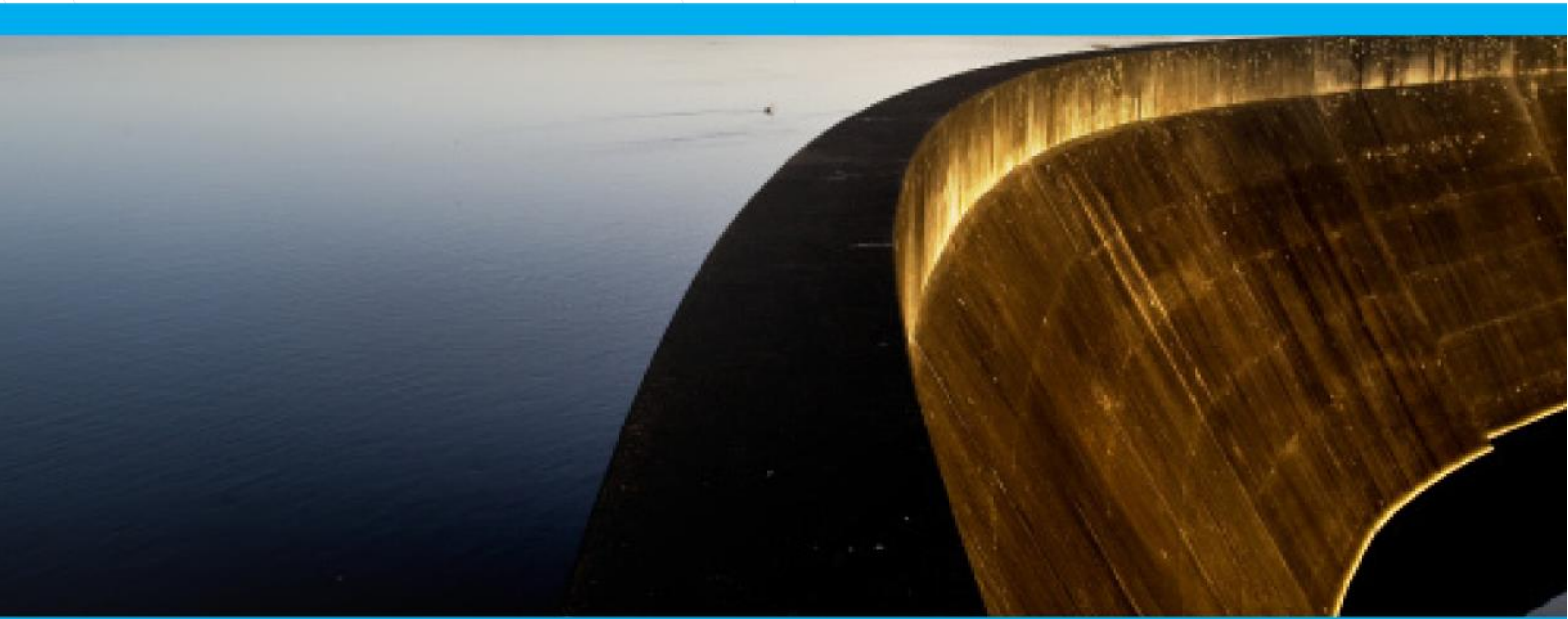


# Technical Standard Specification

**M-SPE-STD-006**

**Supply and Installation**

**Bulk Supply Meters for Potable Water**





## Document Approval

Rev	Name	Role	Signature	Date
2.0	George Henry	Principal Engineer Standards and Specifications		9/06/2017

## Subject Matter Expert Authorisation

Rev	Name	Signature	Date	RPEQ Sign-off Required	RPEQ #
2.0	Rees Davies		9/06/2017	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	-

## Revision History

Rev	Date	Description	Author		Checked by	
			Name	Signature	Name	Signature
1.0	15/09/2016	Issued for use	Raymond Curro			
2.0	9/06/2017	Update	Rees Davies		Akram Khan	

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# 1 Purpose

This Standard Specification provides the minimum requirements for Seqwater works relating to the design, supply and installation of bulk supply (revenue) meters for potable water.

Requirements under this Standard Specification shall apply to:

- bulk supply meters installed on new infrastructure, and
- bulk supply meters on existing infrastructure, limited to where the benefit derived from each requirement can be demonstrated to outweigh the cost to implement the requirement.

This Standard Specification does not apply to meters used for non-revenue applications.

