

Water measuring and metering

Accuracy verification of flow-meters / water measuring devices for closed conduits, fully charged

The Resource Management (Measurement and Reporting of Water Takes) Regulation 2010 became operative on the 10th November 2010. The regulation (7) requires all water metering devices to be initially verified on installation and thereafter every five years.

Verification is a snap-shot of meter performance: it does not guarantee ongoing accuracy within the required 5% margin, particularly in highly variable conditions. Many factors can cause a water measuring device to lose calibration and therefore accuracy, including:

- The buildup of deposits, minerals, oils, and solvents.
- Wearing, breakage, or failure of internal mechanical parts.
- Electronic drift.
- Improper installation.
- Modified pipe configurations.

Therefore to ensure the accuracy of a water metering device is maintained and is traceable the following verification program by a trained/certified verification provider (a list of these follows) has been adopted:

Meter Type	Frequency (years)	Comments
Mechanical <80mm diameter	5	A reference flowmeter is not necessarily required to verify a smaller diameter meter. This can be done by measuring how much time it takes to fill up a container of known volume and comparing this with the actual meter readings.
Mechanical >80mm diameter	2	The reason for an initial two year re-verification is based on experience gained in Canterbury that has shown that mechanical meters are subject to increased wear from sand and silt and require regular repair and maintenance.
	5	If after two years the meter re-verifies within the required 5% accuracy then the verification interval can go to five years.
Ultrasonic Clamp-on	3	For existing installations the contact gel between the sensor and the pipe will require replacing after three years.
	5	For replacement installations improvements in gel type means verification can go to five year intervals, provided the meter is well stock-proofed.
Ultrasonic In-line	5	
Electromagnetic Insertion	5	
Electromagnetic	5	

Note:

1. All new or replacement water measuring device installations require verification within six months as per resource consent conditions (when changed).
2. Environment Canterbury may require some meters to be verified on a more regular basis than is required by the regulation.

Verification quantifies meter performance at a given point against predetermined performance parameters. It does not guarantee consistent performance over time; so in itself verification provides limited value for ongoing meter management unless it is supported by sound installation and maintenance practices. Standardisation of installations is necessary to facilitate verification. Therefore the following proposed framework has been adopted to achieve this:

- New and retrofit installations are to have a minimum 10 diameters of pipe above the meter and 5 diameters below (unless approval is given by Environment Canterbury for a non-standard installation);
- Where mechanical meters are operated an unobstructed length of pipe 15 diameters length must be provided for verification meters. Ultrasonic and electromagnetic meters in most cases are considered non-obstructive in the pipe run and therefore the 10:5 installation will provide the required 15 diameter lengths (Check with your installer); and
- Where an existing installation occurs, and on verification it meets the required minimum $\pm 5\%$ accuracy threshold, then the pipe head works do not need to be changed to meet the required 10:5 diameter lengths.

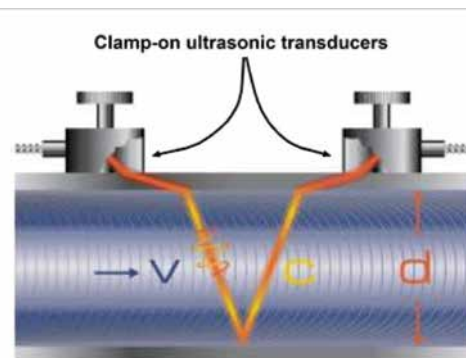
In-field verification: how is this undertaken?

For pipe diameters of less than 80mm

This can be undertaken by measuring how much time Δt it takes to fill a container of known volume, and calculate $V = V/\Delta t$ and compare with this with that recorded by the flowmeter.

For pipe diameters of 80mm or greater

This is undertaken by comparing the output of the flowmeter/water measuring device with the output of a reference flowmeter. Portable ultrasonic flowmeters as reference flowmeters have been adopted in Canterbury as the most cost effective method of verifying in-situ flowmeter accuracy. These transit time flowmeters measure the time difference between ultrasonic beams moving with and against the fluid flow. The time difference, combined with knowledge of the pipe's internal diameter and the distance between ultrasonic transducers, permits a calculation of the volumetric flowrate through the pipe.



