

M-SPE-STD-009

Flow Meters

Document number: SPE-00434

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This Engineering Standard was endorsed by an RPEQ on behalf of Seqwater.

Contents

1.	Purpose	3
2.	Scope	3
3.	Technical Requirements	4
3.1.	General.....	4
3.2.	Design Life	5
3.3.	Operating Conditions	5
3.4.	Potable Water Compatibility	6
3.5.	Physical and Operating Requirements.....	6
3.5.1.	General.....	6
3.5.2.	Accuracy and Pattern Approval.....	6
3.5.3.	Flow Meter Sizing	6
3.5.4.	Electrical and Control.....	7
3.6.	Pressure Class.....	8
3.7.	Protective Coatings.....	8
3.8.	Markings	8
3.9.	Existing Infrastructure.....	8
3.10.	Flow Meter Verification	9
3.11.	Installation	9
3.11.1.	General.....	9
3.11.2.	Pit Installations.....	10
3.12.	Execution	11
4.	Definitions and Abbreviations	11
5.	Roles and Responsibilities	13
6.	References and Related Materials	13
7.	Changes from Previous Version	15

Version No.	Document No.	Document Owner:	Approval Date:	Document Approver:	Page:
2	SPE-00434	Principal Engineering Standards and Assurance	27/07/2023	Manager Technical Support & Improvement	2 of 15

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

1. Purpose

This document is part of a suite of Seqwater Engineering Standards which are in alignment with the Seqwater Quality Management System. Their purpose is to provide a consistent approach to the development, modification, and management of Seqwater infrastructure that is fit for purpose and safe so far as is reasonably practicable. Advice must be sought from Seqwater to clarify any ambiguities in relation to this document.

This Standard Specification provides the minimum requirements for Seqwater works relating to the design, supply and installation of new, replacement or upgraded flow meters.

This document must be used in conjunction with the documents it references to assist in ensuring a fit for purpose asset. This Standard is not intended to be relied on solely for design, supply, and installation works; advice from specialist engineers and/or manufacturers may be required on a case-by-case basis.

This Standard Specification is applicable to all flow meters associated with water treatment plants and the bulk water network, unless specifically noted otherwise. Applications include, but are not limited to, the primary process flows within treatment plants, chemical dosing, and transfer systems where flow rate monitoring is required for operational purposes. The fluids measured will vary depending on the application. Typically, liquids will be water at various qualities or water treatment dosing chemicals.

The requirements of this specification also form the base requirements for bulk supply, revenue, custody transfer and non-urban water flow meters. For specific requirements related to meters for bulk supply and non-urban water, refer to standard specifications, *M-SPE-STD-006* and *M-SPE-STD-007* respectively. These documents provide specific requirements relevant to these types of flow meters. If there is a conflict of requirements between this specification and the bulk supply and non-urban flow meter specifications, the latter will take precedence over requirements of this Standard Specification.

This Standard Specification is not intended to cover gaseous flow monitoring or flow switches.

This Standard Specification forms the minimum requirements for the selection of preferred equipment for flow meters for use within Seqwater assets. The preferred equipment will be developed through one or more open market procurement processes with the resultant selection listed in *X-LST-STD-001, Seqwater Preferred Equipment List*. Seqwater's Commercial Manager will approve the recommended preferred equipment that results from the open market procurement process.

2. Scope

This Standard Specification applies to all Seqwater workers, as well as suppliers, contractors and consultants working for or on behalf of Seqwater unless otherwise stated. It applies to all new assets and to all existing assets undergoing refurbishment or modification. It must be used in conjunction with other relevant Seqwater Engineering Standards and project specific documents to define the technical requirements for infrastructure design and construction.

Seqwater Engineering Standards detail Seqwater's minimum requirements and recommendations to provide infrastructure that will be fit for purpose, and safe to operate and maintain. However, at all times the designer remains responsible for ensuring infrastructure designed is fit for purpose and safe to construct, operate,

Version No.	Document No.	Document Owner:	Approval Date:	Document Approver:	Page:
2	SPE-00434	Principal Engineering Standards and Assurance	27/07/2023	Manager Technical Support & Improvement	3 of 15

maintain, and demolish. In doing so the designer must exercise appropriate due diligence to identify and manage hazards so far as is reasonably practicable.