## 2 Application of Standard Specification

Responsibility for ensuring compliance with Seqwater standard specifications lies with those engaged in the management and execution of design, construction and maintenance activities on Seqwater assets.

This Standard Specification shall be used in conjunction with the Scope of Works and any other Seqwater standards, specifications and guidelines considered relevant to the works.

The Contractor shall not deviate from the requirements of this Standard Specification without first obtaining written agreement from Seqwater. The Contractor maintains responsibility for the design and compliance with all relevant legislation, Australian standards, codes and guidelines.

In the case that it is identified that a specific requirement within this Standard Specification does not meet the requirements of the Scope of Works, another Seqwater standard specification, manufacturer's requirements, legislation, Australian standards, codes or guidelines, the conflict shall be brought to the attention of Seqwater and written agreement shall be gained prior to application of the requirement. Generally the more stringent requirement shall apply.

Advice shall be sought from the Seqwater Principal Engineer Standards and Specifications to clarify any ambiguities, or approve proposed deviations from this Standard Specification. Contact should be made through the nominated Seqwater representative for the particular project or using the details on the back page of this document for general feedback.

Where a Contractor has not received a copy of any Seqwater specification listed in this specification, the onus shall be on the Contractor to request a copy and ensure said specifications are fully taken into consideration for any work or tendering they may undertake. Contractors shall be responsible for obtaining their own copies of any other relevant or referenced non-Seqwater documents.

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## 3 Definitions

Defined terms in this document are:

**Bulk supply meter** means a water meter nominated as a revenue meter.

**Calibrated accuracy** is the worst case accuracy over the specified flow range (measured under optimum factory laboratory conditions) with respect to a value measured using approved calibration techniques. The accuracy value may be achieved by setting specific variable parameters within the flow meter head, which are then used as the reference parameters during site validation.

**Limiting condition** means an extreme condition, such as flow rate, temperature, pressure, humidity and electromagnetic interference, that a water meter is required to withstand without damage, and without degradation of its error of indication, when it is subsequently operated within its rated operating conditions.

**Maximum permissible error (MPE)** is the extreme value of measurement error, with respect to a known reference quantity value, permitted under NMI R 49 / OIML R 49 for a given meter during pattern approval testing (i.e. intensive testing).

**Scope of works** means the scope of works document forming part of the contract particulars including supporting documentation.

**Standard specification** means Technical Standard Specification M-SPE-STD-006 Supply and Installation, Bulk Supply Meters for Potable Water.

**Water meter** means the instrument intended to measure continuously, memorise, and display the volume of water passing through the measurement transducer at metering conditions. In this Standard Specification, a water meter is also referred to as a 'meter'.

Abbreviations in this document are:

**Table 3-1 – Abbreviations**

Abbreviation	Description
AS	Australian Standard
DN	Nominal diameter
ILAC-MRA	International Laboratory Accreditation Cooperation - Mutual Recognition Arrangement
I/O	Input/output
MPE	Maximum permissible error
NATA	National Association of Testing Authorities, Australia
PLC	Programmable logic controller
UPS	Uninterruptable power supply
WSAA	Water Services Association of Australia

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## 4 Reference Documents

The Contractor shall be responsible for obtaining a copy of and applying the requirements of all relevant legislation, statutory local, state and Commonwealth authorities, Australian standards and WSAA guidelines. Where no Australian standard exists, work shall conform to the most current and applicable international standard.

This Standard Specification references the documents listed within Table 4-1 and Table 4-2. In their latest editions, these documents form a part of this Standard Specification.

**Table 4-1 – Reference standards and specifications**

Standard/Specification	Description
AS 4020	Testing of products for use in contact with drinking water
AS 4087	Metallic flanges for waterworks purposes
AS 60529	Degrees of protection provided by enclosures (IP Code)
OIML R 49-1	Water meters for cold potable water and hot water, Part 1: Metrological and technical requirements
NMI R 49-1	Water meters for cold potable water and hot water, Part 1: Metrological and technical requirements Note: NMI R 49-1 is adapted by the Australian National Meter Institute (NMI) from OIML R 49-1, published by the International Organisation of Legal Metrology.
WSA 109	Industry standard for flanged gaskets and o-rings

**Table 4-2 – Reference Seqwater standards and templates**

Standard/Template	Description
E-SPE-STD-001	Electrical design and construction
E-SPE-STD-002	Instrumentation
I-SPE-STD-013	Control systems design and construction
M-PRO-STD-001	Commissioning of bulk supply meters for potable water
M-TMP-STD-003	Electromagnetic flow meter commissioning ITP template
S-DWG-STD-001	Standard drawing – flow meter pit (DN 600 and larger) general arrangement
S-DWG-STD-005	Standard drawing - typical pit information
X-PRO-STD-004	Development and review of asset standards procedure
X-PRO-STD-010	Asset information instruction for project managers, contractors and suppliers

