engineer, which approval shall not remove the Contractor's responsibility for obtaining the required approval from other concerned Authorities.

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A large scale layout shall be submitted for approval before manufacture. No advertising material, other than the above, shall be permitted. The temporary construction identification signs shall be maintained in good condition, repainted as directed by the Engineer and removed from the Site when directed by the Engineer. The sitting and layout of subcontractors' and/or manufacturers' signs shall be to the approval of the Engineer.

No sign shall be erected in a location that is dangerous to the public or creates a hazard to road users.

All signboards shall be removed by the Contractor one month after the completion of the works or as directed by the engineer

The scheme title to be used on all signage for all Contracts relating to the projects shall be described in the Contract Particular Specification.

4. Accommodations for the Contract

This Clause contains a description and the Specification for the Engineer's Site Office Facilities to be provided by the Contractor for use by the Engineer and shall include, but not limited to the providing, constructing, furnishing, equipping, supplying, maintaining and removing upon completion of Contract by the Contractor of such facilities as specified herein.

Within two weeks of the notice of acceptance of the Tender, the Contractor shall submit a plan(s) showing his proposed locations for:

- a) The Offices for the Engineer /clients.
- b) The Contractor's Site Offices
- c) The Contractor's Stores, Plant and Maintenance Yard, Concrete Batching and Materials Stockpiling Facilities.
- d) Principal routes for heavy plant and trucks.
- e) Areas for the temporary storage and permanent dumping of excavated material.

The Offices of the Contractor's Agent shall normally be adjacent to or close to those of the Engineer for ease of access and communication. However, the Engineer's site office shall be completely detached from the Contractor's own office.

The plan(s) shall be submitted to the Engineer in six copies for approval. Any reasonable changes or modifications suggested by the Engineer shall be incorporated.

Deviation from the approved details shall not be permitted unless written consent is obtained from the Engineer.

The facilities shall be located on Site and in accordance with the requirements of Muscat Municipality and any other regulating authority, the Technical Specification, and as approved by the Engineer. The Contractor shall be responsible for locating a site for the offices, for obtaining the required approvals and meeting with the approval of the Engineer.

Temporary security fencing to isolate and secure the office site shall be provided at the Contractor's own cost. It shall be the Contractor's responsibility to obtain all necessary approvals and permits. No claim for extra payment or extension of time shall be considered for delays resulting from the Contractor's failure to obtain necessary approvals and permits for work.

The Contractor shall be responsible for the security of his property located throughout the Contractor's working area and shall make his own arrangements, at no additional cost to the Employer, for any additional working and lay-down area he may require.

All the facilities such as electric services highlighting, power water telephone line, furniture air conditions shall be as described in the contracted documents.

The Contractor shall be responsible for services charges during all the contract duration.

The Contractor shall provide maintenance of the facilities which shall include, but not by way of limitation, continual maintenance of the mechanical, air conditioning, heating, IT support, electrical and plumbing systems; providing potable drinking water and toilet supplies; disposal of all waste; maintenance of interior and exterior of building, grounds and paved areas, and including any repairs thereto. Maintenance shall also include providing water, electricity and telephone service and any other maintenance or services as specified in the contract documents or as further directed by the Engineer.

All Engineer's Site Office facilities, furnishings, equipment, and related items, supplied by the Contractor for the Engineer and his representatives shall be considered as an integral part of the Works. All furnishing, equipment and related items shall be new.

Upon completion of all construction, the facilities shall be removed from the Site and disposed of by the Contractor.

All wastewater and sewage lines shall be connected to existing underground sewers and as approved by the Employer and the Engineer. Where existing underground sanitary sewers are not available and when approved by the Engineer, the Contractor shall provide a disposal system as approved by the concerned authority and the Engineer.

To control dust, the parking area adjacent to the Engineer's Site Office Facilities shall be paved and suitably covered as approved by the Engineer. The entire Site shall be graded so that there are no depressed areas where water shall collect and the site is properly drained.

The building shall be provided with all weather access and connected to suitably covered and paved vehicular parking space for not less than ten vehicles.

The Contractor shall be responsible for daily cleaning of the offices.

The facilities shall be complete with insulated exterior walls and roof, covered with an approved finished material washable covering or as directed by the Engineer.

The doors shall be finished as approved by the Engineer and all doors shall be provided with locks, the keys for which shall be handed to the Engineer.

Windows shall be horizontally sliding, anodized aluminum frames, glazed with tinted glass and shall be lockable from inside. All window openings shall be provided with shades or blinds and insect screens. Fixed, aluminum awnings shall be provided on the exterior over the windows and the door openings.

The facilities shall be furnished with at least three toilet rooms for men and one for women each complete with W.C., urinal, one wash basin, hot water heater and a wall mirror. Potable drinking water shall also be provided. Additionally the Resident Engineer's office shall have an on-suite toilet room.

The Contractor shall furnish and install new furniture in the Engineer's Site Office Facilities as listed in the contract to the approval of the Engineer.

The Contractor shall provide an external telephone connection to all offices outlined under the contract. The Contractor shall provide an internal telephone network throughout the office block, providing a minimum of one telephone point per office.

5. Safety in Sewers and at Sewage Works

The Contractors shall note the content of and comply fully with the following:

- a) Safety in sewers and sewage works, recommendations for the safety of men working in sewers, manholes, pumping stations and at sewage treatment works, published by the Institution of Civil Engineers (UK)
- b) The Health, Safety and Environmental requirements of the Employer – in the event of any conflict than this document shall take precedence.
- c) The Contractor’s HS&E requirements, and shall ensure that all the requirements of the above document are covered by it
- d) The Contractor shall make copies of the above documents available on site.
- e) The Contractor shall provide the necessary monitoring equipment required for entry to hazardous or potentially hazardous atmospheres. Monitoring of all hazardous or potentially hazardous atmospheres shall be carried out by the Contractor and a suitable register maintained.
- f) The Contractor shall provide all necessary entry and rescue equipment, which shall be regularly checked and maintained. A register of equipment checks shall be kept on Site.
- j) Only personnel appropriately trained shall be allowed entry into Hazardous Areas

6. Existing Services

- a) Drains, Pipes, Cables and any other existing services or structures encountered in the course of the Works shall be guarded from damage by the contractor at his own cost so that they may continue to function uninterruptedly to the satisfaction of the owners thereof and the Contractor shall not store materials or otherwise occupy any part of the site in any manner likely to hinder the operations of such owners.
- b) The Contractor shall protect and support, during the progress of the Works, all water mains, electricity cable, telephone ducts/cables, pipes and other apparatus which might be endangered by his operations. The approximate positions and alignment of known services are indicated on the Drawings, but no guarantee of exact location can be given, and the Contractor must communicate with the

authorities and/or proprietors concerned to locate them exactly, and he shall then prepare shop drawings 1/500 scale for each Utility as directed by the Engineer.

When approaching each indicated position, the Contractor shall search, by safe methods such as utility detection devices and hand excavation, which shall not endanger the service, to determine its precise position.

