



Department of
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NSW Interim Water Meter Standards for Open Channel Metering

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1. Introduction

National water meter standards are described in the National Water Initiative (NWI section 88) which sets out the requirement to develop a national meter specification and national meter standards specifying the installation of meters. This work was coordinated by the Metering Expert Group, and on 7 December 2009 the Council of Australian Governments (COAG) endorsed the *National Framework for Non-Urban Water Metering* (the National Framework).

A key requirement of the National Framework is that meters must be pattern approved by the National Measurement Institute and installed in accordance with ATS 4747 Part 6.

To enable the requirements of the NWI to be progressed, these NSW Interim Water Meter Standards (Interim Standards) for Open Channel Metering are designed to cover new meters installed in NSW prior to the effective operation of the National Water Meter Standards, and before pattern approved meters are readily available.

On 2 October 2009, NSW Interim Water Meter Standards were approved by the Commissioner for Water which apply to measurement of flow in closed conduit systems – the closed conduit standards continue to remain in force, and are complemented by the current standards for open channel flow.

The NSW Interim Standards for Open Channel Metering are designed to reflect the scope and intention of the National Framework and enable purchase and installation of new meters until the National Water Meter Standards become fully effective.

These Interim Standards for Open Channel metering will enable exemption (under the National Framework) to be provided to new meters installed to the NSW Interim Standards which were developed in good faith to meet the emerging national standards.

Once approved by the NSW Commissioner for Water, these Interim Standards will enable new meters to be installed with confidence that such meters will not need to be removed at a later stage under the grandfathering condition of the National Framework.

Where these Interim Standards refer to action or approval being required by the NSW Commissioner for Water, this action or approval may be delegated by the NSW Commissioner for Water to the Chief Executive Officer of State Water Corporation.

These Interim Standards apply to all new and replacement meters and to those meters installed under programs to improve and extend metering in NSW. In particular, the Interim Standards apply to new meters installed in the Sustaining the Basin Program.

An existing installed meter, which has already been approved for operation under previous regulatory arrangements, will not be subject to compliance with the Interim Standards. However, such an existing installed meter will be subject to the requirements of the full National Water Meter Standards once those standards become fully effective.

At a time when the National Water Meter Standards become fully operational, the NSW Interim Standards for Open Channel metering will be withdrawn and all meters in NSW will come under the operation of the National Standards.

These NSW Interim Standards for Open Channel Metering will apply to all open channel meters installed from the date of approval of the Interim Standards by the NSW Commissioner for Water.

2. Background

The NWI Agreement provides a strategy for improving water resource management across Australia. In relation to water meters, paragraphs 87 and 88 of the Agreement specify requirements for national metering standards and a nationally consistent framework for water metering and measurement. In addition, paragraph 89 specifies open reporting requirements

relating to metered water use and associated compliance and enforcement actions. As COAG signatories, all State and Territory ('jurisdictional') governments are committed to these objectives.

Recognising that requirements for urban and non-urban water meters differ due to highly variable installation configurations and operating conditions in non-urban environments, a national framework (the 'Metrological Assurance Framework') has been developed to enable implementation of new standards for non-urban water meters and to accommodate future trade measurement requirements.

National Framework for Non-urban Water Metering Policy Paper sets out the framework and arrangements agreed by jurisdictional government and industry representatives as members of the Metering Expert Group appointed by the Australian Government. (see reference 1)

The National Framework for Non-urban Water Metering Policy Paper delivers the primary objective agreed by jurisdictional governments that the national metering standards should seek to provide an acceptable level of confidence that measurement performance under in situ conditions is within maximum permissible limits of error of $\pm 5\%$.

The starting date of the National Framework was scheduled for 1 July 2009, but has been deferred to a date to be determined.

A National Guideline for the Application of in-situ Point Acoustic Doppler Velocity Meters has been developed by Queensland Department of Environment and Resource Management in July 2011 and updated by the Australian Hydrographers Association via an inter-agency technical reference group and submitted to the Bureau of Meteorology's Standards Forum for ratification.