Designers must also ensure compliance with relevant Australian Legislation, Standards, Codes and Guidelines (including those produced by WSAA). Where no Australian Standard exists for a particular application, work must conform to the most current version of an industry accepted international standard.

Deviation from meeting the minimum requirements in this standard requires written agreement from Seqwater as per the deviation process detailed in Procedure *X-PRO-STD-008 Asset Standards Management and Application*. That process includes completion of an *X-TMP-STD-022 Asset Standards Deviation Request Form* and submission by the Seqwater Project Representative to the Seqwater Engineering Mailbox.

Where noted in this Standard Specification that Seqwater approval or acceptance shall/must be sought, approval or acceptance must be gained through the Seqwater Asset Standard Deviation process, as outlined above.

Responsibility for ensuring compliance with Seqwater Engineering Standards lies with those engaged in the management and execution of design, construction, and modification of Seqwater assets. This includes modifications to the functional design of the asset including technical changes made which would extend an asset outside of its design operating envelope and/or approved operation and maintenance practices.

In the case that it is identified that a specific requirement within this Engineering Standard does not meet the requirements of project specific documents, another Seqwater Engineering Standard or Australian Legislation, Standards, Codes or Guidelines, the conflict must be brought to the attention of the Seqwater Principal Engineering Standards and Assurance (or their delegate) via the Engineering Mailbox, and written agreement must be gained prior to application of the requirement.

Advice must be sought from Seqwater to clarify any ambiguities regarding this Engineering Standard.

Seqwater undertakes regular updates of its Engineering Standards. Before utilising this Engineering Standard the complete list of Seqwater Engineering Standards should be reviewed, to ensure currency and applicability of standards to be applied to the works.

3. Technical Requirements

3.1. General

Refer to the *M-SPE-STD-001* for general requirements related to mechanical assets.

The requirements of *WSA 03, Water Supply Code of Australia* and *D-SPE-STD-001, Seqwater Supplementary Manual to WSA 03: 2011* shall be applied wherever applicable.

Electromagnetic meters shall be used for all chemical dosing and transfer $\leq$ DN300.

Electromagnetic meters shall be used for bulk water supply metering, as per *M-SPE-STD-006*.

Flow meters for $\geq$ DN300 should be full bore electromagnetic flow meters, or a manufacturer calibrated, inline ultrasonic flow meter, installed by the manufacturer in a pipe spool.

Alternative meter types to those noted above are generally unacceptable unless specifically approved by Seqwater. Examples of meters generally not accepted include, but are not limited to; insertion electromagnetic, clamp on or non-factory installed ultrasonic, Coriolis, venturi, orifice plate, vortex, mechanical etc.

Version No.	Document No.	Document Owner:	Approval Date:	Document Approver:	Page:
2	SPE-00434	Principal Engineering Standards and Assurance	27/07/2023	Manager Technical Support & Improvement	4 of 15

The meter selected must be specified by the Manufacturer as suitable for measurement in the required metering application and with the specified fluid.

Equipment must have a proven record of reliable operation in that application. The specific application details include, but are not necessarily limited to, operational and maintenance requirements, operating environment, and solution quality. In the case that it is identified that a specific requirement within this Standard Specification would lead to installation of an unsuitable instrument for the application, an alternative shall be identified and brought to the attention of Seqwater for deviation approval.

All equipment shall be selected to ensure that chemical compatibility is appropriately met for systems involved in chemical dosing processes.

Complete replacement units, $\leq$ DN300, and replacement spare parts for larger units must be readily available in Australia. Lead time for the delivery of replacement units to a nominated Seqwater site should be a maximum of three working days after receipt of order.

Any mandated or recommended Australian Standard requirements which cannot be met due to existing installations must be brought to the attention of Seqwater.

There shall not be any external pockets or features on the associated equipment which facilitate moisture ponding.

