Technical Specifications and Installation Requirements for Flow Meters
Environmental Management Group
Technical Requirements

Water Initiatives

Technical Specifications and Installation Requirements for Flow Meters

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Hawke’s Bay Regional Council Flow Meter, Installation Requirements.

2.0 INTRODUCTION

Installation of flow meters in accordance with the manufacturer’s written specifications is necessary for a flow-meter to be accurate as it claims. Every design has a certain tolerance to non-stable velocity conditions in the pipe, but all units require proper piping configurations to operate efficiently. Proper piping provides a normal flow pattern for the device, ensuring specified accuracy and performance.

For Water meters to operate correctly the flow upstream and downstream of the flow-meter must be as free as possible from obstructions, such as butterfly valves, flow switches, elbows etc, as they can cause incorrect measurement of flow and induce errors ranging +/- 50%, to allow for errors created by the pipe run HBRC specify a minimum distant that must be free of any obstructions that could induce these errors.

The flow of water into flow-meters can also be disturbed by partially open valves or poorly mounted flange gaskets.

These installation requirements are Hawke’s Bay Regional Council’s minimum guidelines for flow meters and their installation.

The preferred installed location of meters is above ground.

3.0 PURPOSE

It has been identified that the quality of water take information coming from flow meters installed as part of water take consent has been of a poor quality. This technical specification has been developed to standardise the installation of flow meter and raise the quality of water take information by setting guidelines and technical specifications for the selection of and installation of flow meters.

4.0 TARGET AUDIENCE

This is intended for all people installing flow meters as a requirement of a Hawke’s Bay Regional Council water take consent.

The following minimum requirements must be adhered to

5.0 METER REQUIREMENTS.

- The flow meter must meet Hawke’s Bay Regional Councils technical specifications.
- Selected to be within +/-2% error of the flow-meters accuracy curve throughout the expected and consented flow rates.
- Installed and proved to be reading within +/-5% error of the flow meters accuracy curve throughout the minimum and maximum expected flow rates.
- The meter must be selected and installed to ensure the water quality does not adversely affect the performance and life expectancy of the flow meter.

### 6.0 PIPE LENGTHS

Subject to any specific manufacturer’s installation requirements, a minimum length of ten (10) diameters of straight unobstructed rigid pipe must be fitted on the intake side of the meter and a minimum of five (5) diameters of straight unobstructed rigid pipe on the discharge of the meter.

**Figure 1: Standard pipe run**

In circumstances where it is impractical to install a meter with the same diameter of pipe work, reducers with concentric tapers may be used. However this is conditional on the use of a 6 to 1 ratio taper followed by a minimum length of ten (10) diameters of straight rigid pipe fitted on the intake side of the meter and a minimum of five (5) diameters of straight rigid pipe on the discharge of the meter, followed by a 6 to 1 ratio taper back out to the existing pipe work to minimize flow disturbance.

**Figure 2: Reduced pipe run**

A water meter may be fitted onto a vertical pipe work (as usually found in wells) provided it is certified and endorsed by the manufacture for that purpose.
In circumstances where the meter is not located at a fixed point and is used in conjunction with a portable pump, the meter and a minimum length of ten (10) diameters of straight unobstructed rigid pipe must be fitted on the intake side of the meter and a minimum of five (5) diameters of straight unobstructed rigid pipe on the discharge of the meter can be disconnected from the portable pump for transport purposes and relocation.

All references to “x diameters of straight pipe” refer to a straight length of pipe that has the same internal diameter as the internal diameter of the meter and equivalent in length to at least x times the diameter.

7.0 LOCATION OF METER

Meters are to be located as close as practical to the point of extraction and preferably on the discharge side of the pump.

There must only be permitted off-takes of water between the point of extraction and the meter. (examples domestic, stock water and fire fighting outlets)

The measuring mechanism of the meter must be located in straight clean pipe of uniform, circular cross section and without any fittings or obstructions. In all cases the meter must be installed so that at all flow rates there is a “full pipe of water” on both the intake and discharge sides of the meter.

No meter with flow totalisers attached shall be installed deeper than 1.5 meters below ground level. Where a meter with flow totalisers attached is installed underground sufficient space must be provided to facilitate easy access for maintenance and reading of totalisers at all times. Meters with flow totalisers attached located down to 0.5 meters below ground will require a suitable meter box to house the meter. When meters with flow totalisers attached are located between 0.5 meters and 1.5 meters, an access pit must be provided.
Butterfly valves and flow-switches installed in part of the pipe run that houses the flow meter, must be installed a minimum of 5 pipe diameters on the discharge side of the meter.

8.0 ADDITIONAL REQUIREMENTS

The meter must be installed according to the manufactures written instructions and Hawke’s Bay Regional Councils minimum requirements.