- c) The standard and extent of protection and support provided shall be agreed with the service owner, and approved by the Engineer. Any damage caused to the service due to the Contractor's operations shall be immediately repaired to the specification and the satisfaction of the service owner and approved by the Engineer. The Contractor is advised that he will be heavily reliant on the cooperation of many of the relevant Service Authorities throughout the duration of the Contract, particularly in regard to the NOC approval process. The Contractor shall be solely responsible for the consequences of any non-cooperation from Service Authorities that results from his failure to implement agreed service protection measures.
- d) The Contractor shall make his own arrangement with the owners of the services and with affected parties interested, for any permanent or temporary diversions, temporary stoppages and reinstatement, and he shall allow in his programme for all such arrangements.
- e) If any underground service is encountered unexpectedly, excavation shall cease, and the Engineer shall be notified immediately. Emergency work, as necessary, shall be put in hand without delay and without prejudice to the indemnity of the Employer.
- f) The Contractor is instructed that in many instances records will not be available for existing underground services throughout the project area. The Contractor shall recognize that he will encounter such unknown services on a regular basis in the execution of his work. The Contractor shall be solely responsible for taking all measures required to deal with such circumstances, including but not limited to diversion of the existing service, realignment and design checks of the proposed works and any required reapplication of the NOC process and other approvals. Notwithstanding any items of work that will be re-measurable under the Bill of Quantities, the Contractor shall be responsible for all costs and time implications involved in such circumstances.
- g) Repairs shall be coordinated with the owner of the service. In the case that the service owner employs a third party to carry out the repair to a damaged service, the Contractor shall be responsible for the cost of the work carried out by the third party. The contractor shall also be responsible for the payment of fines or charges of any kind resulting from damage to services.

- h) The Contractor shall keep available and provide upon request a damaged utility response team to assist service authority Engineers in the repair of the services damages by the contractor.
- i) The contractor shall give notice, in writing, to the Engineer and to the appropriate service company of all damages to existing services caused by him or by any Sub-Contractor in the course of the Works. He shall be held responsible for any such damage and shall immediately have such damage made good at his own expense and shall relieve the Employer of all claims in respect of any loss or interruption involved.
- j) All existing sewers, culvers, water courses and drains of every kind and condition that have been altered, extended or otherwise interfered with, either directly or indirectly by the work, or that may be leakage, stopping of free flow or otherwise interfere with or delay the execution of the work, shall be made good, cleaned, placed in working order, supported, maintained, and protected and the Contractor shall provide everything necessary for efficiently dealing with, protecting, pumping or removing, as the case may be.

7. Flows in Pipelines and Pumping Stations and decommissioning of existing sewage holding tanks

- a) During the execution of the Works the Contractor shall maintain flows in pipelines and at pumping stations or alternatively provide adequate means of diverting the flows or over pumping of the flows to the satisfaction of the Engineer.
- b) The Contractor shall note that the Employer may decide to carry out over pumping utilising his own plant and resources and the contractor shall make due allowance for the necessary coordination with the Employer with respect of the Contract programme. Such arrangements shall not relieve the Contractor of his obligations for the maintenance of flows and the safety of the Works.
- c) When instructed by the Engineer, the Contractor shall decommission existing sewage holding tanks in a safe and environmentally safe manner as proposed by the Contractor and approved by the Engineer. It shall be the Contractor's responsibility to submit to, and obtain the approval for it from the concerned authorities for the method he proposes. The Contractor shall be responsible for paying any fees to any authority or for the treatment of any disposed contents of the holding tanks.
- d) For the avoidance of doubt, the basic decommissioning requirements include the removal and safe disposal of the internal contents of the tank (septage), the cleaning and disinfection of the internal parts of the tank, the backfilling of the

tank with suitable material that could include selected surplus excavated material; The Contractor shall be aware that the size of the tanks may vary and it is his responsibility to ascertain an average size and price his tender accordingly.

- e) The Contractor shall also be aware that he will encounter different scenarios in relation to the work involved in completing this decommissioning work, particularly in relation to access and in availability of reinstatement materials. The Contractor shall be responsible for ensuring the successful decommissioning of each tank encountered within the project area. Where this involves innovative solutions or particular working methodologies these will be approved by the Engineer. The Contractor shall be responsible for assessing an average cost for this element of the works and for pricing his tender accordingly.

8. Commencing Excavation Works

The Contractor shall be fully responsible for obtaining all necessary excavation permits and permissions, except those normally obtained by the Employer or Engineer, prior to commencement of the Works.

These shall include but shall not be limited to the following:-

- a) general excavation permits
- b) specific excavation permits relating to road crossings, working near oil or gas lines etc.
- c) provisions of all necessary bonds required by the permits
- d) permissions in respect of erection of site offices, labor camps, stores, etc.
- e) permissions in respect of use of explosives.

In addition

- a) Any environmental pollution resulting from the Contractor's activities is set right by the Contractor at his own cost.
- b) Care shall be taken during construction to minimize disturbance and damage to surrounding areas. All reasonable measures shall be taken to control dust.
- c) Noise levels shall not be such as to cause harm or disturbance to inhabitants in the vicinity of the Contractor's operations.

- d) Septic and holding tanks shall comply in all respects with the Sultanate of Oman's Regulations for Septic tanks and Holding tanks.
- e) Percolation tests shall be submitted to the concerned authority by the Contractor upon commencement of the Project.
- f) The approval of the local Municipality shall be obtained by the contractor for disposal of any solid wastes.
- g) The site shall be reinstated following the cessation of activities by the Contractor. Spoil tips are to be removed and excavation sites are to be leveled.
- h) The approval of any other concerned Ministries and Authorities is also obtained by the Contractor prior to commencement of Work

9. No Objection Certificate (NOC)

The Employer shall hold the Contractor responsible for compliance with the obligations imposed by the NOC Certificate to the extent that the Contractor's fulfillment of his obligations under the Contract may result in conditions requiring actions to comply with the NOC Certificate. The Contractor shall carry out the necessary actions at no additional cost to the Employer.

The requirements of the NOC Certificate shall be deemed to be a part of the Contract although they may include additional obligations otherwise imposed under the Contract.

10. Road Cutting and Excavation Permits

The Contractor shall make application to the concerned local Authority after obtaining NOC and prior to excavation in order to obtain permission to excavate in areas outwith private properties.

At this time the Contractor shall agree with the concerned Authority the method and specification for reinstatement of paved areas which come under their jurisdiction. It is a general requirement that excavated road surfaces be reinstated to original specification. The Contractor must be aware however that the final method and Specification for reinstatement shall be to the requirements of concerned Authority.

Road reinstatement works will be carried out in two stages, that is:-

- a) Immediate reinstatement of the full excavation area, as per the concerned Authority specification. This must be carried out as part of the continuous (without any delay) construction operation for the installation of the permanent works.
- b) A secondary reinstatement stage is to be carried out at a later date during the construction phase of the contract that will involve resurfacing of the full carriageway width (i.e. road lane) to the standards specified by the concerned Authority

The Contractor shall be fully aware of the relevant standards required by the Concerned Authority Roads Department and all costs involved in the provision of the required road reinstatement works are deemed to be included in the Tender Prices.