Where flow meters are being installed in a Classified Hazardous area, requirements identified in the Hazardous Area Application section of *E-SPE-STD-001* shall be met.

Unless otherwise specified, the meter shall be supplied with all required ancillary components for installation.

3.2. Design Life

The required design life for Flow Meters is specified in *M-SPE-STD-001*. The selection of all associated equipment must reflect the specified design life.

3.3. Operating Conditions

The system and all components of the measurement instrument and transmitter must be suitable for the design maximum flows, pressures, temperatures, and other duty conditions. All components and materials must have long term compatibility and suitability with the fluid specified in the project specific documentation.

At a minimum, the flow meter shall be rated to operate with a process fluid temperature of 5 to 35°C.

All components must be suitable for the external environment, including exposure to any potential liquid spills or chemical vapour. At a minimum, all components must be suitable for an outdoor industrial environment with ambient operating temperatures of -5 to 45°C and relative humidity of 10 to 95%. More extreme environmental conditions may need to be assigned on a case-by-case basis.

Consideration must be made for transmitters placed in direct sunlight. Appropriate protection such as an enclosure or cover must be applied if the transmitter display has the potential to be damaged by prolonged exposure. However, any method of protection must not introduce new hazards.

The meter must be rated for installation within an industrial electromagnetic environment.

Version No.	Document No.	Document Owner:	Approval Date:	Document Approver:	Page:
2	SPE-00434	Principal Engineering Standards and Assurance	27/07/2023	Manager Technical Support & Improvement	5 of 15

A minimum of C3-Medium corrosivity category, as per AS 4312, will apply for all external surface protection requirements. A C4-high or C5-very high corrosivity category shall be assigned to equipment that will be installed close to the coast or in accordance with those specified within *M-SPE-STD-004, Protective Coatings*.

3.4. Potable Water Compatibility

All components of the flow meter that may come into contact with drinking water must comply with the Potable Water Compatibility requirements of *M-SPE-STD-001*.

3.5. Physical and Operating Requirements

3.5.1. General

The flow meter display must be in metric units. Devices that have the functionality to provide multiple flow units are preferred. Unless otherwise stated in the Scope of Works for the flow meter, the flow unit of measurement will be litres per second.

3.5.2. Accuracy and Pattern Approval

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

Flow meters shall be specified, designed, manufactured, and installed such that in-situ errors, under rated operating conditions, do not exceed the maximum permissible error (MPEs) required for the process. Unless otherwise specified, the maximum MPE will be $\pm 2\%$.

Where specifically identified as required for the application, meters must have pattern approval under either *NMI / OIML R 49* or *NMI M 10* as appropriate. Pattern approval provides greater confidence of meter performance during adverse conditions. In circumstances where pattern approval is not required, meters with approval are preferred.

3.5.3. Flow Meter Sizing

The project statement of work must detail the minimum, normal and maximum operational flow rates and the flow meter shall be suitably sized to achieve the required accuracy. However, consideration must be given to ensure that the maximum operational flow rate does not induce excessive head pressure loss.

The Manufacturer of the flow meter shall prescribe the minimum flow rate (Q_1), transitional flow rate (Q_2), permanent flow rate (Q_3) and overload flow rate (Q_4). Refer to *NMI / OIML R 49* for full definitions of these flow designations.

Flow meter selection should always be sized such that the minimum flow through the flow meter is above the manufacturers published transitional flow rate, Q_2 . This is only exempt during start-up and shutdown. For critical applications that require very high degrees of accuracy (better than $\pm 2\%$), the flow meter should be sized to achieve a minimum fluid velocity greater than 0.5 m/sec.

Consideration must also be given to the maximum flow rate to ensure the flow meter is appropriately sized. The maximum allowable operating flow cannot be above the manufacturer prescribed permanent flow rate, Q_3 .

The internal diameter of the upstream and downstream straight pipe length required, shall be within 5% of the actual Flow meter tube's internal diameter.