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## 5 Technical Requirements

### 5.1 Meter Accuracy and Pattern Approval

Water meters shall have a calibrated accuracy within  $\pm 0.2$  % of the measured value under factory (laboratory) conditions. The performance of the meter shall be defined and documented in an individual calibration certificate, supplied with the meter. The calibration facility shall be accredited by NATA or an equivalent accreditation body recognized by the ILAC-MRA.

Water meters shall be pattern approved in accordance with NMI R 49 or OIML R 49 to the following accuracy class:

- Class 1 for meters  $\geq$  DN 900
- Class 1 or Class 2 for meters  $<$  DN 900

A water meter shall be designed and manufactured such that its errors do not exceed the maximum permissible errors (MPEs) as defined below under rated operating conditions.

For Class 1 water meters:

- the MPE for the upper flow rate zone is  $\pm 1$  %, for temperatures from 0.1 °C to 30 °C, and  $\pm 2$  % for temperatures greater than 30 °C.
- the MPE for the lower flow rate zone is  $\pm 3$  % regardless of the temperature range.

For Class 2 water meters:

- the MPE for the upper flow rate zone is  $\pm 2$  %, for temperatures from 0.1°C to 30 °C, and  $\pm 3$  % for temperatures greater than 30 °C.
- the MPE for the lower flow rate zone is  $\pm 5$  % regardless of the temperature range.

Note: the lower flow rate zone is  $Q_1 \leq Q < Q_2$  and the upper flow rate zone is  $Q_2 \leq Q \leq Q_4$ . Refer to NMI R 49 for full definitions of the flow rate zones and various flow designations. The specific flow rates corresponding to the flow designations are provided by the meter manufacturer.

Water meters without pattern approval to NMI / OIML R 49 may be accepted if the meter meets with requirements under NMI / OIML R 49 and the meter is calibrated, inspected and tested in accordance with that standard.

### 5.2 Existing Infrastructure

For bulk supply meters assessed, installed or replaced on existing infrastructure, the requirements under this Standard Specification shall be considered to be a preferred installation. It is important to note that modifying existing infrastructure to meet all requirements within this document may not be practicable. As such, the assessed benefit derived from each requirement must be demonstrated to outweigh the cost to implement the requirement.

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### 5.3 Meter Verification

The meter shall be capable of in-situ verification to ensure the meter components are working within their normal working limits and the assessable parameters are within the original factory calibration.

A verification certificate shall be provided on commissioning of the meter.

### 5.4 Contact with Potable Water

The internal liner to the meter shall be in accordance with AS 4020 or to an equivalent international standard, subject to Seqwater's acceptance.

### 5.5 Pressure Class

The pressure class of the meter shall be equivalent to or greater than the design rated pressure class of the associated infrastructure. A reduced pressure class based on site operating pressures will not be accepted.

### 5.6 Structural Stresses

The flow meter installation shall be designed to withstand all potential stresses on the meter as a result of pipeline loads, including but not limited to thermal expansion.

### 5.7 Flanges & Gaskets

The end connection flanges to the meter shall be in accordance with AS 4087 to the pressure class specified in the Scope of Works.

Flange gaskets shall comply with WSA 109.

### 5.8 Process Conditions

The meter shall be rated to operate within the following process conditions:

Process temperature: 0.1 to 30 °C (T30 temperature class)

Fluid conductivity: > 5 µS/cm

Water meters approved with a T30 temperature class shall also comply with a limiting condition of 50 °C as per NMI R 49.

### 5.9 Environmental Conditions

The meter shall be rated to the following environmental conditions:

Ambient temperature: - 20 to 55 °C

Electromagnetic environment: E2 (industrial)

Environmental classification: Class O (for fixed meters installed outdoors)

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## 5.10 Meter Sizing

The designer shall consider the operating flow range when selecting the diameter of the meter. The accuracy of the meter shall be maximised as much as practicable.