Route permits must be obtained from concerned Authority. Permits shall be required for each sewer, T.E., water or duct line to be installed. The Contractor shall present shop drawings clearly indicating distances from road, utility apparatus and building lines to the proposed sewer or duct line. The plans shall be to a scale 1:1000, A1 size sheet.

Before a road opening permit is issued the plans must also indicate the location of other known utilities and “No Objection Certificates” (NOC’s) shall be required from any other relevant underground utility owner, government body or Authority

The Contractor shall note that the above procedures can consume a considerable amount of time and require the services of personnel familiar with the local requirements and processes. Under no circumstances shall the Contractor be allowed to carry out works without the written consent of the various utilities noted above.

The Contractor shall provide a traffic management plan to satisfy the requirements of the ROP and the concerned Authority Roads Department for each location where it shall be necessary to disrupt traffic. The Contractor must consider this at tender stage when submitting a Programme for the works.

11. Maintenance and Protection of Traffic.

The Contractor shall ensure that all works in the public roads is carried out in full compliance with the following:

- a) Maintenance and protection of traffic shall be in accordance with Sultanate of Oman, Highway Design Manual, Volume 1, January 1994 and the Specifications.

- b) Existing Regulatory signs shall be maintained at all times unless otherwise directed by the Engineer.
- c) The Contractor shall provide temporary pavement markings in accordance with the requirements for permanent pavement markings stated in the Highway Design Manual, Volume 1, January 1994.
- d) The contractor shall prepare a plan of temporary warning signs. Any deviation from the plan must be approved by the Engineer prior to placement.
- e) All pavement markings, existing and temporary, shall be maintained during construction unless directed otherwise by the Engineer. Periodic replacement of temporary pavement markings at approximately six month intervals or as directed by the Engineer shall be required
- f) Conflicting existing pavement markings shall be removed by water blasting or by other methods approved by the Engineer. All existing pavement markings outside the limits of construction, which are altered, shall be replaced upon completion of the project.
- g) It shall be the Contractors responsibility to install and maintain temporary drainage during construction. Removal of water off the traveled roadway shall be maintained at all times.
- h) The Contractor shall barricade and cordon off all work areas and entrance and exit ramps that are not open to traffic, in accordance with the Highway Design Manual Standards.
- i) The Contractor shall develop a Maintenance and Protection of Traffic scheme in accordance with the Specifications and the Highway Design Manual, for all operations within the construction zone for each stage of construction.
- j) Direct safe access of a construction approved by the Engineer, to all businesses and homes within the construction zone shall be provided by the Contractor at all times. This access shall be both pedestrian and vehicular. The Contractor shall maintain all such accesses in a good condition and where access is compromised for the purposes of the installation of the permanent works, the Contractor shall make every effort to complete this section and reinstate access as quickly as possible. The Contractor shall respond immediately to any request from businesses or residents or to instruction from the Engineer in respect of the provision and maintenance of safe access.

- k) Short-term temporary road markings on finished surfaces of permanent work may be marked by the use of adhesive traffic tape as approved by the Engineer.
- l) All signs shall use reflective sheeting or be internally illuminated.
- m) The Contractor shall do the necessary arrangements and the work shop drawings for utilities relocation and temporary protections prior to construction of MPT scheme. These work shop detailed plans must be approved by the Engineer.

12. Site Laboratory and Test Equipment

Contractor's Site Laboratory shall have the following features:

- a) Suitable refabricated construction may be acceptable.
- b) Minimum area: 60m²
- c) Air Conditioned 24 hrs a day.
- d) Suitably equipped with running water, cube curing tank indoors), work benches, cabinets, and concrete plinths as enquired for the equipment.
- e) The Contractor shall provide all measuring and test equipment deemed to be necessary by the Engineer to conduct all site testing required by the Contract Documents.

Unless specified under the contract, the Contractor shall provide the following equipment as a minimum requirement under the contract.:

- 1) Electrically operated compression machine with safety guards (preferably with automatic load control) conforming to the requirements of BS 1881: Part 115, or as acceptable to the Engineer.
- 2) Electronic balance, (equipped with stirrup – optional) preferably top loading, having a capacity of approximately 20kg and sensitive to 1gm.
- 3) Electronic balance, readable to 0.1gm (approx. capacity 6000gm).
- 4) Drying oven capable of maintaining a temperature of 105° - 110°C (approx. capacity 225 litre).
- 5) Drying oven capable of maintaining a temperature of 105° - 110°C (approx. capacity 100 litre).
- 6) Scoop (250mm long x 125mm diameter, 5kg capacity).

- 7) Sampling Tray (1.2m x 1.2m x 50mm deep, 1.6mm thick).
- 8) Container for receiving concrete from scoop such as wheel barrow.
- 9) Digital Thermometers sensitive to 0.5°C and conforming to requirements stipulated in ASTM C 1064.
- 10) Slump cone (BS 1881).
- 11) Tamping rod (BS 1881).
- 12) Base plate for slump cone.
- 13) 150mm cube moulds with attached base plate.
- 14) Compacting bar (BS 1881).
- 15) Enclosed insulated boxes for initial curing of cube samples on site.
- 16) Curing tank situated in A/C cooled room (with recirculating pump and immersed heater).
- 17) Vernier caliper (0-200mm range x 0.01mm Min.).
- 18) Moisture container (500 grm capacity appx.).
- 19) Moisture container / tray (4 kg capacity appx.).
- 20) Pouring cylinder (150mm).
- 21) Calibrating container for 150mm P. cylinder.
- 22) Compaction mould (CBR mould complete set with solid base plate).
- 23) Metal tray (base plate suitable for 150mm pouring cylinder)
- 24) Replacement sand.
- 25) Suitable containers to carry replacement sand and soil.
- 26) Scoop (100mm wide appx.).
- 27) 1 Ltr. Compaction mould (complete set to BS 1377).

- 28) Rammer (4.5 kg).
- 29) Sample dividers (slot width 60mm and 25mm appx.).
- 30) Metal trays of suitable sizes.
- 31) Speedy moisture tester.
- 32) Balance 50 kg, sensitive to 10gm.
- 33) Suitable container for unit weight.
- 34) Strike-off plate for above.
- 35) Set of suitable ASTM and BS sieves having required apertures including suitable lids and receivers.
- 36) Rebound Hammer with Graph Chart.
- 37) Desiccators of suitable size.
- 38) A suitable cylindrical container with lid complying with the requirements of ASTM C 232.
- 39) Pipet suitable for drawing water.
- 40) Graduated Measuring Cylinders – 1000ml, 500ml, 250ml, 100ml & 10ml.
- 41) Mattel beaker of 1000ml.
- 42) Hot plate.
- 43) Microwave oven of suitable size for moisture determination.
- 44) Coating adhesion tester conforming to the requirements of ASTM D 4541
- 45) Equipment for measuring the dry film thickness of coatings on concrete.
- 46) Paint inspectors kit having the following items:-
 - a. Coating thickness meter to measure the thickness of dry film coating on steel and iron (digital).