Version No.	Document No.	Document Owner:	Approval Date:	Document Approver:	Page:
2	SPE-00434	Principal Engineering Standards and Assurance	27/07/2023	Manager Technical Support & Improvement	6 of 15

It shall be brought to Seqwater's attention if a single flow 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 Seqwater approval.

3.5.4. Electrical and Control

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

- *E-SPE-STD-001, Electrical Design and Construction*
- *I-SPE-STD-015, Instrumentation*
- *I-SPE-STD-013, Control System Design and Construction*

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

Electromagnetic flow meters shall be supplied as complete sets incorporating the flow tube and a transmitter. The transmitter may be attached to the flow tube or remote.

The flow meter shall be suitable for use within an electromagnetic environment. The flow meter must not influence or be influenced by surrounding electromagnetic devices when the flow meter sensor, transmitter and cabling are installed in accordance with the manufacturer's separation and segregation requirements.

For remote mounted transmitters, the sensor cable length between the flow tube and transmitter shall be as short as practicable. The cable length shall be no more than 50m or the maximum cable length nominated by the flow meter manufacturer, whichever is shorter. Deviations for longer cable lengths will be considered where the actual absolute minimum fluid conductivity, from historical records, is known.

At a minimum, a 30-40cm cable loop, at the flow tube connection, shall be provided to facilitate ongoing maintenance and relieve connection stress.

The flow meter shall be designed for automatic restart and monitoring functionality after power supply interruption, without the need for any manual local reset functions at the site.

The flowmeter and its associated components must be electrically isolated and grounded in accordance with regulations, the flow meter manufacturer's requirements for the specific installation, and in accordance with *E-SPE-STD-001*.

Where a high risk of a lightning strike exists, the flow meter installation design should consider management and mitigation of the potential effect from a possible lightning strike.

3.5.4.1. Remote Monitoring

3.5.4.1.1 Unidirectional Meters

All flow instruments must support the following interface:

- Instantaneous Flow (Analogue)

The following signals may be added in addition, dependent on design:

- Instrument Fault Alarm (Digital)
- Volume Total (Digital)

Version No.	Document No.	Document Owner:	Approval Date:	Document Approver:	Page:
2	SPE-00434	Principal Engineering Standards and Assurance	27/07/2023	Manager Technical Support & Improvement	7 of 15

3.5.4.1.2 Bidirectional Meters

All bidirectional meters must support the following interfaces:

- Instantaneous Flow (Analogue)
- Flow Direction (Digital or Analogue)

The following signals may be added in addition, dependent on design:

- Forward Volume Total (Digital)
- Reverse Volume Total (Digital)
- Instrument Fault (Digital)

3.6. Pressure Class

The pressure class of the flow meter shall be equivalent to or greater than the design pressure of the associated infrastructure.

3.7. Protective Coatings

All protective coatings shall be as per *M-SPE-STD-004, Protective Coatings*. Equipment shall generally be coated and tested to the appropriate original equipment manufacturers (OEM) high performance paint specification. The OEM paint specification is to be assessed for suitability for the specific application.

The specific product and application method shall be such that the coating will be suitable to achieve the design life without the need for re application. Refer to Section 3.3 for the expected operating environment, including minimum corrosivity category.

The transmitter and sensor shall be, at minimum, rated to IP67 specified within AS 60529. More stringent requirements may be required after consideration of the installation location. If the sensor is contained within a pit or location prone to inundation, the sensor shall be rated to IP68 with a fully potted terminal box.

3.8. Markings

The flow meter and transmitter shall be clearly and indelibly marked with the equipment serial number and all other standard information specified by the manufacturer, as well as the requirements specified within *NMI / OIML R 49*. Further Seqwater identification shall be attached meeting the requirements of both *X-PRO-STD-006, Equipment Numbering Convention* Standard Procedure and *M-SPE-STD-001, General Mechanical Standard Specification*.

