INSTALLATION

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.

Hawke's Bay Regional Council requires that the flow meter must be installed with a minimum of 10 diameters* of straight unobstructed ridged pipe upstream of the meter and a minimum of 5 diameters of straight rigid pipe downstream of the meter.

GOOD INSTALLATION

1. Meters installed with sufficient distance between the meter and upstream and downstream sources of turbulence, such as elbows and valves, in accordance with the manufacturer's specifications.

BAD INSTALLATIONS

2. Meter too close to filter and insufficient straight lengths of pipe.

3. Meter too close to tee, obstruction directly up stream of meter and insufficient straight length of pipe.

4. Meter too close to elbow.

FLOWMETER REQUIREMENTS

This is a summary only of Hawke's Bay Regional Council's meter selection and installation requirements. The full requirements can be found on the Council's web site www.hbrc.govt.nz (search on: water metering)

- The flow meter must meet either ISO 4064-1:2005 or OIML R49.1:2006.
- When installed, the meter must not have an error greater than 5%. It is a requirement that the meter has a wet calibrated certificate carried out under laboratory conditions stating the manufactured degree of error which must not exceed 2%.
- The flow meter must be installed with a minimum of 10 diameters* of straight unobstructed ridged pipe upstream of the meter and a minimum of 5 diameters of straight rigid pipe downstream of the meter.
- The meter's flow totaliser should read in cubic meters (m3) and remain legible over the life of the meter.
- The wet test should only be undertaken in a laboratory that is accredited by IANZ (International Accreditation New Zealand) or one of the organisations recognised by IANZ worldwide through mutual recognition arrangements.

*** Note:** All references to "x diameters of straight pipe" refer to a straight pipe that has the same internal diameter as the internal diameter of the meter and equivalent in length to a least x time the diameter.

Information in this pamphlet is based on "Know The Flow – Flow Metering Training Manual" by the Australian National Committee on Irrigation and Drainage 2002 (www.irrigation.org.au), and in conjunction with Environmental Canterbury.

Installation photos kindly provided by Page Bloomer & Associates.

FLOWMETERS

Systems and requirements explained

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HAWKE'S BAY REGIONAL COUNCIL

SELECTING A FLOW METER

WATER SOURCE – This could be a river, surface water, groundwater, open channel or pressurized pipe. Water source will have a bearing on water quality (silt, weed etc), range of flow rates and head.

HEAD – How much head do you have? Do water levels fluctuate during a season? If so by how much? What is the minimum head a meter needs to work? Do you need to minimize head loss?

FLOW RANGE – What is the flow range throughout the year and what are the fluctuations in flow? Most meters have a minimum flow below which they cannot provide an accurate reading. If you choose a large meter, you may lose accuracy at the lower end of the flow range. Meters continually operated in the high flow range wear out and fail much quicker than meters that operate in the middle of their flow range.

ACCESS TO POWER – When selecting meters for remote locations you will need to consider if they can run accurately on solar power, batteries or even need power at all. This also applies to dataloggers.

ACCURACY – If there is a requirement for a data accuracy of 2% then it would not be useful to choose a meter that only reads with accuracy of 5%. A manufacturer's claims for meter accuracy are usually well substantiated by laboratory tests supplemented by standardized field tests. A meter will only be accurate if the metering situation meets all the manufacturer's requirements of flow profile, temperature, humidity, flow range, vibration etc.

RELIABILITY – A meter needs to be reliably accurate so it provides the correct reading time after time.

DATA OUTPUT – What level of data accuracy do you need? What units do you need your data in? Does the data need to be a measure of instantaneous flow, totalized flow or both? Does the data need smoothing or integration?

TAMPER-PROOF – Meters can be buried and some manufacturers provide special containers for just this purpose. Access to the meter can then become a problem.

LONGEVITY – What is the average operating life before overhaul? This will be dependent on the meter type and the situation the meter is used in.

COST – One of the most crucial parameters is cost. Generally, the more accurate and reliable the meter, the more expensive it is. But, purchase price is not the only cost. Other aspects should be considered such as the cost of installation, maintenance, data collection, calibration and longevity.

ELECTROMAGNETIC METER

An electromagnetic meter consists of a section of pipe with a magnetic field around it and electrodes to detect electrical voltage changes. When a conductive fluid passes through the pipe an electrical voltage is created in the fluid, which is proportional to the fluid velocity. Electrodes in the probe detect the voltages generated by the flowing water. Measurement of the voltage is then converted to velocity from which the flow rate can be derived for a given pipe section. This type of meter is produced in a range of standard sizes and flow capacities.

Advantages

- High degree of accuracy (+/- 0.15% - 2%) and consistent over full flow range.
- Wide flow range and no obstructions to flow.
- Robust with only minimal routine maintenance required.
- No moving parts.

Disadvantages

- Power supply required.
- Electronic components vulnerable to lightning damage.
- Repairs require skilled technician and specialized equipment.

MECHANICAL INSERT METER

An impellor is rotated by water passing through the meter, which is translated to a volumetric reading. The mechanism is calibrated by an adjustable device which is pre-set and security sealed. The meters are available in various sizes and have to be full of water during measuring.

Advantages

- Reliable and accurate means of measurement providing the meter is correctly installed.
- Relatively low initial cost.
- In-line maintenance with simple efficient mechanism.
- Headworks replacement readily available.

Disadvantages

- Difficult to detect malfunction or unauthorised interference to meter while operating, if operated without a datalogger.
- Prone to wear in silty water, potentially resulting in loss of accuracy.
- Some head loss characteristics.

ULTRASONIC METERS

Ultrasonic meters use transducers to measure water velocity in full pipe applications and convert this to a flow rate. Transducers are fixed on the outside of the pipe and a transit time method is used to calculate the velocity of water within the pipe. The transit time method calculates velocity from the differences in time for an impulse to pass between two transducers located on the outside of the pipe.

Advantages

- Robust with minimal routine maintenance required.
- Simple to install and no moving parts.
- Same meter can be used in a wide range of pipe sizes.
- Consistent over full flow range.

Disadvantages

- Repairs require skilled technician and specialized equipment.
- Power supply required.
- Electronic components vulnerable to lightning damage.

SPECIFICATIONS	ELECTROMAGNETIC FLOWMETER	MECHANICAL INSERT METER (PADDLE OR TURBINE)	ULTRASONIC FLOWMETER
Accuracy (laboratory)	+/- 0.15% - 2%	+/- 2% - 5% of rate	Better than +/- 2%
Reliability and tamperproof protection	Very high	Medium	High
Flow rate indication available	Yes	Yes - with datalogger attached	Yes
Remote reading capability	Yes	Optional	Yes
Average operating life before overhaul (depending on water quality)	20 years	4 years	15 years
Pressure loss (head loss)	Negligible	400mm (insertion type meter) Negligible (paddle type meter)	Negligible
Resistance to blockage	Very high	Medium	Very high
Resistance to weed	High	Medium	High
Relative installed cost	Medium	Medium	Low
Power required	Yes or solar/battery	No	Yes or Solar
Water quality	Can cope with silty water	Prone to wear with continued exposure to silty water	Can cope with silty water