- b. Wet film gauge.
- c. Bare metal (steel zero plate).
- d. Hygrometer.
- e. Digital thermometer with suitable thermocouple for temperature measure on steel surface.
- f. Dial type magnetic thermometer.
- g. Dew point and RH% slide calculator.
- h. Tape for profile measurement.
- i. Gauge for profile measurement.
- j. Burnishing tool.
- k. Surface roughness comparator.
- l. Magnifying lens (x 20) with built in bottom light.
- m. The Contractor shall provide all in suitable condition subject to the Engineers approval.

The Contractor shall maintain the accuracy of all measuring and test equipment.

The Contractor is responsible to provide a unique identification number or mark permanently fixed to each item of measuring and test equipment.

The Contractor shall ensure that he calibrates each item of measuring and test equipment at intervals recommended by the manufacturer.

The Contractor shall develop a log of all measuring and test equipment and record:

1. Equipment description
2. Identification number
3. Date of the last calibration
4. Date that the next calibration is due.

13. Engineer's Surveying Equipment

At the time of site handover, the Contractor shall provide the following survey equipment in new condition for the exclusive use of the Engineer:-

1. 3 second fully integrated Total Station with built in memory of minimum 2000 points or 4200 coordinate points. The Total Station equipment shall have the facility to transfer data direct to a computer and shall contain built in programs. One original copy of LISCAD software shall also be provided.

2. Universal auto level, accuracy standard 0.7mm
3. Sectional stubs, each 4.0 m long complete with strong bag.
4. Steel measuring tapes, each 50m long.
5. Ranging rods, each 2.15m high, detachable at center, red and white day glow colour.
6. Parasol, 2m diameter.
7. 1 no. set of accessories for the Total Station comprising:-
 - a. 1 no. single prism holder.
 - b. 2 no. three prism holders in a box.
 - c. 4 no. circular prisms.
 - d. 1 no. target plate.
 - e. 1 no. tribrach with ground plummet.
 - f. 1 no. carrier with plate level.
 - g. 1 no. large rechargeable battery.
 - h. 1 no. battery charger.
 - i. 1 no. plumb rod with bubble for holders.
 - j. 1 no. heavy-duty universal tripod.
 - k. 1 no. light duty universal tripod.
 - l. 1 no. standard cable from batter to station.

The Contractor shall provide every assistance necessary to allow the Engineer and his staff to carry out their duties and shall provide pegs, poles, paint, lines, spirit levels and other materials and small tools for checking the setting out and for measurement of the work.

The equipment shall be approved by the Engineer and maintained in good working order by the Contractor throughout the duration of the contract and shall be returned to the Contractor at the end of the maintenance period.

The number of the equipment shall be described in the Contract Particular Specification.

14. Submittals

14.1 Scope

This part specifies the general procedures and requirements for submittals.

14.2 Product Data and Shop Drawings

Product Data and shop Drawings include drawings, diagrams, illustrations, brochures, schedules, bills of materials and other data prepared specifically for the works.

14.3 Manuals

Manual are manufacturer’s written installation, start – up, operating, maintenance and repair instructions. They shall include parts lists, pictures, sketches and diagrams specific to the equipment supplied.

14.4 Submittal Procedure

The Contractor shall prepare and submit a list of submittals, required by the Contract or otherwise, showing the forecast date for submission of each item within thirty (30) days of the start of the Contract or otherwise as specified in the Contract Documents.

14.5 Method of Submittals

The Contractor shall deliver submittals by means of dated, signed and sequence numbered transmittals. The transmittal shall be Contractor’s letterhead and shall fully describe the submittal contents.

In each transmittal the Contractor shall state the Drawing number and specification Section, Parts and Paragraphs to which the submittal pertains. Accompanying data sheets, catalogues and brochures shall be identified in the same manner.

The Contractor shall prepare and submit method statement for all major work activities. He shall also prepare and submit method statement for specific work activities if it is a requirement of the project Documentation or if instructed to do so by the Engineer. The method statements shall incorporate any supporting calculations, drawings and manufacturer’s guidelines.

14.6 Contractor’s Review and Approval

Every submittal shall bear the Contractor’s review and approval stamp certifying that the Contractor has reviewed, checked and approved the submittal, co-ordinated the contents with the requirements of the works, the Project Documentation and any related works

determined and verified all the quantities, field measurements, field construction criteria, materials, equipment, catalogue numbers and similar data.

14.7 Review and Approval

Submittals will be reviewed only for conformance with the design concept of the project and with information given in the Project documentation. The approval of a separate item as such shall not indicate approval of the assembly in which the item functions.

The approval of submittals shall not relieve the Contractor of responsibility for any deviation from the requirements of the project Documentation unless otherwise agreed with and confirmed in writing by the Engineer.

Any approval from the Engineer shall not relieve the Contractor of responsibility for errors or omissions in the submittals.

14.8 Material Approval

Submittals shall be approved before the material or equipment covered by the submittals are shipped out in the case of foreign supplies, and delivered then to Site in the case of local supplies.

14.9 List of Materials

The Contractor shall prepare and submit a list of the material to be used in the construction of the work within the period stated in the Contract. The material list shall be neatly bound and shall have an index listing the contents.

The data for each item listed shall be explicit with regards to details of the actual items being furnished shall include sufficient information for the Engineer to determine that the product submitted conforms to the requirements of the Documentation. Such information shall include but not limited to:

- a) Manufacture's name and address
- b) Trade or brand name
- c) Local supplier's name and address
- d) Catalogues and Brochures marked to indicate the items proposed the intended use.
- e) Terms and Conditions of the manufacturer's guarantee and warranty.
- f) Material Inspection and testing agency.

14.10 Samples

Unless otherwise specified, each submittal shall include two sets of samples. All disapproved samples will be returned to the Contractor.

Samples shall be taken in accordance with the provisions of relevant standards where appropriate. Unless otherwise specified samples shall be labeled and properly identified with the following:-

- a) Date.
- b) Part of the Works which offered.
- c) Specification Section, Part and applicable Paragraph numbers.
- d) Supplier/manufacturer.
- e) Product identification (trade name)

Samples shall be accompanied by an approved transmittal form along with specifications and other pertinent data required for the Engineer to determine that the material conforms to the requirements of the Project Documentation.

If requested in writing by the Contractor, samples of value will be returned to the Contractor after completion of the work.

Approved samples returned to the Contractor may only be incorporated into the work upon written approval of the Engineer.

14.11 Certificates

When stated in the Project Documentation or requested by the Engineer in writing, the Contractor shall submit manufacturer's certificates indicating that test results, component manufacture or installation complies with the requirements of the Project Documentation. A statement from the Contractor, sub-contractor, equipment supplies, or agent indicating that the product installation complies with the requirements of the project Documentation shall not be considered as a certificate.

15. Materials

15.1 General

This Part specifies the requirements for materials incorporated in the Works. In the context of this part, components and items of equipments are to be considered as materials and all requirements applicable to materials are likewise applicable to components and items of equipment.

15.2 Quality of Materials

All material shall comply with particular national or international standards and shall be marked with the certified trade mark associated with the organization responsible for the standard. The mark of conformity of any approved third party certification body or an equivalent mark shall be an acceptable alternative to this requirement.

If in the opinion of the Engineer that third party inspection and assurance is not required, in such case and where materials are required to comply with a particular standard or its equivalent, the Contractor shall submit to the Engineer test certificates.