3.9. Existing Infrastructure

The requirements of this Standard Specification must be adhered too and used to prescribe the preferred equipment and installation for flow meters installed or replaced within existing infrastructure. It is important to note that modifying existing infrastructure to meet all requirements within this document may not be practicable. As such, the appropriateness of any proposed variations from this Standard Specification, based on existing constraints, must be brought to the attention of Seqwater and a deviation from this Standard Specification submitted to Seqwater for approval.

Version No.	Document No.	Document Owner:	Approval Date:	Document Approver:	Page:
2	SPE-00434	Principal Engineering Standards and Assurance	27/07/2023	Manager Technical Support & Improvement	8 of 15

3.10. Flow Meter Verification

The flow meter must be capable of in-situ verification to ensure the flow meter components are working within their normal working limits and the assessable parameters are within 1% of the original factory values. Seqwater must be informed if there is any parameter outside of the accepted limits.

Meters capable of being independently challenged to verify that their components are working within their normal working limits and the assessable parameters are within the original factory calibration set points are preferred.

3.11. Installation

3.11.1. General

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

The flow meter installation shall include a means of flow meter removal, such as dismantling joints, and all necessary infrastructure to facilitate flow meter isolation, and means of pipeline drain down and re-charge to facilitate flow meter maintenance or replacement. Existing network infrastructure such as isolation valves, air valves and scour valves may be utilised for this function subject to them being suitable, fit for purpose and in a condition that will achieve a service life greater than the design life of the replacement flow meter.

The meter must not be installed at a local high point or on a downward sloping pipe section to ensure that the meter will always run full, and that there is no entrapped air.

The flow meter must be separated from upstream and downstream flow disturbances with rigid pipe by a minimum of 5 pipe diameters upstream and 3 pipe diameters downstream, or in accordance with the manufacturer's recommendations, whichever is greater, to achieve a suitably uniform flow profile and meter accuracy. In addition to the standard straight pipe lengths specified, the designer, in consultation with the manufacturer, shall consider the influence of nearby infrastructure with regards to uniform flow profile (such as pumps, valves, pressure regulating valves, mixers, two bends in different planes). Additionally, flow meters required to measure bi-directional flow must have appropriate upstream straight pipe lengths on both sides of the flow meter.

There shall be no branches or fittings placed within the straight pipe lengths. Fittings such as dismantling / coupling joints and sample connection points shall be on the downstream side of the flow meter.

As per *NMI / OIML R 49*, any specific flow conditioning section, including straightener must be prescribed by the manufacturer.

The directly adjoining pipeline shall be the same nominal diameter as the flow meter, i.e. no significant step down or step up of diameter directly at the meter flanges. The maximum diameter differential at the meter flanges must not exceed manufacturer requirements. If it is required to reduce the pipeline diameter to match the selected diameter, reducers that have been approved by the manufacturer must be used and installed outside the required straight diameter pipe lengths.

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

Where required, the flow meter shall be installed with suitable fluid contact rings on both sides of the meter.

Version No.	Document No.	Document Owner:	Approval Date:	Document Approver:	Page:
2	SPE-00434	Principal Engineering Standards and Assurance	27/07/2023	Manager Technical Support & Improvement	9 of 15

Flow meters installed in parallel, or in close proximity, shall be segregated to meet the meter manufacturer's requirements to avoid electromagnetic interference. Meters in series shall be separated with a minimum of 5 straight pipe diameters separating the two meters.

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.

Flange connections must comply with *M-SPE-STD-001*.

Flange gaskets must comply with *WSA 109*.

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

The location of the installed flow meter must be safely and ergonomically accessible for maintenance without the need for any temporary access device and should be kept clear of:

- Oil, grease, noxious fumes, and hazardous materials
- Long grass, overgrown vegetation, and loose soil
- Hazardous machinery

Where access to the flow meter is required for operation and maintenance purposes, permanent access structures shall be provided. These access structures shall conform with Seqwater standard specification *M-SPE-STD-002 Platforms, Walkways, Stairways and Ladders*, and relevant Seqwater standard drawings.

Where the meter is installed on a pipeline with cathodic protection, ensure that the manufactures requirements are followed to ensure that the cathodic protection does not affect meter integrity or accuracy. Additionally, it must be ensured that the meter installation does not adversely affect the effectiveness of the cathodic protection of the pipeline.

