

Selection of Water Meters

General Considerations

Sometimes people in the water industry are faced with the problem of selecting the flowmeter needed to measure the flowing water. The right selection could be thought of as being the most reliable meter at the lowest cost when giving the user the required performance.

The type, metrological characteristics and sizes of water meters shall be determined according to the operating conditions of the installation and the environmental classes demanded.

The following factors should be considered in flowmeter selection:

- Physical and chemical characteristics of the water (eg. Turbidity)
- Accuracy required
- Expected flowrate conditions of the installation (Q1 & Q3)
- Acceptable pressure loss across the meter
- Available space and pipework to install the meters and fittings
- Power supply of the meter (where applicable)
- Available supply pressure
- National Legal requirements (eg. Notice of Approval)

Meter			Type of Use
Size	Type	Flow Range	
15 mm (5/8 in.)	PD	1 to 55 Lpm	Single family, duplex, small business (up to 10 staff)
20 mm (3/4 in.)	PD	2 to 110 Lpm	Large residences, homes w/ irrigation systems or swimming pools, apartment bldg w/o Laundromat (up to 6 units), barber shop, filling station w/o car wash, churches, small institutional
25 mm (1 in.)	PD	3 to 185 Lpm	Residences w/ pool and irrigation system, small to medium apartment building (6–17 units), small school (up to 200 students), institutional (up to 50 staff), churches w/ social activities, small motels (up to 10 units), large individual commercials, beauty parlor, group of commercials (up to 10 units)
38 mm (1.5 in.)	PD	5 to 375 Lpm	Apartment bldg (18–40 units), senior citizen apt bldg (up to 50 units), schools (up to 400 students), medium-sized hotels (up to 30 units), motels (up to 40 units), large filling stations w/o automatic car wash, small processing plants, small shopping centres, medium Laundromats or cleaners, restaurants, small hospitals (up to 100 beds), medical bldgs
50 mm (2 in.)	PD	7 to 600 Lpm	Medium apartment bldg (41–120 units), row houses condominium (41–80 units), schools w/ small irrigation (up to 2000 students), medium-sized hospitals or shopping centres, medium hotels or motels, large filling station w/ garage
50 mm (2 in.)	Compound	1 to 600 Lpm	Schools w/ irrigation (2000–5000 students), medium hospitals, community centres, nursing homes, city halls
50 mm (2 in.)	Turbine	15 to 600 Lpm	Can replace 50 mm (2 in.) PD meter, strainer recommended
75–100 mm (3–4 in.)	Compound	2 to 1600 Lpm	Condo complex or apartment bldg (120–350 units), large hotel or motel, hospital, office tower, schools (over 2500 students), large shopping centres, government bldg
75–100 mm (3–4 in.)	Turbine	40 to 1850 Lpm	Condo complex or apartment bldg (over 150 units), large Laundromats, large institutional, industrial plant, processing plant, hospital linen service, industrial cleaner

Note: PD = Positive displacement.
Lpm = Litres per minute.

FLOW METER INSTALLATION

Installation Guidelines Overview

- Installation guidelines for any technology are available. They should be looked at as a MINIMUM requirement
- The flow meter must remain completely full at all time
 - The meter must be installed with sufficient straight pipe upstream and downstream
 - Upstream : shut-off valve, strainer, flow straightener
 - Downstream : shut-off valve, check valve,



Installation Associated Fittings

- A water meter installation should include the following accessories **UPSTREAM** of the meter (as applicable):
 - A stopcock or valve, optionally with the direction of the valve operation indicated
 - A flow straightening device and/or a length of straight pipe fitted between the valve and the meter
 - A strainer fitted between the stop valve and the meter
 - A Means of sealing the connection of the water meter to the water supply line in order to detect any unauthorized removal of the meter.