The Contractor is responsible for the timely delivery of all samples and materials to the Materials and Laboratory Division.

15.3 Manufacturer's Instructions

Unless otherwise described in the Project Documentation, the use, installation, application or fixing of materials shall be in accordance with all applicable recommendations and instructions of the manufacturers.

The Contractor shall obtain the manufacturer's instructions and recommendations relating to all materials and proprietary articles and systems to be incorporated in the Works,

and shall keep copies of the same on site at all times for the information of the Engineer. Such instructions and recommendation shall be considered to be part of this Specification.

Where appropriate, the Contractor shall make use of any technical advisory service offered by manufacturers regarding use and installation of materials.

15.4 Alternative Materials

The Contractor may propose the use of alternatives to materials specified in the Project Documentation. Such proposals shall be complete with all supporting information showing that the alternative is equal or better than the specified material in all respects. The use of alternative materials shall only be permitted if approved by the Engineer in writing.

15.5 Owner Furnished Materials

Materials to be furnished by the Owner and installed by the Contractor shall be as specified in the Project Documentation.

The Contractor shall be responsible for the collection delivery and the storage of materials to be furnished by the Owner and installed by the Contractor. The collection location of such materials shall be as detailed in the Project Documentation.

The Owner reserves the right to place and install items of equipment, furniture, furnishings, partitions etc., in completed or partially completed parts of the Works upon the understanding that the exercising of such a right will not substantially interfere with the regular progress and completion of the Works.

15.6 Delivery of Materials to Government Stores

Materials to be delivered to the Government Stores shall be as detailed in the Project Documentation.

Materials delivered to the Government Stores shall be cleaned, painted or otherwise treated or prepared as detailed in the Project Documentation.

The Contractor shall prepare a delivery ticket, in a format approved by the Engineer, for all materials delivered to the Government Stores.

15.7 Ordering Materials

The Contractor shall notify the Engineer of any material which he is unable to order due to lack of information, non-availability, or for any other reason, within sixty (60) days of the acceptance of the Contract or otherwise stated elsewhere in the Contract Documents.

The Contractor shall ascertain the quantities and quality of materials for ordering from the Project Documentation. The Bill of Quantities alone shall not be used as a basis for ordering materials.

The Contractor shall be responsible for any delays to the Contract due to non-compliance with this Clause.

15.8 Delivery of Materials to the Site

Materials shall be new and shall bear complete identification. Such identification shall include, but not be limited to, the class, model, number and type of the material. Where materials are not so identified, the Contractor shall furnish copies of invoices or certificates providing complete identification.

Deliveries shall be programmed to minimize handling and deterioration due to site storage.

15.9 Handling of Materials

Materials shall be handled in such a manner as to avoid any damage or contamination, and in accordance with all applicable recommendations of the manufacturers.

Particular care shall be taken when handling components with lifting equipment. Slings, lifting hooks, forks and the like should only be applied at the points indicated as being suitable for application by the manufacturer.

15.10 Storage of Materials on the Site

Materials shall be stored in such a manner as to preserve their quality and condition to the standards required by this Specification. Any recommendations made by the manufacturer which relate to storage of materials and equipment shall be fully complied with.

The quantity of materials and equipment stored on the Site shall be consistent with that necessary for efficient working. Incompatible materials shall be separately stored.

Storage shall be such that any particular consignment can be readily identified by its delivery ticket, test certificate; etc... Materials which are liable to deteriorate shall be used in the order of delivery.

15.11 Protection of Materials

Adequate protection against any form of damage or deterioration to materials shall be provided and shall include protective tapes, casing and the like which shall be cleared away on completion of the Works. Tarpaulins shall be provided where necessary.

Particular care shall be taken to protect finished surfaces during the application of adjacent work.

Materials which are subject to deterioration by ultra violet light shall be stored so that they are not exposed to direct sunlight.

16 Quality Control

16.1 Inspection & Testing Plan

The Contractor shall submit Inspection and Test Plans to the Engineer for approval in accordance with the Contract Conditions. The Inspection and Test Plan shall consider the requirements of each Section of the Standard Specification in turn. No work covered by the Inspection and Test Plan shall begin until the plan has been approved.

Inspection and Test Plans (ITP) must clearly indicate the stages at which these will be carried out.

Inspection & testing of materials, equipment etc must be carried out as required by the ITPs. Non-conforming product must be identified and treated in accordance with the documented procedure. Independent verification and testing of the installation must be carried out by Quality inspectors and engineers. Quality records must be created to record inspection and tests. The customer's representative must be informed whenever customer 'hold point' or 'witness points' are indicated in the Quality Plan.

16.2 Inspection and Test Status:

The outcome of tests or inspections (of material, installation and site work) must be indicated by appropriate means such as markings, stamps, tags, label etc to indicate conformance and non-conformance of the product.

The inspection and test status of materials, equipment and construction work shall be identified by suitable means, which indicates the conformance or non-conformance of materials, equipment and construction work with regard to inspection and tests performed. The identification of inspection and test status shall be maintained, as defined in the Quality assurance plan and/or documented procedures, throughout the course of construction to ensure that only materials, equipment and construction work that have passed the required inspections and tests are used or installed.

16.3 Inspection and Testing Process

The Contractor shall provide equipment, instruments, qualified personnel, and facilities necessary to inspect the work and perform the tests required by the Project Documentation.

The Contractor shall repeat tests and inspections after correcting non-conforming work until all work complies with the requirements. All re-testing and re-inspections shall be performed at no additional cost to the Client.

The Engineer may elect to perform additional inspections and tests at the place of the manufacture or the shipping point to verify compliance with applicable Specifications.

Inspections and tests performed by the Engineer shall not relieve the Contractor of his responsibility to meet the Specifications. Inspections and tests by the Engineer shall not be considered a guarantee that materials delivered at a later time will be acceptable. All costs associated with the foregoing shall be borne by the Contractor.

Inspections and tests conducted by persons or agencies other than the Contractor shall not in any way relieve the Contractor of his responsibility and obligation to meet all Specifications and referenced standards.

All inspections and tests shall be conducted in accordance with written test procedures as detailed in the Quality Assurance Plan and Inspection and Test Plan that have been reviewed and approved by the Engineer.

Inspection and test procedures submitted for approval shall include, but not be limited to, the following:

- Inspection/test procedure reference
- References to clauses of this specification and other standards along with applicable inspection/test levels specified therein
- Prerequisites for the given inspection/test
- Required tools, equipment
- Necessary environmental conditions
- Acceptance criteria
- Data to be recorded
- Test results reporting forms
- Identification of items tested

Approved procedures and instructions shall be readily available and used by inspection and test personnel at the time of inspection or test. All revisions to these procedures and instructions shall be approved prior to being used to inspect or test the work. No deviations from the approved procedures and instructions shall be allowed without written authorization from the Engineer.

Inspection and testing work shall be performed by personnel designated by the Contractor. Such personnel shall not be the same as those performing the work.

