Project Particular Specification

Water Meters

PA WM

NAIDU CONSULTING
ENGINEERING DEVELOPMENT

Trenance 3 Reservoir: The Construction of a 6 Mℓ Reinforced Concrete Reservoir, Pump Station, Inlet & Outlet Pipework, 400Kℓ Elevated Tank and Ancillary Works: Ward 59

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NAIDU CONSULTING

Table of Contents

PREAMBLE

This Project Specification forms an integral part of the contract and supplements the Employer’s Standard Specifications where relevant. This specification shall be read in conjunction with the requirements of eThekwini Municipality.

All material, equipment, and fittings required shall be manufactured and supplied by an Employer preferred approved supplier. It is the Contractors's responsibility to confirm with their supplier that they are approved by the Employer.

PA WM Water Meters

PA WM 1 Electromagnetic Flow Meters

The electromagmnetic flow measuring equipment for recording potable bulk water supply for the works shall be supplied and installed as indicated on the Drawings and shown in the table below and shall be installed in the meter chambers:

Table 1: Summary of Electromagnetic Flow Meter Installations

Installation Description	Sizes	Pressure Rating	Drawing Reference
Trenance 3 Reservoir: The Construction of a 6 Mℓ Reinforced Concrete Reservoir, Pump Station, Inlet & Outlet Pipework, 400Kℓ Elevated Tank and Ancillary Works: Ward 59	DN250 DN200	PN10	60570/025

The Contractor will be required to supply, install, calibrate, and commission all metering equipment supplied.

The meters offered shall be of an approved standard design capable of operating under the specified working conditions.

Meter shall be installed strictly in accordance with manufacturer's instructions.

PA WM 1.1 Electromagnetic Flow Meters Specifications and Requirements

Electromagnetic flow meters shall comply with the following:

1) The flow meter shall be the in-line electromagnetic type and not strap on type comprising of a minimum of 2 pair of sensors and remote microprocessor based converter unit. The system shall be inherently bi-directional with separate isolated analogue (4-20mA) and pulse outputs (volt free) for forward and reverse flow.

2) The flowmeter shall be provided with facilities for a pulsed output to enable electronic data recording, display and/or logging equipment to be linked to the meter.

3) The flowmeter will be able to operate on both municipal power supply and battery.

4) The flow meter shall have no moving parts to ensure that there is no damage from particulate matter e.g. stones, etc.

5) The wetted materials shall be compatible with and suitable for use on potable water. The liner shall be certified by an internationally recognised body such as AWWA or equivalent.

6) The flow sensor and probes enclosure and fittings shall be of stainless steel or better and shall be rated to IP68 requirements to be suitable to indefinite submergence to a depth of up to 10m. A coupling medium is to be applied to ensure good acoustic contact between sensor and coupling.

PA WM 1.1.1 Electromagnetic Flow Meter Accuracy

The system accuracy shall be equal to or better than ±0.5% of measured value under reference conditions irrespective of flow direction with a flow range of 0.01 to 20 m/s full scale (i.e. 2000:1 turndown). Repeatability shall be equal to or better than ±1.0%.

PA WM 1.1.2 Electromagnetic Flow Meter Coating and Lining

The flow meter shall be epoxy lined and coated to a minimum dry film thickness of 300µm.

PA WM 1.1.3 Electromagnetic Flow Meter Sensor Tube

The flow sensor measuring tube shall be made from AISI grade 316L stainless steel.

PA WM 1.2 Electromagnetic Flow Meter Transmitter

The flow meter, electronic equipment, and transmitter shall meet the minimum requirements and must include the following:

1) At least 2 digital outputs, potential free contacts programmable for counter outputs related to flow in both directions.

2) The instrument must be configurable via the integral display keypad and PC-based configuration via plug in port.

3) LCD with custom configurations for presenting different measured values and status variables with a minimum of three totalisers. There shall be independent totaliser displays to give forward total, reverse total, nett totals, time and date. The display shall be backlit.

4) Remote non-re-settable integrator with cyclometer display to give a running total of flow in selectable for kilolitres, megalitres etc.

5) Remote 'Rate of Flow' indicator (analogue display, selectable for litres/second, megalitres/day).

6) The device shall incorporate a menu selection allowing range, units, etc to be made. Data shall be stored in a non-volatile memory.

7) The signal converter shall be capable of non-full pipe detection.

8) The meter software shall incorporate multi password protection to prevent inadvertent or fraudulent programming or units of measurement changes.