The following portable ultrasonic flowmeters are used in Canterbury: -

- Parametric PT 878
- Prosol PCS-XPA Portable – (NZ Supplier – Process Solutions Ltd)
- Proline Prosonic Flow 93T Portable – (NZ Supplier – EMC Industrial Group Ltd)
- Siemens Sitrans F FUP1010 – (NZ Supplier – Siemens Ltd)
- SiteLab SL8811 Portable – (NZ Supplier - Water Supply Products Ltd)
- Yokogawa US300PM – (NZ Supplier – Yokogawa NZ Ltd)
- Fuji Portaflow-X (Detection Services Ltd)

A list of trained certifiers for these instruments is listed further on.

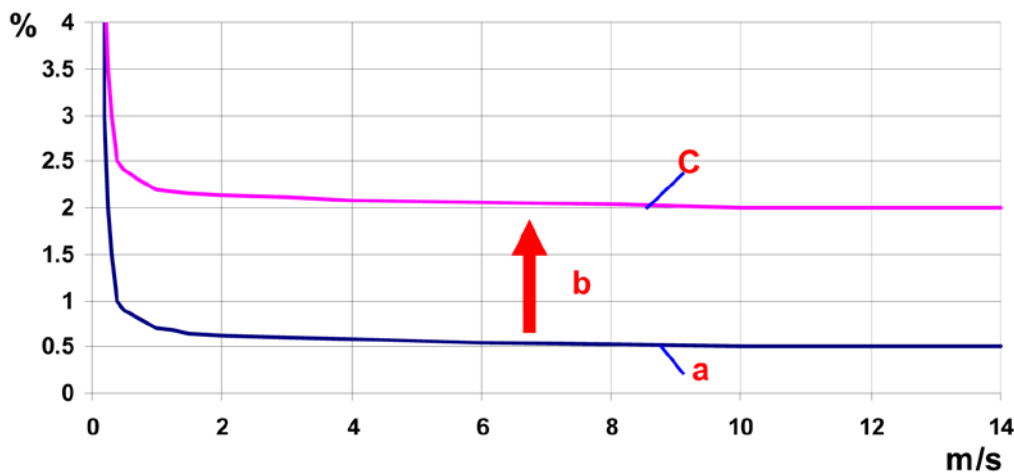
Typically these flowmeters have a measured error of 0.5%, but the measured error depends on a number of factors. A distinction is made between the measured error of the device and an additional installation-specific measured error (typically 1.5% of the measured value) that is independent of the device.

The installation-specific measured error depends on the installation conditions on site, such as the nominal diameter, wall thickness, real pipe geometry, etc.

The sum of the two measured errors is the measured error at the measuring point.



Example: reference flowmeter setup.



Example of the measured error in a pipe with a nominal diameter DN>200

- Measured error of the device (0.5% o.r.)
 - Measured error due to installation conditions (typically 1.5% o.r.)
 - Measured error at the measuring point: 0.5% o.r. + 1.5% o.r. = 2% o.r.
- (o.r. = of reading)

Who has been approved to undertake verification?

The Regulations require that the verification of the water measuring device is carried out by a person, who in the opinion of the regional council that granted the resource consent is suitably qualified to verify the particular meter. This could be a person from a regional council or an external organization. Environment Canterbury has approved the following personnel who have undergone industry training and have shown competency in the operation of the flowmeter listed.

See Ecan approved verifiers: Factsheet 4

Verification report?

The Regulations state that the relevant regional council may request evidence from the resource consent holder that the water measurement device that kept the submitted records has been verified as accurate. Therefore, after verification of a water meter measurement device, a verification report must issued by the verifier to the resource consent holder as evidence of verification. As a matter of course Environment Canterbury require these reports to be submitted to council. Copies of the verification report (CON581) can be found on Environment Canterbury's website at <http://ecan.govt.nz/advice/your-water/watermetering/Pages/consent-forms.aspx>

What happens if my flowmeter/water measuring device accuracy is outside the 5% required accuracy range?

Flow meter type	Mechanical	Clamp-on Ultrasonic Flow	Electromagnetic
Step 1	Remove and inspect.	Remove sensors and renew contact gel.	If the meter has traceable diagnostic capabilities then verification should be undertaken. A copy of the diagnostic certificate is to be forwarded to Environment Canterbury.
Step 2	If the meter shows wear and tear send meter away for repair and calibration.	Replace and reset sensors, re-verify.	If the meter is still out of calibration remove and send away for repair and calibration.
Step 3	Reinstall meter and re-verify.		Reinstall meter and re-verify.

Remember - your flowmeter is only as accurate as its calibration, and your calibration is only as accurate as your calibration system.

References

Guidelines for the Measurement and Reporting of Water Takes. – Irrigation New Zealand Inc. Resource Management (Measurement and Reporting of Water Takes) Regulation 2010.

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