The meter diameter shall be selected to ensure that the flow rate (through the meter) during operation is as follows:

- Pumped system: flow rate shall always be above the  $Q_2$  of the selected meter except during startup and shutdown.
- Gravity / demand driven system: for the majority (i.e. greater than 50%) of the operating time, and volume transfer, the flow rate shall be above the  $Q_2$  of the selected meter. Operating flow rate below  $Q_2$  should be minimised as much as practicable. The estimated volume which will be transferred below  $Q_1$  and  $Q_2$  flows shall require the approval of Seqwater.
- For any installation, consideration must also be given to the maximum flow rate in order to ensure the meter is appropriately sized. The maximum allowable operating flow cannot be above  $Q_3$ , except for short periods up to  $Q_4$ .

Note: The specific flow rates corresponding to the various flow designations are provided by the meter manufacturer. A smaller diameter meter will generally have a lower  $Q_2$ . Refer to NMI R 49 for full definitions of the various flow designations.

It is accepted that the calibrated accuracy of  $\pm 0.2\%$  does not apply at minimum flow conditions, instead the NMI / OIML R 49 maximum permissible error limits shall apply.

In the case that a meter does not have a nominated  $Q_2$  value, the following conditions shall be met during operation:

- Pumped system: velocity shall always be above 0.1 m/s except during startup and shutdown. Velocity shall be no less than 0.5 m/s for the majority of the operating time and volume transfer.
- Gravity / demand driven system: velocity shall be no less than 0.5 m/s for the majority of operating time and volume transfer. Operating velocity below 0.5 m/s should be minimised as much as practicable. The estimated volume which will be transferred below 0.1 m/s and 0.5 m/s flows shall require the approval of Seqwater.

It shall be brought to Seqwater's attention if a single water meter is not suitable for the range of system operating flow conditions. In such cases an alternative metering installation may need to be considered and shall require approval from Seqwater.

## 5.11 Meter Installation

The designer shall consider all relevant operating, safety and environmental conditions/requirements when specifying the meter and installation.

There shall be a minimum straight pipe length of 20 x pipe diameters upstream the meter and 10 x pipe diameters downstream the meter. Meters required to measure bi-directional flow shall have a minimum straight pipe length of 20 x pipe diameters on both sides of the meter.

The meter shall be the same nominal diameter of the adjoining pipeline. If it is required to reduce the pipeline diameter to match the selected meter diameter, reducers (approved by

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meter manufacturer) shall be installed upstream and downstream of the required straight pipe lengths (not directly upstream and downstream the meter). Meter manufacturer advice shall be sought in relation to any minor difference between actual internal diameters.

There shall be no branches or fittings placed within the straight pipe lengths except for the dismantling / coupling joint and a sample connection as required, where these fittings shall be on the downstream side of the meter. In the case of bi-directional flow meters such fittings shall be on the predominantly downstream side.

The designer shall consider the influence of associated infrastructure with regards to uniform flow profile (such as pumps, pressure regulating valves, mixers, two bends in different planes) in addition to the nominated straight pipe length requirements. The designer shall ensure the installation meets the meter manufacturer's requirements for uniform flow profile.

The meter shall be installed upstream chemical dosing points where possible. If unable to install the meter upstream a dosing point, the meter shall be no less than 50 x diameter downstream the dosing point and the fluid shall be well mixed.

The designer shall consider potential influences of electromagnetic interference in the design of the meter installation. In general, ferrous metal structures shall not be installed within close proximity of an electromagnetic meter due to the potential to influence measurement. It is not permitted to install thrust restraining rods surrounding the meter.

Other than those approved by the meter manufacturer, no structures or wiring shall be in contact with the meter.

Meters installed in parallel or in series shall meet the meter manufacturer's segregation requirements.

The meter shall be installed with stainless steel fluid contact rings both sides and shall be electrically grounded in accordance with the meter manufacturer's requirements.

The sensor shall be rated to IP68 with a fully-potted terminal box.

The transmitter shall be rated to IP67.

The transmitter shall not be installed within a confined space or at a location susceptible to immersion.

Meter manufacturer requirements shall be met (or exceeded) for all aspects. Items to consider (in addition to the above) include, but are not limited to, location of nearest pipe supports, meter orientation, allowable vibrations, vacuum avoidance etc.

Site assessment shall be undertaken prior to meter selection and installation design. This shall include assessment of mechanical, electrical and control constraints.

## 5.12 Operations and Maintenance Considerations

All water meters associated with buried pipelines shall be installed within a pit to facilitate ongoing maintenance and meter replacement.

Pits for meters shall comply with the following standard drawings:

- S-DWG-STD-001 Flowmeter pit (DN 600 and larger) general arrangement

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- S-DWG-STD-005 Typical pit information

Generally the requirements of S-DWG-STD-001 shall also apply to meters < DN 600, however modifications to this pit arrangement may be considered, subject to acceptance by Seqwater.