3. National and state implementation plans

As set out in the *National Framework for Non-urban Water Metering Policy Paper*, jurisdictional governments shall implement national standards for non-urban meters and the Metrological Assurance Framework in accordance with this policy. Implementation shall be undertaken through:

- The national implementation plan for non-urban metering approved by the Australian Government.
- State implementation plans for non-urban metering prepared by the relevant jurisdictional departments or agencies and endorsed by the Australian Government.

4. Requirements of interim standard

For meters installed under the control of the NSW government the NSW Interim Standard for Open Channel Metering applies to the following:

- Bed Mounted (Acoustic Doppler Velocity Meter) ADVN systems.

The bed mounted ADVN measures water velocity and cross-sectional parameters and has a methodology (either by way of software or instruction manual) to determine the flow through the meter. These NSW Interim Standards for Open Channel Metering define the requirements of the site and equipment, but do not quantify or detail the process to calculate the flow. The process to determine the flow must be defined by the meter manufacturer, and must be available at the time of installation.

4.1 Meter

A meter must be installed that meets the following criteria:

1. Is designed and manufactured such that the maximum error does not exceed $\pm 2.5\%$ after manufacture, EXCEPT where the meter consists of more than one components that are

combined in the field, in which case the maximum error of the combined meter must not exceed $\pm 5\%$ as measured in the field.

2. Has written confirmation from the manufacturer that the above maximum errors are not exceeded. Such written confirmation may be in the form of an approval under a regulatory regime or other internationally recognised standard (this may include, but not be restricted to, test results for meters tested overseas in International Laboratory Accreditation Cooperation (ILAC) signatory accredited laboratories). Written confirmation may also be of the form of a test certificate or other evidence from a reputable testing authority.
3. Is suited to the intended purpose, installation configuration and operating condition.
4. Is provided with a specification from the manufacturer to identify the recommended installation conditions, including the identification of any adverse conditions that would impact on the maximum error.
5. Is provided with a specification from the manufacturer of the methodology (either by way of software or instruction manual) to determine, assess, develop and maintain the calculation of the flow past the meter.
6. Is installed in accordance with any requirements of the manufacturer and Australian Standards or Australian Technical Specifications (including ATS 4747), such that there is an acceptable level of confidence that the meters will operate within the maximum permissible limits of error ($\pm 5\%$) under in situ conditions.
7. Is inspected after installation by an Approved Person (see later section of the Interim Standard) to ensure the meter's suitability and its installation in accordance with any requirements of the manufacturer and ATS 4747. Such checks should involve examining the meter (or measuring system, including its component parts) to ensure:
 - it has a relevant identification mark
 - it is correctly installed in accordance with the relevant Australian Standards or Australian Technical Specifications and manufacturer's specifications
 - it is checked to ensure that the lead-in/lead-out lengths of the installation are of the specified length
 - it is inspected to ensure that upstream and downstream infrastructure minimizes potential obstructions impacting on the performance of the measuring device
 - it is provided with a seal that is approved by the NSW Commissioner for Water to prevent tampering.
8. Is maintained in accordance with any requirements of the manufacturer and ATS 4747 and the National Standard for ADVMs.
9. Progressively totalises the cumulative volume of water, and displays the accumulated total volume on a visible register at any time.
10. Is installed and operated such that the meter displays the accumulated total volume to an in-service maximum permissible error of $\pm 5\%$ of the actual (true) accumulated total volume, and maintains that accuracy rate at any and all of the discharge rates of the diversion work as it is installed and operated, and ensure that this discharge rate is within the design flow rates as specified by the manufacturer.
11. Displays the accumulated total volume in standard metric units.
12. Displays the units of measurement adjacent to the accumulated-total-volume display.
13. Displays the integers of an accumulated total volume in digital form.
14. Has sufficient capacity to record more than one year of flow measurement.
15. Is constructed so as to allow the incorporation or connection of data-logging equipment.