9) The transmitter unit shall be protected to a minimum IP67 and must be of remote version type to be wall mounted which shall house the above.

10) Programming software and communication cables compatible with a USB interface on the programming station.

11) An isolated 4 to 20mA analogue output that is programmed for the flow rate.

12) Signal cable outputs with cable gland in wall-mounted panel to enable transmission of data by radio telemetry to the Employer's main board.

13) Instrument to give detailed status indication of all configuration settings i.e. hardware or software.

14) The signal transmitter must be fitted with built it communication interface with the integral MODBUS protocols. No converters will be accepted. Optional Profibus and Hart Ethernet configurable connections shall be available.

15) System to have immunity to radio frequency interference and not affect radio telemetry equipment installed on site.

16) The electronic display and recording equipment described above shall be installed before hydraulic pressure and it shall be calibrated and commissioned in-situ after hydraulic pressure testing completion and approvals.

PA WM 1.2.1 Electromagnetic Flow Meter Cabling and Sensor Probes

The cabling length to connect the signal transmitter and meter shall as per the table below:

Table 2: Summary of Electromagnetic Flow Meter Cabling

Installation Description	Cable Length	Transmitter Type and Location	PLC	SCADA
DN200 Inlet Meter	55m	Remote Type, Wall mounted in Telemtry	Yes	No
DN200 Outlet Meter (E.T)	65m	Remote Type, Wall mounted in Telemtry	Yes	No
DN200 Inlet Meter	60m	Remote Type, Wall mounted in Telemtry	Yes	No
DN250 Inlet Meter	10m	Remote Type, Wall mounted in Telemtry	Yes	No

The cable shall meet the following requirements:

1) The cable length between sensor and transmitter to meet the installed conditions.

2) Cabling between the signal transmitter and meter shall be single cable providing both power and measurement signal from the flowmeter sensor to the flow meter transmitter.

3) The sensor cable to be PVC or PTFE insulated.

4) All inputs and outputs to be galvanically isolated from the power supply. All pulse/status outputs and Analogue 4-20 mA output to be fully galvanically separated.

5) The flow sensor and probes enclosure and fittings shall be of stainless steel or better and shall be rated to IP68 requirements to be suitable to indefinite submergence to a depth of up to 10m. A coupling medium is to be applied to ensure good acoustic contact between sensor and coupling.

PA WM 1.3 Electromagnetic Flow Meter Power Supply

The meter and transmitter shall be suitable for 24V DC power supply without the need for link setting or voltage selection. A 24-hour battery backup with a 24V DC charger shall be incorporated into the system. Alarm contacts for loss of supply and voltage must be made available in the system. The battery must be of the lithium type.

The meter and transmitter shall have transient power protection.

The power for the charger equipment is to be provided under this Contract by means of a 230V, 15A supply from a dedicated rated circuit breaker in the distribution board.

Any electrical supplies which may be required for the charger are to be provided by the Contractor under this Contract and the cost thereof will be deemed to be included in the tendered rates.

PA WM 1.4 Electromagnetic Flow Meter Pressure Rating

Meters shall be suitable for a maximum working temperature of 0 to 70°C at pressures up to 1.5 x meter design pressure rating shown in Table 1 on the drawings. All meters shall be flanged to SANS 1123 or EN 1092-1.

PA WM 1.5 Electromagnetic Flow Meter Inlet and Outlet Pipe Runs

Tenderers must provide full details of the minimum lengths of straight pipe required upstream and downstream from each type of appurtenance, so that the accuracy of the meters remains within the specified accuracies.
The specification is based off minimum installation of straight pipe requirement of 3 x meter

diameter upstream from the flow meter and 3 x meter diameter downstream from the flow meter.

Any additional straight pipe lengths required for the offered flow meter for the upstream and downstream spool pieces are deemed to be inclusive in the pricing of the flow meter.

PA WM 1.6 Electromagnetic Flow Meter Panel

The wall mounted meter panel shall be completely enclosed over the whole front face and at the sides. The panel is to be designed so that access to the equipment therein will be from the front. All cable entries shall be from the bottom.

The panel shall be finished in baked enamel with either a smooth or stippled surface.

All bolts, screws and handles for the operation of the front access door shall be polished metalwork free from scratches and of uniform appearance. All labels shall be made in approved sandwich type board with not less than 10 mm lettering. All bolts, nuts, screws, and washers shall be 316 stainless steel.