The pit shall be appropriately sized and configured to facilitate temporary installation of a clamp-on ultrasonic flow meter downstream the meter. Seqwater may nominate the requirement for a permanent ultrasonic flow meter as a reference meter in the Scope of Works, subject to site metering requirements. Note that ultrasonic flow meters are not intended to be used as in-situ validation; instead they may be used for example if the permanent meter fails.

Minimum requirements for accessible pipe lengths within the pit for a clamp-on ultrasonic flow meter are nominated in Table 5-1.

**Table 5-1 – Required accessible pipe length for clamp-on ultrasonic flow meter**

Pipe size range	Required accessible pipe length (mm)
< DN 600	600
≥ DN 600 to ≤ DN 1200	1200
> DN 1200	1500

The meter installation shall include a permanent stainless steel nameplate on the wall of the pit (or other approved location) which provides the details necessary for ultrasonic meter installation and configuration (e.g. pipe I.D., pipe wall thickness, cement lining thickness etc.).

The meter installation shall include all necessary infrastructure to facilitate meter isolation, drain down and re-charge of the pipeline for future meter maintenance or replacement. Existing network infrastructure such as existing isolation valves, air valves and scour valves may be utilised for this function, subject to acceptance by Seqwater.

## 5.13 Electrical & Control

Meters shall operate from a 24VDC power supply and be supported by a 24VDC uninterruptable power supply (UPS).

Communications protocol signals from the transmitter to the PLC shall be used if available under the water meter's NMI / OIML R 49 approval. Any communication protocol shall be in alignment with Seqwater Standards (refer below) and site requirements. If a communications protocol is used, the transmitter total volume output value shall be utilised for revenue purposes.

Where a communication protocol is not available, the following shall apply:

- The meter transmitter shall provide the following inputs to the PLC as a minimum:
  - For unidirectional flow:
    - Flow rate (analogue)
    - Totalised volume increment (pulse digital)

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- General fault (digital signal)
- For bidirectional flow:
  - Forward flow rate (analogue)
  - Reverse flow rate (analogue)
  - Forward totalised volume increment (pulse digital)
  - Reverse totalised volume increment (pulse digital)
  - General fault (digital signal)
- Forward and reverse flow rate and total volume may be derived in the PLC via flow direction status signal where discrete outputs from the meter transmitter are limited.
- Any volume calculation required within a PLC shall be performed by the PLC receiving the pulsed output from the meter, not by a successive PLC.

It is not permitted to calculate totalised volume in the PLC via the flow rate output.

The sensor cable length between the electromagnetic sensor and the remote mounted transmitter shall be as short as practicable. The cable length shall be no more than 50m or the maximum cable length nominated by the meter manufacturer, whichever is shorter.

Electrical and control works shall comply with the following Seqwater standard specifications:

- E-SPE-STD-001 Electrical design and construction
- E-SPE-STD-002 Instrumentation
- I-SPE-STD-013 Control system design and construction

Where a requirement under this Standard Specification conflicts with a requirement from a specification in the above list, the requirement within this Standard Specification shall apply.

## 5.14 Commissioning

The meter shall be commissioned in accordance with the Seqwater procedure M-PRO-STD-001 Commissioning of bulk supply meters for potable water.

Commissioning tasks shall be documented in accordance with M-TMP-STD-003 Electromagnetic flow meter commissioning ITP template.

## 5.15 Operation and Maintenance Documentation

Configuration software backup or configuration details for the meter shall be provided to Seqwater.

Asset details shall be submitted in accordance with X-PRO-STD-010 Asset information instruction for project managers, contractors and suppliers.

An operation and maintenance manual shall be supplied for all equipment.

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## 6 Changes from Previous Version

Section Number	Change Description
N/A	Major update with changes throughout standard, including but not limited to; application to existing infrastructure installations, meter sizing, meter installation and electrical and control.

This Standard Specification will be regularly reviewed and updated in accordance with the Seqwater Review Procedure for Standards (X-PRO-STD-004). Requests for updates shall be submitted to the Seqwater Engineering Technical Support Team using the details on the back page of this document. The request must include a clear description of the update scope and recommended change(s).

## 7 Works Verification

Compliance with this document may be verified by internal audit.

## 8 Further Information

For further information please contact the Seqwater Engineering Technical Support Team using the details on the back page of this document.

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