If the meter is installed below ground, and the pipe work is not accessible, there must be permanent access elsewhere to, fifteen (15) diameters of unobstructed straight rigid pipe, for auditing and calibration purposes, this can be above or below ground and must be capable of carrying the full volume of water as measured at the flow meter.

The meter must not be installed in a section of pipe where there may be air pockets or the pipe does not run full of water. If it is likely that air will become entrapped near the meter, an air valve must be installed upstream of the meter.

The installer must have the installation tested within one month of installation and provide to Hawke’s Bay Regional Council a certificate stating that the meter’s installed accuracy has an error of less than +/-5% throughout the minimum, maximum and consented pumping rates.

A meter approved for operation in full flowing pipes shall be installed so that it is completely filled with water under all conditions during operation. Nonpressurised systems may require elbows or pipe elevation to ensure that this requirement is met.

Any filtering equipment must be installed on the intake side of the meter. And >10 pipe diameters upstream.

Any backflow preventer must be installed on the discharge side of the meter and >5 pipe diameters downstream of the flow meter.

The meter must be installed in the correct direction to flow.

If the meter is non-mechanical (electro-magnetic) it is essential that the meter is earthed correctly as stated in the manufacture’s specifications.

Where the meter is to be fitted above ground to plastic, PVC or polythene pipelines, it must be suitably supported to ensure stability.

The meter must be mounted in such a way that it allows for both easy access and reading of the display unit.

9.0 CALIBRATION REQUIREMENTS OF PORTABLE ULTRASONIC TEST METERS

All portable ultrasonic meters used to verify installations, as part of Hawke’s Bay Regional Council requirements, must be calibrated and their accuracy verified on a yearly basis. A certificate must be provided to Hawke’s Bay Regional Council stating the meter’s serial number, person conducting the test, location where the test was carried out, date, time and % error of meter.
10.0 SECURITY

The flow-meter installation shall be sealed (i.e. tamper proof) in such a way there is no possibility of dismantling, altering or removing the flow-meter or any adjacent components (e.g. data loggers, telemetry equipment etc) without visibly damaging the protective devices. This will be by the use of tamper tags fitted through the flow meter mounting bolts or tamper tape on loggers and cable junction boxes.

11.0 ENVIRONMENT

Where the potential for the meter is to be located in an aggressive environment, the meter shall be protected from risk of damage due to external environmental conditions (such as flooding, stock, corrosion etc).

12.0 COMMISSIONING

Commissioning is required to ensure the meter is ready for use and able to be validated. The commissioning process shall be conducted by the flow meter installer and consent holder. Steps in the commissioning process shall consist of, but not be limited to those listed below.

- Check that the meters or measurement instrument have been approved by or are compatible with Hawke’s Bay Regional Council requirements.

- Check that the instruments have been installed in accordance with the Hawke’s Bay Regional Council requirements and the manufacturer’s installation instructions.

- Where applicable, check that the flow computer has been programmed with any revised parameters and the Consent Number is used as the data identifier.

- Where applicable, check the correct version of software has been installed.

- Check installation, and install tamper seals and secure electronic settings that may alter the accuracy and integrity of the meter and associated devices.

- Record initial flow meter reading at time of installation.

- Record all measurement and configuration data used in flow computer and make this information available for future use.

- Complete appropriate documentation and return to Hawke’s Bay Regional Council within one (1) month of the completion of the flow-meter installation.

- The installer shall complete and return the Flow Meter Installation form to Hawke’s Bay Regional Council.

- Provide to Hawke’s Bay Regional Council a certificate stating that the meter’s installed accuracy is less than +/-5% through the entire pumping rate.

- The consent holder to sign and return to Hawke’s Bay Regional Council the Water Measuring Device Declaration form, validating that the meter is ready for use.
**FLOW-METER TECHNICAL SPECIFICATIONS**

Flow meters

**Non-Mechanical Flow Meters** Performance requirements and operating conditions

Eg, Electromagnetic, Ultrasonic flow meter etc

To be used, only where water quality is free of any material that would adversely affect the performance and life expectancy of the non mechanical flow meter.