The Contractor shall furnish the Engineer with a signed and stamped inspection report for each item of work to be inspected. The report shall indicate whether the item of work, material and/or equipment complies with all the inspection/test criteria. The Contractor shall submit inspection/test results to the Engineer prior to incorporating the item(s) into the work. Inspection/test failures shall be reported to the Engineer immediately. Inspection and test reports shall, as a minimum, identify the following:-

- a) Test procedure reference
- b) Name of inspector/tester
- c) Observations/comments
- d) Specified requirements
- e) Acceptability
- f) Deviations/non-conformance
- g) Corrective action
- h) Evaluation of results
- i) Signature of authorized evaluator.

The Contractor shall clearly document and identify the inspections and test status of all materials and equipment throughout construction. Identification may be by means of stamps, tags, or other control devices attached to, or accompanying, the material or equipment.

16.4. Measuring and Test Equipment Records

The Contractor shall establish and maintain documented procedures which conform to accepted and approved national or international standards to control, calibrate and maintain inspection, measuring and test equipment used by the Contractor to demonstrate the conformance of materials, equipment and/or construction work with the requirements of the Project Documentation.

Inspection, measuring and test equipment shall be used in a manner which ensures that the measurement uncertainty is known and is consistent with the required measurement capability.

The Contractor shall establish a unique identification number for each item of measuring and test equipment. This unique identification number shall be permanently affixed to each item of measuring and test equipment

The Contractor shall ensure that each item of inspection, measuring and test equipment is calibrated at intervals recommended by the manufacturer. Valid calibration certificates for measuring and testing equipment shall be present and available for inspection during inspections and tests.

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The Contractor shall establish a log of all measuring and test equipment and record:

- a) Equipment description.
- b) Identification number.
- c) Date of last calibration.
- d) Date the next calibration is due.

16.5. Quality Records

The Contractor shall establish and maintain documented procedures for identification, collection, indexing, access, filing, storage, maintenance and disposition of quality records. Quality records shall be maintained to demonstrate conformance of materials and equipment to specified technical requirements and the effective operation of the quality system.

Quality records shall be maintained to demonstrate conformance of materials and equipment to specified technical requirements and the effective operation of the quality system.

The Contractor shall supplement these quality records as necessary to monitor quality throughout the Contract period.

All quality records shall be legible and shall be stored and retained in such a way that they are readily retrievable and are kept in facilities that provide a safe environment to prevent damage or deterioration and to prevent loss.

As a minimum, the quality record for any particular item shall include:

- (a) Name of item
- (b) Item number
- (c) Item description
- (d) Suppliers name
- (e) Serial number or other identification (where applicable)
- (f) Specification reference (where applicable)
- (g) Verification of receipt of all required supporting documentation
quantity of items
- (i) Location and installation of item
- (j) inspection/test procedure reference

16.6 Document and Data Control

The Contractor shall establish and maintain documented procedures to control all documents and data that relate to the requirements of the Specification. Documents and data can be in the form of any type of media, such as hard copy or electronic media.

The documents and data shall be reviewed and approved for adequacy by authorized personnel prior to issue. A master list or equivalent document control procedure identifying the current revision status of documents shall be established and be readily available to preclude the use of invalid and/or obsolete documents. This control shall ensure that:-

- (a) The pertinent issues of appropriate documents are available at all locations where Operations essential to the effective functioning of the quality system are performed.
- (b) Invalid and/or obsolete documents are promptly removed from all points of issue or Use or otherwise assured against unintended use
- (c) Any obsolete documents retained for legal and/or knowledge preservation purposes are suitably identified.

16.7 Non-Conformances

The Contractor shall establish and maintain documented procedures to ensure that an item that does not conform to the requirements of the Project Documents is prevented from unintended use or installation. This control shall provide for identification, documentation, evaluation, segregation (when practical) and disposition of the non-conforming item(s).

The monitoring system shall apply to material and equipment as well as installation and construction which fail to conform to the Project Documentation.

16.8 Identification of Non-Conforming Items

The Contractor shall clearly identify each non-conforming item with a status tag or other distinguishing mark. The Contractor shall establish procedures for installing, monitoring, and removing these status tags and identify personnel authorized to remove status tags.

16.9 Review and Disposition of Non-Conforming Items

The responsibility for review and authority for the disposition of non-conforming items shall be defined in the Quality Plan.

Non-conforming items shall be reviewed in accordance with documented procedures. A non-conforming item may be:

- Reworked to meet the specified requirements
- Accepted with or without repair if agreed in writing by the Engineer
- Re-graded for alternative applications
- Rejected.

The proposed use or repair of an item which does not conform to the requirements of the project documentation shall be reported to the Engineer. The description of the non-conformity and of repairs shall be recorded to denote the actual condition. Repaired and/or reworked products shall be inspected in accordance with the Quality Plan and/or documented procedures.

16.10 Corrective and Preventive Action

The Contractor shall establish and maintain documented procedures for implementing corrective and preventive action. Any corrective or preventive action taken to eliminate the causes of actual or potential nonconformities shall be to a degree appropriate to the magnitude of problems and commensurate with the risks encountered.

The Contractor shall take prompt action to identify the causes of each non-conformance and the corrective action necessary to prevent recurrence.

The results of failure and discrepancy report summaries, Contractor evaluations, and any other pertinent applicable data shall be used for determining corrective action.

Information developed during construction, tests, and inspections that support the implementation of required improvements and corrections shall be used to support the adequacy of corrective action taken.

The Contractor shall implement and record any changes, to the documented procedures, for implementing corrective and preventive action.

The procedures for preventive action shall include:

- a) The use of appropriate sources of information such as processes and work operations which affect product quality, concessions, audit results, quality records and service reports to detect, analyze and eliminate potential causes of non-conformities.
- b) Determination of the steps needed to deal with any problems requiring preventive action.
- c) Initiation of preventive action and application of controls to ensure that it is effective.
- d) Ensuring that relevant information on actions taken is submitted for management review.

16.11 Non-Conformance Records

The Contractor shall provide the Purchaser / Engineer with the following information for each nonconformance:-

- a) Identification of non-conformance
- b) Description of non-conformance
- c) Evaluation of non-conformance to establish the cause
- d) Recommended corrective action
- e) Date non-conformance was identified
- f) Date corrective action was completed
- g) Description of final corrective action.

The contractor shall establish and maintain a non-conformance log the log shall contain the following information as a minimum:-

- a) Sequential reference number
- b) Date issued
- c) Originator
- d) Description of item deemed to be in non-conformance
- e) Description of non-conformance
- f) Recommended and final disposition
- g) Date closed

17. Quality Audits

17.1 Contractor's Quality Audit

The Contractor shall establish and maintain documented procedures for planning and implementing internal quality audits to verify whether quality activities and related results comply with planned arrangements and to determine the effectiveness of the quality system.

Internal quality audits shall be scheduled on the basis of the status and importance of the activity to be audited and shall be carried out by personnel independent of those having direct responsibility for the activity being audited. Unless otherwise agreed with the Engineer in writing, the Contractor shall carry out a quality audit every three months. The results of the audits shall be recorded and brought to the attention of the personnel having responsibility in the area audited. The management personnel responsible for the area shall take timely corrective action on deficiencies found during the audit.

Follow-up audit activities shall verify and record the implementation and effectiveness the corrective action taken.