Manufacturer, supplier, and pattern approval certificate conditions 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, flow meter orientation, allowable vibrations, vacuum avoidance, normally full pipes etc. Any conflict or deviation from these requirements will be identified to the Seqwater Project Manager and managed via consultation with, and approval from Seqwater Engineering Standards and Assurance.

3.11.2. Pit Installations

Flow meters shall not be directly buried. All flow meters installed below ground level must be installed within a suitable pit or other structure to facilitate ongoing maintenance and meter replacement with appropriate safe access and egress. This structure must be permanently self-draining via a suitably sized drainage pipe (preferred) or sump pump with auto float switch and have a breathable lid to reduce condensation. The flow meter and terminal box must be IP68 rated with the terminal box potted. The associated transmitter must be mounted within a suitable above ground enclosure per *I-SPE-STD-015*, in a readily accessible location.

A high-level switch should be installed within the pit and alarmed via the plant monitoring and control system. If the pit is drained via a sump pump, it is mandatory to include a high-level switch.

Where a flow meter is to be installed within a pit, the need to enter a confined space shall be avoided as much as practicable. Installation of unnecessary items within confined spaces shall be avoided. Issues and risks related to personnel access, vehicle access, vandalism and security of any above ground equipment must be considered.

Pits for meters shall comply with the following standard drawings:

Version No.	Document No.	Document Owner:	Approval Date:	Document Approver:	Page:
2	SPE-00434	Principal Engineering Standards and Assurance	27/07/2023	Manager Technical Support & Improvement	10 of 15

- D-DWG-STD-029 Flowmeter pit (DN 600 and larger) general arrangement
- D-DWG-STD-033 Typical pit information

Generally, the requirements of *D-DWG-STD-029* shall also apply to meters < DN 600, however modifications to this pit arrangement may be considered, subject to Seqwater approval.

For all critical installations, 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. The Ultrasonic meter is not intended to be used as in-situ validation meter but maybe; used as a backup meter in case the permanent meter fails or to determine if there is any change in relationship or deviation between the permanent meter and the Ultrasonic meter.

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

Table 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

3.12. Execution

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 Requirements.

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

Flow meters are required to be tested for vibration levels in accordance with AS 60068.2.64 and shock tested in accordance with AS 60068.2.27.

All approvals, supply, assembly, testing, submission, installation, and commissioning requirements shall be as *M-SPE-STD-001, General Mechanical* and *B-SPE-STD-003, Commissioning Requirements*.

Electromagnetic flow meters shall be commissioned per *M-PRO-STD-001, Commissioning of Electromagnetic Flow Meters for Potable Water Supply* and have *M-TMP-STD-003, Electromagnetic Flow Meter Commissioning, Inspection & Test Plan* completed upon handover.

4. Definitions and Abbreviations

Table 2 Definitions and Abbreviations

Term	Definitions
Employees	Means persons employed directly by Seqwater in a permanent, temporary or casual capacity.

Version No.	Document No.	Document Owner:	Approval Date:	Document Approver:	Page:
2	SPE-00434	Principal Engineering Standards and Assurance	27/07/2023	Manager Technical Support & Improvement	11 of 15