16. Is able, where it incorporates or is connected to data-logging equipment, to collect and transmit data in accordance with the requirement of the NSW Commissioner for Water.
17. Displays on its register or registers at any time precisely the same value as the value recorded in any associated data logger.
18. Has no facility for manipulating or resetting a register or data logger, or for manipulating or disabling its flow-measurement, recording or display functions (unless undertaken by an approved person).
19. Incorporates a facility for sealing against manipulation and tampering.
20. Is constructed and installed so as to allow convenient inspection and checking of components.
21. Is clearly and permanently marked with the name of its manufacturer and with a unique identifying number or alpha-numeric identifier.

4.2 Meter site selection

Channel width is the average width of the channel as measured (at a minimum) at the meter site, 5 channel widths upstream and 5 channel widths downstream

For installation of a meter which is of an ADVDM design, the site must be selected as follows:

22. Be a stable and uniform cross section at the point of measurement.
23. Have a suitable cross section for gauging located close to the meter site.
24. Provide mixed flow with uniform horizontal and vertical flow distribution.

A meter installed at the site must:

25. Be able to be mounted in a position to measure the mean velocity.
26. Be mounted to prevent siltation and debris fouling.

A meter installed at the site must, EXCEPT if the NSW Commissioner for Water has accepted (prior to installation of the meter and based on evidence that the required accuracy level can be attained) lesser numbers of channel widths:

27. Have 5 Channel Widths (CW) upstream of the meter and 5 Channel Widths downstream of the meter without any significant changes to the channel profile.

Note: Any divergence of the channel width, long-slope, alignment, cross sectional area or angle of flow approach by more than 20 per cent could be considered significant

28. Be installed no closer than 20 Channel Widths downstream from a pumping source or channel filling point.
29. Be installed no closer than 20 Channel Widths downstream from any significant angular diversion of the channel from straight.

4.3 Meter site installation

The National Guideline for ADVDM's (section 6.2) outlines the specific requirements for the installation of bed mounted ADVDM's. Installation of all open channel ADVDM's are to comply with the installation requirements (section 6.2) of the National Guideline for ADVDM's along with the following additional requirements:

30. The flow meter display must be sited and installed so that its visible register is accessible to be read at any time.
31. The flow meter display must be mounted at a height not greater than 1.2 metres above ground level (unless in a defined flood zoned).
32. The flow meter and data logger/telemetry system must be located on the channel bank adjacent to the flow meter and housed in a suitable enclosure.

33. All ADVm and associated equipment must be secured to prevent tampering and vandalism.

4.4 Meter maintenance

The following principles will apply to meter maintenance:

34. All maintenance shall be undertaken such that there is an acceptable level of confidence the meter will continue to operate within the maximum permissible limits of error allowable under in situ conditions ($\pm 5\%$).
35. Maintenance of a meter shall only be undertaken by a person who is an Approved Person under the NSW Interim Standards.
36. A meter must be re-calibrated if its metrological performance has been affected by maintenance of the meter.
37. The metrological performance of a meter is considered to have been affected by maintenance (and hence re-calibration is required) if the seals on the meter are broken or removed by a person who is not an Approved Person under the NSW Interim Standards.
38. Re-checking by an Approved Person (under the NSW Interim Standards) of the installation is required if maintenance interferes with the installation (e.g. where the meter has been removed for laboratory re-calibration, or the meter has been shifted to a new location; or in the case of a metering system, where the configuration has been altered or one or more components of the system have been altered or replaced).

4.4.1 Types of maintenance

Maintenance consists of corrective, preventive and predictive maintenance.

39. Corrective maintenance shall be undertaken as soon as practical after a fault is discovered.
40. Preventive maintenance includes regular inspection of meters and installations to identify any departures from those requirements stipulated by the meter manufacturer.
41. Predictive maintenance includes the analysis of meter/usage data either to establish an optimal replacement frequency based on economic objectives or to establish whether meters should be replaced as the result of an evaluation of a sample of meters.

4.4.2 Maintenance plan

A maintenance plan shall be developed and shall be approved by the NSW Commissioner for Water to deliver the necessary elements that reflect the key elements of the Metrological Assurance Framework. The plan shall include the following:

42. Details of compliance checks as required by auditing, checking and readings programs.
43. Details of corrective, preventive and predictive maintenance schedules, and associated procedures.
44. Details of predictive maintenance methods and associated procedures.
45. Identification of the resources that will undertake the maintenance, such as approved designated personnel or subcontractors, and the certifications held by team members and supervisors.