The results of the Contractor's quality audits shall be made available for review by the Engineer. The Contractor shall implement any recommendations made by the Engineer based on the results of the internal audit.

The Contractor shall allow the Engineer to observe the Contractor's internal audit upon request.

17.2 Engineer's Quality Audit

The Engineer may undertake a quality audit of any of the Contractor's activities at any time during the course of the Contract. The Contractor shall make all personnel and facilities available to the Engineer as necessary to undertake quality audits.

The Engineer shall make the results of his quality audit available to the Contractor for review. The Contractor shall implement any recommendations made by the Engineer based on the results of the Engineer's quality audit.

17.3. Quality Audits by Purchaser:

The Purchaser or his authorized representative (i.e the Engineer or Third Party independent Auditors) may undertake a quality audit of any of the Contractor's activities at any time during the course of the Contract to verify compliance with approved management procedures, specifications and all referenced standards.

Such audits will be performed as felt necessary by the Purchaser or his Consultant to guarantee 'effectiveness' of the Quality System and its QA/QC procedures. The project Quality Management System shall be amended and upgraded as and when required,

during all phases of the Contract, to the complete satisfaction of the Purchaser the Contractor shall provide all necessary cooperation and assistance to the Purchaser and / or his representatives during these Management Audits.

The Contractor shall make all personnel and facilities available to the purchaser as necessary to undertake quality audits. The purchaser shall make the results of his quality

audit available to the Contractor for review. The Contractor shall implement any recommendations made by the Purchaser or his authorized representative based on the results of this quality audit.

18 Drawings and Data to be Furnished by the Contractor

18.1 General

The Contractor shall submit to the Engineer for his review and approval all drawings and data as called for in the Specification, including but not limited to, reinforcing steel placement and bar bending diagrams, shop drawings for structural steel and miscellaneous iron work, architectural items, shop drawings for mechanical, electrical, instrumentation and control work, shop drawings for pipeline alignment and level, samples, materials lists, equipment data, instruction manuals, record documents, manufacturer's equipment manuals and other submittals required by the Specification, or subsequently as covered by variations. Those covering the several related items of equipment in an integrated system shall be submitted concurrently in order that the system can be reviewed by the Engineer. Submittals and their contents shall be properly prepared, identified, and transmitted as provided in the Specification or as the Engineer may otherwise direct. Except for record documents and instructional manuals for operation and maintenance, submittals shall be approved by the Engineer before the materials or equipment covered by the submittals are shipped out in the case of foreign supplies and delivered to site in the case of local supplies.

The Contractor shall be responsible for and shall pay the extra cost, if any, occasioned by any discrepancies, errors or omissions in the drawings and other particulars supplied by him, whether they have been approved by the Engineer or not.

The Contractor shall submit a list of all submittals showing the forecast date for submission of each item at the commencement of the Contract.

Drawings and data shall be submitted to meet the time schedules stipulated in this Contract and where such time schedules are not specified, to meet the requirements of the approved program. Unless specified otherwise, the Contractor shall allow not less than thirty days for the review of submittals by the Engineer.

Extension of time shall not be granted because of the Contractor's failure to make timely and correctly prepared and presented submittals with allowance for the checking and review periods.

The Contractor shall deliver submittals by means of dated, signed, and sequence numbered transmittals on the Contractor's letterhead, identifying as to initial or resubmittal status, and fully describing the submittal contents. Submittals are not acceptable directly from Sub-Contractors, suppliers, or manufacturers. In each transmittal the Contractor shall state the Drawing numbers and Specification Clauses, Articles, and paragraphs to which the submittal pertains; accompanying data sheets, appropriate standards and codes of practice, catalogues, and brochures shall be identified in the same manner, and where several types or models are contained the Contractor shall delete non-applicable portions or specifically indicate which portions are intended and applicable.

Every submittal of shop drawings, samples, materials lists, equipment data, instruction manuals, and other submittals upon which the proper execution of the Work is dependent shall bear the Contractor's review and approval stamp certifying that the Contractor

- (a) Has reviewed, checked, and approved the submittal and has coordinated the contents with the requirements of the Work and the Contract Documents including related Work,
- (b) Has determined and verified all quantities, field measurements, field construction criteria, materials, equipment, catalogue numbers, and similar data, or shall do so,
- (c) States the Work covered by the submittal is recommended by the Contractor and the Contractor's guarantee shall fully apply thereto. The Contractor's stamp shall be dated and signed by the Contractor in every case. It is expected that the Contractor shall prepare his submittals in such a manner that he is able to obtain a submittal approval by the second submission.

The Employer reserves the right to deduct monies from the amounts due to the Contractor to cover the cost of the Engineer's review time beyond the first re-submission.

The Contractor shall make all required corrections and shall resubmit the required number of corrected submittals until approved. The Contractor shall direct specific attention in writing to revisions other than the corrections called for on previous submittals. He shall identify each resubmittal with number of the original submittal followed by consecutive letters starting with "A" for first resubmittal, "B" for second resubmittal, etc.

The Contractor shall check submittals returned to him for correction and ascertain if the corrections result in extra cost to him above that included under the Contract Documents, and shall give written notice to the Engineer within five days if, in his opinion, such extra cost results from corrections.

By failing to so notify the Engineer or by starting any Work covered by a submittal, the Contractor waives all claims for extra costs resulting from required corrections.

Submittals shall be reviewed only for conformance with the design concept of the Project and with information given in the Contract Documents. The approval of a separate item as such shall not indicate approval of the assembly in which the item functions. The approval of submittals shall not relieve the Contractor of his responsibility for any deviation from the requirements of the Contract Documents or for any revision in resubmittals unless the Contractor has given notice in writing of the deviation or revision at the time of submission or resubmission and written approval has been given to the specific deviation or revision, nor shall any approval by the Engineer relieve the responsibility of Contractor for errors or omissions in the submittals or for the accuracy

of dimensions and quantities, the adequacy of connections, and the proper and acceptable fitting, execution, and completion of the work.

All expenses resulting from any error or omission in or from delay resulting in returned submittal or resubmittal shall be borne by the Contractor.

Submittals which are incomplete, including those not correctly transmitted, not correctly titled and identified, or not bearing the Contractor's review and approval stamp, may be returned to the Contractor without review.

No Work represented by required submittals shall be purchased or commenced until the applicable submittal has been approved. Work shall conform to the approved submittals and all other requirements of the Contract Documents unless subsequently revised by an appropriate variation order, in which case the Contractor shall prepare and submit revised submittals as may be required. The Contractor shall not proceed with any related Work

which may be affected by the Work covered under submittals until the applicable submittals have been approved, particularly where piping, machinery, and equipment and the required arrangements and clearances are involved.

Except where the preparation of a submittal is dependent upon the approval of a prior submittal, all submittals pertaining to the same class or portion of the Work shall be submitted simultaneously.

Shop Drawings- Each submittal shall be complete with respect to dimensions, design criteria, materials, connections, bases, foundations, anchors, and the like, and shall be accompanied by technical and performance data as necessary to fully illustrate the information in the shop drawings. Unless otherwise specified, each submittal shall include six sets of copies. Three sets of copies shall be returned to the Contractor marked to show the required corrections or approval.