Term	Definitions
Leader	Means any Level 1, 2, 3 and 4 Leader with responsibility for managing a functional area of the business, including people management responsibilities within their functional area.
Worker(s)	Includes all permanent, temporary, and casual employees of Seqwater, and: • vocational and work experience placements • volunteers • contractors and consultants employed by another entity but temporarily assigned to do work for or on behalf of Seqwater.
Seqwater approval / acceptance	Written sign-off gained via the deviation process, as detailed in <i>X-PRO-STD-008 Asset Standards Management and Application</i> .
Contractor	An entity engaged by Seqwater to undertake work in accordance with an agreed contract and defined scope of work.
Engineering Standard	Includes Seqwater Engineering Standard Procedures and Standard Specifications and associated supporting documents such as Standard Drawings, Guidelines, Lists, Manuals, Registers, and Templates.
Manufacturer / Supplier / Vendor / Original Equipment Manufacturer (OEM)	The entity that manufacturers or supplies equipment to meet the specifications of the Contractor.
Owner / Principal / Seqwater	The entity that engages the Contractor to undertake the work and takes custody of the outcome. The Owner may delegate responsibilities to other entities to act on its behalf (e.g., a consultant).
REX	Seqwater Electronic Document and Records Management System.
shall / must	Indicates a mandatory requirement
should	Indicates a recommendation
TSI	Technical Support and Improvement
Calibration	Calibration completed under factory conditions to identify the flow meter's individual defined parameters and confirm performance accuracy under set conditions. The equipment utilised in this will be traceable, operating within their calibration and meeting industry best practice
Verification	Systematic checking that the components function under simulated conditions to prove the device(s) perform within tolerance of their initial factory calibration
Validation	Validation is a form of proof that the in-situ operational installation is performing to a defined accuracy. This is completed and confirmed by quantitative data, such as the change in level of a known storage vessel
AS/NZS	Australian Standard and New Zealand Standard
DN	Nominal Diameter
ESA	Engineering Standards and Assurance

Version No.	Document No.	Document Owner:	Approval Date:	Document Approver:	Page:
2	SPE-00434	Principal Engineering Standards and Assurance	27/07/2023	Manager Technical Support & Improvement	12 of 15

Term	Definitions
ILAC-MRA	International Laboratory Accreditation Conference – Mutual Recognition Arrangement
NATA	National Association of Testing Authorities, Australia
NMI	National Measurement Institute
OMIL	Official Municipal Information Laboratory
PN	Nominal pressure
PLC	Programable logic controller
SCADA	Supervisory control and data acquisition
WSAA	Water Services Association of Australia

5. Roles and Responsibilities

Table 3 Roles and Responsibilities

Role	Responsibility
Leaders	In addition to the responsibilities of a worker, ensure compliance with this Standard Specification by those they lead.
Workers / Employees	Be aware of and comply with this Standard Specification

6. References and Related Materials

The documents listed in **Table** below, and the requirements therein, are relevant to this Standard Specification. In their latest editions, these documents form a part of this document. Note that this is not an exhaustive list of documents relevant to the works.

Seqwater undertakes regular updates of its Engineering Standards. Before utilising this document, the complete list of Seqwater Engineering Standards should be reviewed to ensure currency and applicability for the proposed works.

Table 4 References and Related Material

Description	Location
PRO-01617 X-PRO-STD-009 Engineering Design, Construction, Operation and Maintenance	Rex & Waternet
PRO-01845 M-PRO-STD-001 Commissioning of Electromagnetic Flow Meters for Potable Water Supply Procedure	Rex & Waternet
PRO-01872 X-PRO-STD-002 Engineering Drawing Number Procedure	Rex & Waternet
PRO-01873 X-PRO-STD-001 Asset Standards Documentation Classification and Naming Structure	Rex & Waternet

Version No.	Document No.	Document Owner:	Approval Date:	Document Approver:	Page:
2	SPE-00434	Principal Engineering Standards and Assurance	27/07/2023	Manager Technical Support & Improvement	13 of 15

This document is the property of Seqwater. It must not be copied or reproduced in any way whatsoever without the authority of Seqwater. This document is uncontrolled when printed. An electronic database manages and stores the controlled version.