<table>
<thead>
<tr>
<th>Non-Mechanical</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td>Must be able to operate at all times in environments where 240v power supply is not always available</td>
</tr>
<tr>
<td>Output</td>
<td>Pulse output in 1(^{a})mtr (if not combined with a data logger)</td>
</tr>
<tr>
<td></td>
<td>Data logger must be able to be fitted with telemetry (For future use)</td>
</tr>
<tr>
<td>Operating Environment</td>
<td>Minimum of IP 65 indoor or IP 67 outdoors or IP 68 in areas prone to flooding</td>
</tr>
<tr>
<td></td>
<td>0-95% Relative Humidity, -5 °C to 50°C Non-condensing</td>
</tr>
<tr>
<td></td>
<td>Ambient temperature operating range –10 °C to +50 °C (0°C to +50°C indoor installation)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>+/- 2% accuracy over complete velocity range as supplied</td>
</tr>
<tr>
<td></td>
<td>+/- 5% accuracy over complete velocity range as installed</td>
</tr>
<tr>
<td>Display</td>
<td>Cumulative flow totaliser (cubic meters m(^3)) (if not combined with a data logger)</td>
</tr>
<tr>
<td></td>
<td>Meter register must remain legible over the life of the meter</td>
</tr>
<tr>
<td></td>
<td>Instantaneous flow rate</td>
</tr>
<tr>
<td></td>
<td>Record error functions e.g. Disconnection, alarms</td>
</tr>
<tr>
<td>Security</td>
<td>Device must be tamperproof and be designed to show signs of tampering and malfunction</td>
</tr>
<tr>
<td>Standards</td>
<td>OIML R49.1:2006 pattern approved</td>
</tr>
</tbody>
</table>

Each meter is to have a have a factory wet calibration certificate stating the calibration date, time and accuracy of the meter, available upon request for minimum period of 6 years after manufacture.
**Mechanical Flow Meters** Performance Requirements and Operating Conditions

To be used, only where water quality is free of any material that would adversely affect the performance and life expectancy of the non mechanical flow meter. Not to be used on surface water takes, unless appropriate filtration is installed before the flow meter.

### Table 2: Mechanical flow meter requirements

<table>
<thead>
<tr>
<th>Mechanical</th>
<th>Description Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td>Must be able to operate at all times in environments where 240v power supply is not always available</td>
</tr>
<tr>
<td>Output</td>
<td>1&quot;mtr Pulse output capable</td>
</tr>
<tr>
<td>Accuracy</td>
<td>+/- 2% accuracy over complete velocity range as supplied</td>
</tr>
<tr>
<td></td>
<td>+/- 5% accuracy over complete velocity range as installed</td>
</tr>
<tr>
<td>Operating Environment</td>
<td>Minimum of IP 65 indoor or IP 67 outdoors or IP 68 in areas prone to flooding</td>
</tr>
<tr>
<td></td>
<td>0-95% Relative Humidity, -5°C to 50°C Non-condensing</td>
</tr>
<tr>
<td></td>
<td>Ambient temperature operating range –10°C to +50°C (0°C to +50°C indoor installation)</td>
</tr>
<tr>
<td>Display</td>
<td>Cumulative flow totaliser (cubic meters, m³ or cubic kilolitres kl³)</td>
</tr>
<tr>
<td>Security</td>
<td>Meter register must remain legible over the life of the meter</td>
</tr>
<tr>
<td></td>
<td>Device must be tamperproof and be designed to show signs of tamper</td>
</tr>
<tr>
<td></td>
<td>Device must be data secure</td>
</tr>
<tr>
<td>Standards</td>
<td>ISO4064-1:2005 and/or ISO4064-1999 class B and/or OIML R49.1:2006 pattern approved</td>
</tr>
</tbody>
</table>

Each meter is to have a factory wet calibration certificate stating the calibration date, time and accuracy of the meter, available upon request for minimum period of 6 years after manufacture.

For meters with the ability to fit certified pre-calibrated measuring elements, a separate and current certification for the measuring element stating the calibration time, date and accuracy must be provided, available upon request for minimum period of 6 years after manufacture.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge side of meter</td>
<td>Downstream of the meter</td>
</tr>
<tr>
<td>Data logger</td>
<td>An electronic device that records data over time either with a built-in instrument, sensor or via external instruments and sensors.</td>
</tr>
<tr>
<td>Intake side of the meter</td>
<td>Upstream of the meter</td>
</tr>
<tr>
<td>Pipe flow</td>
<td>Water moving through a closed conduit under pressure.</td>
</tr>
<tr>
<td>Pipe work, Pipe line, Pipe run.</td>
<td>The plumbing (pipe run) that connects to the water meter.</td>
</tr>
<tr>
<td>Volume display unit</td>
<td>The part of the meter that displays the measurement results.</td>
</tr>
<tr>
<td>Flow meter (a “meter”)</td>
<td>An instrument (“water meter”) that continuously measures and records the volume of water passed through a pipe and includes any ancillary device attached to or incorporated in the instrument. The instrument must be able to measure and display the cumulative flow volume and allow for readings to be taken to determine the instantaneous flow rate of water passing through the pipeline.</td>
</tr>
</tbody>
</table>