The Contractor shall submit four (4) sets of operation, maintenance and instruction manuals covering all mechanical and electrical equipment and machinery installed in the Work as specified under sections dealing with mechanical and electrical work.

18.2 Record Drawings and Specification

The Contractor shall maintain one record copy of all Drawings, Specification, Addenda, variations, approved submittals, correspondence, and transmittals at the site in good order and readily available to the Employer and the Engineer. The Record Drawings shall be

clearly and correctly marked and the Record Specification annotated by the Contractor to show all changes made during the construction process at the time the changed Work is installed. No such changes shall be made in the Work unless previously authorized by a variation order or by specific approval of deviations or revisions in submittals.

The Contractor shall prepare and furnish to the Engineer accurate “As-Built” record drawings in digitized format on a suitable platform from which AutoCAD drawings can be transferred directly to GIS format, as directed by the Engineer. The drawings shall be supplemented as necessary by schedules and data sheets indicating quantity, quality and types of materials installed. Draft “As-Built” Record Drawings shall be submitted to the Engineer for his approval, and then finalized in accordance with any amendments required by him.

The Contractor shall submit these “As-Built” records and any other GIS data specified in the Contract Documents in a progressive and continuous manner throughout the duration of the Contract.

No release of retention monies shall be made until all As-built record drawings and specified GIS data have been received and approved by the Engineer.

Computer files containing Autocad drawings shall be maintained as seamless drawings.

The record drawings shall show the works as executed complete with existing and finished levels, dimensions, reinforcing details, details of supports left in place and locations of all services encountered. For mechanical and electrical equipment the details shall include the whole plant as erected and described in the Specification. For other works the drawings shall include, but not be limited to:

- Existing and finished levels;
- Coordinates;
- Profiles of all pipeline ;
- Dimensions;
- Reinforcing Steel details;
- Details of supports left in place;
- Locations of all services and underground utilities encountered;
- Locations of all structures including tanks, buildings, chambers and appurtenances;
- Invert and cover levels of all chambers;

- Connection details and locations;
- Details of pipe materials and bedding;
- Sizes and grades of manhole covers.
- Any other information requested by the Engineer

Record drawing submissions shall include:-

- 1) Four bound sets of As-Built Record Drawings
- 2) One set of first copy negatives
- 3) One set provided on CD.

Contractor shall not be entitled to any extra payment or extension of time for the preparation or changes thereto of the Final As-Built Record Drawings.

18.3 Revision of Submittals

Whenever a variation order causes a change to the information contained in previously approved drawings, the Contractor shall submit revised information and data corresponding to the changed requirements for approval. Revision submittals shall be submitted following the procedures required for previously approved submittals.

18.4 Daily and Monthly Reporting

The Contractor shall provide the following minimum information by way of a report to the Engineer on a daily basis:

- a) Labour on site
- b) Materials on site
- c) Works done
- d) Works planned for the next day
- e) Cubic metres of Concrete poured
- f) length of pipe (varying diameters) installed
- g) Drawing illustrating the location of pipe installed
- h) Problems

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The Contractor shall provide the following minimum information by way of a report to the Engineer on a monthly basis:

- a) Contact Details
- b) Contract Progress against Programme
- c) Monthly financial report
- d) Material approval status
- e) Staffing Levels / Staffing requirements
- f) Issues

The daily and monthly reporting shall be finalised by the Contractor and the Engineer during commissioning.

19. Sewage Treatment Plant PreStart-up, Start-up, Commissioning and Testing

19.1 Submittals:

The name, qualifications and relevant experience of the Contractors proposed for testing and field personnel;

Detailed plans for prestart-up, start-up, commissioning and testing of the equipment supplied under the Contract;

Installation Certification Forms, Ready-to-start Tags, control loop check lists and Start-up Certification Forms;

A plan to providing 24-hour telephone response during the commissioning period. The plan shall be complete with a daytime staffing plan and names, qualifications, and telephone numbers of those assigned to off-hour standby duty;

Protocol for Performance Testing, instrumentation to be used, proposed flow rates, and other information necessary to describe the proposed testing plan;

Develop the detailed test procedure which will be subject to approval of the Engineer;

A full and complete report for all Performance Tests. Reports shall include description of the units tested, test procedures, test flow rates, pressures, levels, and all other data and results required to demonstrate that the items tested meet specified requirements;

19.2 Prestart-up

Prestart-up consists of the non-operating functions required to bring the supplied equipment to a state of readiness for placing systems into service. It includes, but is not limited to; cleaning, leakage and pressure testing, cold alignment checks, disinfection, system flushing, lubrication of mechanical equipment, rotation checks and wiring loop checks.

At this stage, deficiency lists are prepared and the General Contractor is to remedy outstanding incomplete or incorrect work in accordance with terms of the Contract. The Contractor shall complete Equipment Installation Certification Forms, as supplied as part of the Contract, for each specified piece of equipment and shall submit these to the Engineer for review.

Notify the Engineer that each piece of equipment in a system or subsystem has been properly checked out, inspect and certify that the supplied equipment is ready for start-up.

Inspect and ensure that all instrumentation has been calibrated.

Check and verify each control loop. The Contractor will be required to perform verification tests to ensure a minimum of 98% correct loop terminations prior to prestart-up.

Sign-off on the Equipment Installation Certification Forms and affix a Ready-to-Start tag on the equipment designating that the Prestart-up Phase for that particular system is complete.

19.3 Start-up

Once each piece of equipment within a defined system carries a Ready-to-Start tag, then that individual system shall be started and tested.

Conduct start-up tests in conjunction with the Contractor, and under the witness of the Engineer.

Potable water or secondary effluent shall be used for wet tests as required in the start-up plan.

Deficiencies that are uncovered shall be corrected and retesting shall be conducted as required.

Start-Up Completion Certificates shall be prepared certifying that the equipment or system is complete, successfully tested, started and ready for commissioning and continuous operation.

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19.4 Commissioning

Commissioning consists of placing the supplied equipment into continuous operation in an orderly manner. Commissioning is considered to be complete when all systems have been operating continuously for a period of no less than 24 hours or as defined in the Particular Specification, without fault and in accordance with the specified performance requirements.

Inspect and test system components during the commissioning period that were not able to be tested during prestart-up and start-up tests

Test and verify software is to be field verified to ensure all control interconnections are proven and working as required.

Provide field operating personnel until the system is completely commissioned.

Notify the Engineer upon completion of the commissioning period.

The Employer will operate the system upon completion of the commissioning processes.

19.5 Performance Testing

The intent of this testing is to ensure that the system can meet the effluent requirements stipulated in this Contract at the design average maximum day and peak hour flows.

Performance tests shall be performed during the commissioning period.

Provide all labour and materials to perform Performance Tests

All BOD5, Total Suspended Solids, Ammonia Nitrogen, Total Nitrogen and Total Phosphorus sampling and testing are to be performed at a certified laboratory acceptable to the Engineer. Preserve and analyze in accordance with the latest edition of "Standard Methods for the Examination of Water and Wastewater", a joint publication of the American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF)..