Description	Location
PRO-01874 X-PRO-STD-004 Development and Review of Asset Standards	Rex & Waternet
PRO-02140 X-PRO-STD-013 Engineering Technical Hazard Study	Rex & Waternet
PRO-02187 X-PRO-STD-007 Drawing and Spatial Data Standards	Rex & Waternet
PRO-02190 X-PRO-STD-006 Equipment Numbering and Naming Convention	Rex & Waternet
PRO-02205 X-PRO-STD-008 Asset Standards Management and Application	Rex & Waternet
PRO-02234 X-PRO-STD-015 Management of Change – Technical	Rex & Waternet
SPE-00346 Commissioning Requirements	Rex & Waternet
SPE-00352 Water Supply Network Planning Design and Construction (Seqwater Supplementary Manual to WSAA Water Supply Code of Australia WSA 03:2011)	Rex & Waternet
SPE-00352 Electrical Design and Construction	Rex & Waternet
SPE-00353 Instrumentation	Rex & Waternet
SPE-00361 Control System Design and Construction	Rex & Waternet
SPE-00367 General Mechanical	Rex & Waternet
SPE-00348 Protective Coatings	Rex & Waternet
SPE-00322 Supply and Installation - Bulk Supply Meters for Potable Water	Rex & Waternet
SPE-00347 Meters for Non-Urban Water Supply	Rex & Waternet
REG-01074 Seqwater Preferred Equipment List	Rex & Waternet
TEM-00153 Electromagnetic Flow Meter Commissioning ITP Template	Rex & Waternet
TEM-00224 X-TMP-STD-022 Asset Standards Deviation Request	Rex & Waternet
D-DWG-STD-029 Flowmeter Pit (DN600 and Larger) General Arrangement	Rex
D-DWG-STD-033 Typical Pit Information	Rex
AS4020 Testing of products for use in contact with drinking water Australian and International Standards Web Service	SAI Global
AS4312 Atmospheric Corrosivity Zones in Australia Australian and International Standards Web Service	SAI Global
AS60529 Degrees of protection provided by enclosures (IP Code) Australian and International Standards Web Service	SAI Global
AS60068.2.27 Environmental Testing Part 2.27: Tests and Guidance: Shock Australian and International Standards Web Service	SAI Global
AS60068.2.64 Environmental Testing Part 2.64: Tests and Guidance: Vibration Australian and International Standards Web Service	SAI Global
NMI R 49-1 Water meters for cold potable water and hot water – Part 1: Metrological and technical requirements	National Measurement Institute (Australia)

Version No.	Document No.	Document Owner:	Approval Date:	Document Approver:	Page:
2	SPE-00434	Principal Engineering Standards and Assurance	27/07/2023	Manager Technical Support & Improvement	14 of 15

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Description	Location
NMI M 10 Meters Intended for the Metering of Water in Full Flowing Pipes	National Measurement Institute (Australia)
OIML R 49-1 Water meters for cold potable water and hot water – Part 1: Metrological and technical requirements	International Organisation of Legal Metrology
WSA03-2011 Water Supply Code of Australia v3.2 January 2022 - Seqwater Copy - for Internal Use Only	Rex & Waternet
WSA109 Industry standard for flanged gaskets and O-rings	Water Services Association of Australia

7. Changes from Previous Version

This Standard Specification will be regularly reviewed and updated, including the consideration of requested alterations, in accordance with Seqwater Procedure X-PRO-STD-004, Development and Review of Asset Standards. Changes made from the previous version of this document are summarised in Table 5 below.

Table 5 Changes from Previous Revision

Section Number	Change
All	Reformatted to meet new Seqwater Style Guide requirements.
3.1 (previously 6.1)	Accuracy requirement deleted and defined in 6.5.2
3.3 (previously 6.3)	Reference to M-SPE-STD-004 added
3.5.2 (previously 6.5.1)	+/- 2% maximum MPE added
3.5.4 (previously 6.5.4)	B-SPE-STD-003 removed. Remote transmitter cable length requirements updated. Communication requirements updated
3.10 (previously 6.10)	Verification limit added
3.11.1 (previously 6.11.1)	Straight pipe length, fitting and meters in series installation requirement clarified
3.11.2 (previously 6.11.2)	Terminal box IP rating specified. Auto float switch and high-level switch for pit sump pumps added. Back up meter purpose detailed
3.12 (previously 7)	Commissioning per M-PRO-STD-001 added.

Version No.	Document No.	Document Owner:	Approval Date:	Document Approver:	Page:
2	SPE-00434	Principal Engineering Standards and Assurance	27/07/2023	Manager Technical Support & Improvement	15 of 15

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