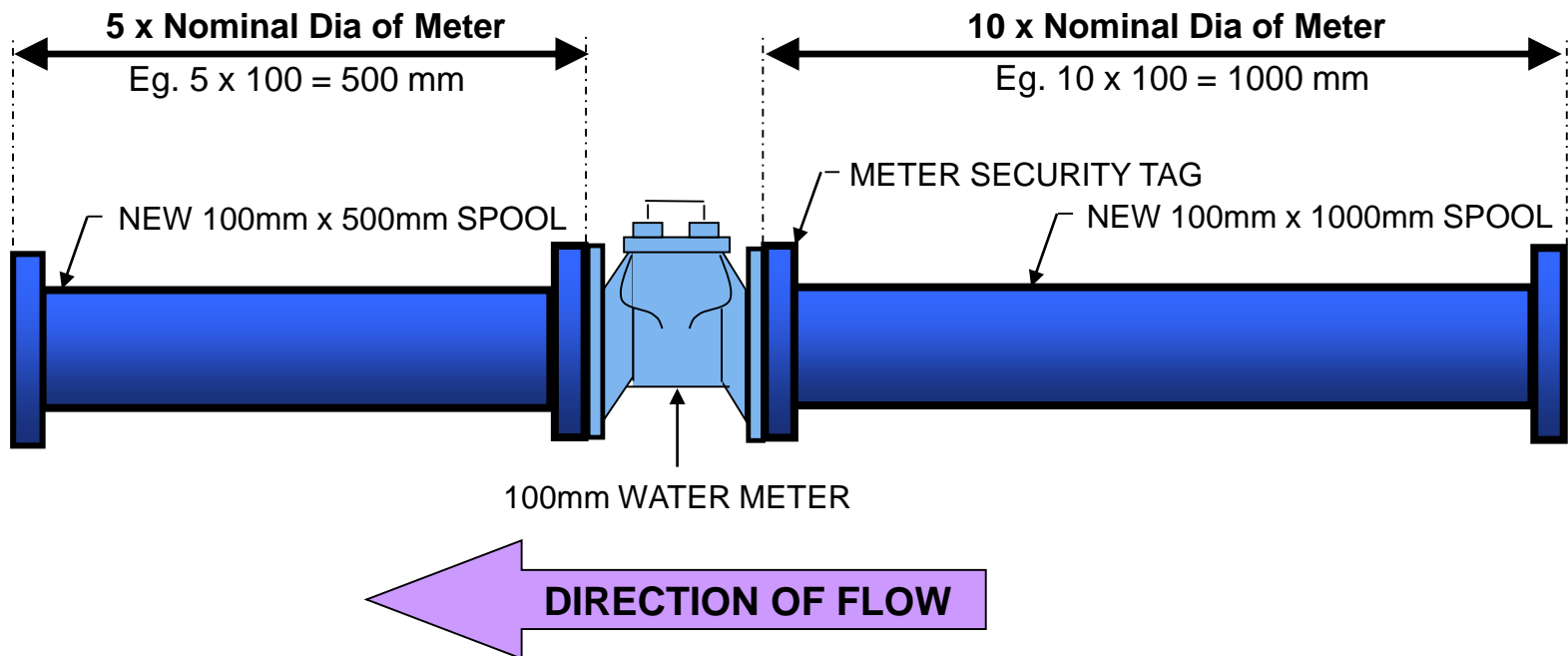
Installation Associated Fittings

- A water meter installation should include the following accessories **DOWNSTREAM** of the meter (as applicable):
 - An adjustable length device to allow for easy installation and removal of the water meter
 - A device including a drain valve which may be used for pressure monitoring, sterilization and water sampling
 - A ball or gate valve
 - A check valve or backflow protection valve



FLOW METER INSTALLATION

DIAGRAM OF STRAIGHT LINE WATER METER INSTALLATION SHOWING PIPEWORK MEASUREMENTS



TYPICAL 100mm METER INSTALLATION

Installation General Requirements

- **The installation site (as applicable) should be equipped with the following:**
 - Adequate illumination
 - The floor should be even, rigid and non-slip surface
 - Clear of obstacles
 - Adequate space and clearance to allow access to working position
 - Permanent or portable handling equipment for heavy large meters

Installation Types - General

- **Inside Residence or Business Premises**
- **Outside Location**
- **Meter Pit**

Inside Installation



Outside Installation



Malaysia



Meter Pit Installation



Installation Specific Requirements

The water meter shall always be:

- Full of water
- Protected from shock or vibration induced by surroundings
- Securely mounted (ex. plinth or bracket)
- Protected from extreme water or ambient temperatures
- Protected from air entering the meter (upstream air release valve)
- Mounted in correct orientation (as marked on meter)

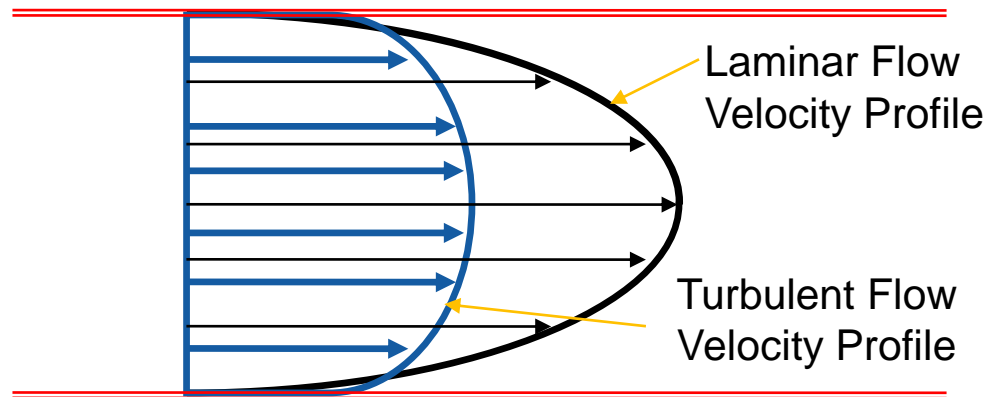
Hydraulic Disturbances

General

“Many types of meters are sensitive mainly to upstream flow disturbances, which cause large errors and premature wear. They are sensitive to downstream flow disturbances thought to a lesser extent.”