PA WM 1.7 Electromagnetic Flow Meter Calibration and Other Certification

The meter performance shall have been verified using wetted calibration with potable water on a fully traceable test facility that is internationally accepted. Laboratory traceability packs shall be available on request. Meter calibration certificate to be provided and results to comply applicable to an accredited standard i.e. SANAS or better.

The meter shall also be provided with an ITS (inspection test plan), pressure certificate, material specification, and material certificate.

The meter shall be designed and manufactured under the ISO 9000 series of quality standards. It shall also have a meter body length to current ISO standard for in-line electromagnetic flow meters to facilitate interchangeability of product.

PA WM 1.8 Electromagnetic Flow Meter Direction of Flow

The forward flow direction indication shall be provided on of the meter housing in a position which can be seen from the top of the meter. This indication shall be in the form of an arrow forming part of the casting or in the form of an engraved brass plate with an arrow and fixed to the housing with drilled and tapped stainless steel machine screws.

PA WM 1.9 Electromagnetic Flow Meter Documentation

5 x copies, specific for the meter for the specified pipe size, covering installation, and operating and maintenance instructions, shall be provided prior to installation and commissioning.

General arrangement (GA) drawings shall be supplied with the meter and shall also be included in the O & M manuals.

Meter datasheet (both soft and hard copies) to be provided after commissioning

Full details of the meter offered and of its guaranteed performance capabilities and accuracies shall be furnished with the tender.

PA WM 1.10 Electromagnetic Flow Meter Measurement and Payment

An item has been scheduled in the Bill of Quantities for the supplying, installing, installation of transmitter, cabling, calibrating, testing, and commissioning of all the necessary flow measuring and recording/display equipment as specified. The rates tendered shall be deemed to include for all labour, plant, materials, and equipment necessary to complete the work.
Unit: No.

PA WM 2 Cathodic Continuity Across Meter Installations for Steel Pipeline Installations

This specification shall be used in the absence of a Cathodic Protection specification for the installation of flow meters assemblies on steel pipelines. The requirements mentioned below are deemed inclusive of the supply of the meter.

PA WM 2.1 Cathodic Continuity Description

All inline equipment (buried or in a chamber) along a steel pipeline such as joints, flanged joints, valves, meters, and specials which have flanged connections with gaskets usually have an electrical resistance which encourages the electrical current to jump off the pipeline. All valves, meters, specials, and flanged joints require an electrical cabling anti-corrosion by-pass to ensure the current remains on the pipeline.

PA WM 2.2 Cathodic Continuity Bonding of Buried Joints

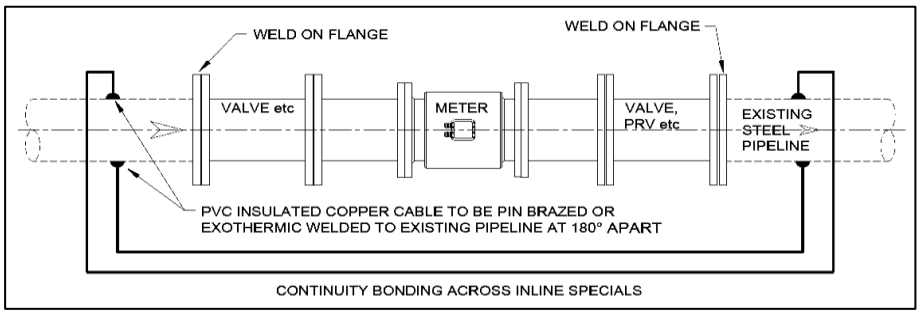
All pipe joints shall be continually bonded by means of 2 x 16mm² black PVC insulated copper cables pin brazed or exothermic welded to the steel pipeline either side of the joint.

All bonding of cables to the pipeline must be in accordance to PA WM 4.4 below.

PA WM 2.3 Cathodic Continuity Bonding of Inline Pipework Assemblies

All inline equipment, specials, and/ or pipework assemblies shall be continually bonded by means of 2 x 16mm² black PVC insulated copper cables pin brazed or exothermic welded to the steel pipeline either side of the inline equipment, specials and/ or pipework assemblies. The cables shall run in a 25mm diameter PVC conduit with a minimum offset of 350mm from the pipeline as illustrated below and shall have electrical warning tape placed 500mm above conduit during backfilling. conduit ends shall be sealed with polyurethane Foam.

All bonding of cables to the pipeline must be in accordance to PA WM 4.4.