5. Ancillary equipment

If required by the NSW Commissioner for Water, the meter must:

46. Be equipped with an electronic data logger to record readings.
47. Be equipped with a telemetry device to allow remote reading on the meter.

6. Approved persons

Approved Persons who undertake work on meters (including installation, maintenance and validation) should hold certification issued by a nationally recognised, industry-based certification scheme. Certification should be competency-based and will recognise qualifications and/or equivalent experience. Under these NSW Interim Standards, a person will be approved to undertake work on water meters if they are:

48. Accredited as a Certified Person by Irrigation Australia Limited (or other accredited provider) under the National Framework, or
49. approved by the NSW Commissioner for Water as being able to perform the task in accordance with the intentions of the National Framework.

Glossary

COAG	Council of Australian Governments
ILAC	International Laboratory Accreditation Cooperation
NWI	National Water Initiative
NWMS	National Water Meter Standards
NSWIMS	New South Wales Interim Metering Standards
ADVM	Acoustic Doppler Velocity Meter

References

Water Metering Expert Group (2008) *The National Framework for Non-urban Water Metering Policy*. Final Draft. Viewed 1 Oct 2009

www.environment.gov.au/water/publications/agriculture/ris-metering-non-urban.html

Legislation

National Measurement Act 1960 (Commonwealth)

Work Health and Safety Act 2012 (New South Wales)

Standards

ATS 4747 Australian Technical Specification suite: *Meters for non-urban water supply* includes:

ATS 4747.1:2008 Meters for non-urban water supply: Part 1: Glossary of terms.

ATS 4747.3-2008 Meters for non-urban water supply: Part 3: Specifications for open channel meters.

ATS 4747.6-2008 Meters for non-urban water supply: Part 6: Installation and commissioning of open channel meters.

Guidelines

National Guideline for the Application of in-situ Point Acoustic Doppler Velocity Meters developed by Queensland Department of Environment and Resource Management (July 2011) and updated by the Australian Hydrographers Association via an inter-agency technical reference group and submitted to the Bureau of Meteorology's Standards Forum for ratification.

APPENDIX A – Metrological assurance framework

This appendix reflects the main components of the national Metrological Assurance Framework, and guides the content of the NSW Interim Standards.

Key requirements

Non-urban meters shall comply with the following key requirements of the Metrological Assurance Framework to ensure an acceptable level of confidence in meter performance. All non-urban meters shall be:

- Pattern approved by the National Measurement Institute (NMI) where available [Where pattern approval is not available for meters or measuring devices, a contemporary meter or metering system approved by the relevant jurisdictional department or agency would be acceptable. Use of an approved meter must still provide an acceptable level of confidence that it will perform within the maximum permissible limits of error in field conditions ($\pm 5\%$)].
- Laboratory verified by a Verifying Authority under the *National Measurement Act 1960* (Commonwealth), prior to installation.
- Suited to the intended purpose, installation configuration and operating conditions.
- Installed in compliance with the Pattern Approval certificate and the appropriate Australian Standards.
- Validated by a certified validator after installation and before water is taken through the meter under an entitlement.
- Maintained periodically in accordance with the Pattern Approval certificate and relevant Australian Standards or Australian Technical Specifications (e.g. ATS 4747).
- Periodically validated by a certified validator on an ongoing basis.
- Able to provide an acceptable level of confidence without in situ verification that performance of the meter is within the maximum permissible limits of error ($\pm 5\%$) in field conditions.
- Re-verified (either in a laboratory or in situ when and where practical and preferred) by a Verifying Authority or certified licensee under the *National Measurement Act 1960* (Commonwealth) following maintenance affecting the metrological performance of the meter. [In situ re-verification may not be possible where very large meters or measuring systems are used in high capacity applications; or where physical access is a safety concern; or where adequate facilities are unavailable; or where costs are prohibitive. However, even where it is possible to undertake in situ re-verification, laboratory re-verification may be selected as the preferred option].
- Audited on a regular basis by water service providers, government agencies or independent auditors in accordance with national and state implementation plans.