$$\text{FLOWRATE (m}^3\text{/hr)} = \text{Pipe Area (m}^2\text{)} \times \text{Water Velocity (m/hr)}$$

Velocity Profile



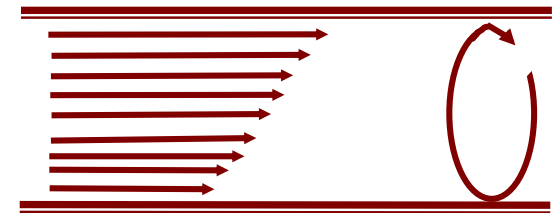
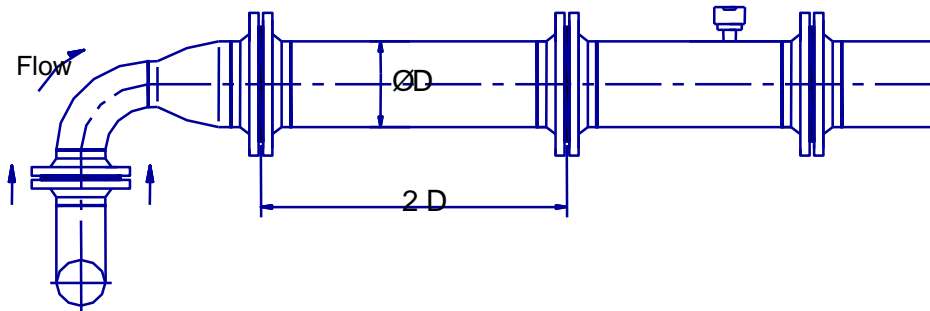
Velocity Profiles of Laminar and Turbulent Flow

FLOW METER INSTALLATION

Flows due to bends and area changes

Practically, it is very difficult to ensure that the flow profile is fully developed. More often the flow profile will be distorted by a bend upstream or an area change due to a contraction, expansion or a valve in the pipework.

As a result, the flow will not be symmetric and generally the linearity of the flowmeter is reduced. Bends can also cause rotation of the flow (termed swirl) and this too results in large changes in the performance of some types of meter.



bend and area enlargement

Hydraulic Disturbances

Types of Disturbances

Velocity Profile Distortion:

- Caused typically by an obstruction partially blocking the pipe
- Presence of a partly closed valve
- Butterfly valve
- Check valve
- Orifice
- Flow or pressure regulator

Swirl:

- Two or more bends of the pipe in different planes
- Centrifugal pump
- Tangential inlet of supply line into the main line

Hydraulic Disturbances

Methods of Eliminating Disturbances

- Minimize abrupt reduction in pipe size “coning down”
- Proper installation of joint washers and gaskets
- In-line valves remain fully open when meter is in service
- Straight pipe upstream and downstream of meter (U10, D5)
- Pipe should be of the same diameter as the meter

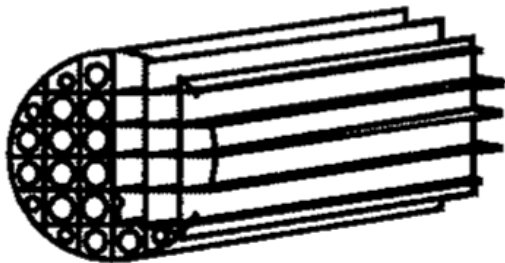
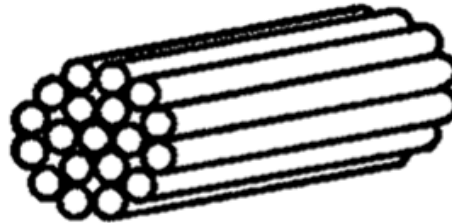
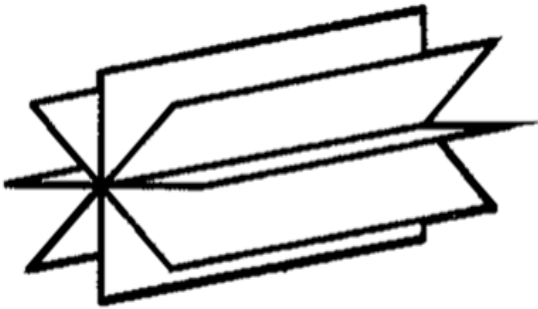
Hydraulic Disturbances

Methods of Eliminating Disturbances

- Flow control valves, check valves, pressure regulators to be installed downstream of meter
- Located at the far end of the straight section
- If the piping has two or more bends in different planes:
 - Shall ideally be located downstream of the meter
 - If located upstream of the meter, moved them as far away as possible from the meter
 - Separate as far as possible from each other
- Install a compatible flow straightener upstream of the meter

Flow Conditioners

- used to restore the distorted profile to a fully developed profile within a shorter distance



Selection and Installation of Water Meters



Questions or Comments