CONTINUITY BONDING ACROSS INLINE SPECIALS

PA WM 2.4 Cathodic Continuity Cable Connection to Steel Pipe Connection

Insulated PVC copper cable shall be pin brazed or exothermic welded to the steel pipeline. The technique used shall ensure that metallurgical contact is achieved between the cable and the pipeline while care is taken to (re)insulate the pipeline coating and the weld to prevent currents going to earth and to prevent corrosion. All wires to be crimped at ends with electrical type copper lugs or ferrules. Contractor shall submit details of the technique and equipment to be used.

The minimum amount of coating to bare pipe shall be removed. After connecting the cable, the entire exposed area shall be encapsulated in epoxy. The procedure for this is as follows:

1) Clean the pipeline coating to a minimum of 50mm beyond the final repair limits in accordance to PSL 3.9.

2) Construct a dam from a suitable material around the coating repair area.

3) Apply squish pack Copon Hycote 151 epoxy or similar approved non-conductive epoxy over the entire repair area, ensuring a minimum 5mm cover over the cable connection. A minimum overlap of 50mm shall be made over the existing coating.

All cable to pipe connections and coating repairs shall be witnessed by the Employers Representative.

PA WM 3 Data Sheets

The Tenderer shall complete in full the information on the following data sheets in respect of the equipment offered.

The Tenderer is to fill in the unshaded cells.

Meter 1: DN200 Electromagnetic Inlet Flow Meter

Description	Offered
Meter Type	
Name of Manufacturer	
Country of Manufacture	
Meter Description	
Diameter of Meter	DN200
Overall Length of Meter	
Pressure Class	PN10
Maximum recommended flow in l/s	
Maximum recommended flow in m³/hr	
Turn down ratio	
Accuracy at flow rates (m³/hr):	
m³/hr	
m³/hr	
m³/hr	
m³/hr	
Loss of Head at flow rate (m³/hr)	
m³/hr	
m³/hr	
m³/hr	
m³/hr	
Factory Body Test Pressure (kPa)	
Type of Transmitter	
Minimum Pipe Lengths (x DN):	
Upstream of meter	
Downstream of meter	
Further Details	

Meter 2: DN200 Electromagnetic Outlet Flow Meter (E.T)

Description	Offered
Meter Type	
Name of Manufacturer	
Country of Manufacture	
Meter Description	
Diameter of Meter	DN200
Overall Length of Meter	
Pressure Class	PN10
Maximum recommended flow in l/s	
Maximum recommended flow in m³/hr	
Turn down ratio	
Accuracy at flow rates (m³/hr):	
m³/hr	
m³/hr	
m³/hr	
m³/hr	
Loss of Head at flow rate (m³/hr)	
m³/hr	
m³/hr	
m³/hr	
m³/hr	
Factory Body Test Pressure (kPa)	
Type of Transmitter	
Minimum Pipe Lengths (x DN):	
Upstream of meter	
Downstream of meter	
Further Details	

Meter 1: DN200 Electromagnetic Outlet Flow Meter

Description	Offered
Meter Type	
Name of Manufacturer	
Country of Manufacture	
Meter Description	
Diameter of Meter	DN200
Overall Length of Meter	
Pressure Class	PN10
Maximum recommended flow in l/s	
Maximum recommended flow in m³/hr	
Turn down ratio	
Accuracy at flow rates (m³/hr):	
m³/hr	
m³/hr	
m³/hr	
m³/hr	
Loss of Head at flow rate (m³/hr)	
m³/hr	
m³/hr	
m³/hr	
m³/hr	
Factory Body Test Pressure (kPa)	
Type of Transmitter	
Minimum Pipe Lengths (x DN):	
Upstream of meter	
Downstream of meter	
Further Details	

Meter 1: DN250 Electromagnetic Outlet Flow Meter

Description	Offered
Meter Type	
Name of Manufacturer	
Country of Manufacture	
Meter Description	
Diameter of Meter	DN250
Overall Length of Meter	
Pressure Class	PN10
Maximum recommended flow in l/s	
Maximum recommended flow in m³/hr	
Turn down ratio	
Accuracy at flow rates (m³/hr):	
m³/hr	
m³/hr	
m³/hr	
m³/hr	
Loss of Head at flow rate (m³/hr)	
m³/hr	
m³/hr	
m³/hr	
m³/hr	
Factory Body Test Pressure (kPa)	
Type of Transmitter	
Minimum Pipe Lengths (x DN):	
Upstream of meter	
Downstream of meter	
Further Details	