Asia-Pacific
Economic Cooperation

Asia-Pacific
Legal Metrology
Forum

Selection and Installation of Water Meters

APEC / APLMF Training Courses in Legal Metrology

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Measurement Canada
An Agency of Industry Canada

Mesures Canada
Un organisme d'Industrie Canada

Canada

Selection of Water Meters
General Considerations

ISO 4064 Part 2

“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.”

Selection of Water Meters
General Considerations

Factors to Consider:

- Available supply pressure
- Physical and chemical characteristics of the water (ex. Turbidity)
- Acceptable pressure loss across the meter
- Expected flowrate conditions of the installation (Q1 & Q3)
- Combination meters – ensure “cross-over” flowrates are different from normal operating flowrates

Selection of Water Meters
General Considerations

Factors to Consider:

- Suitability of meter type for the intended installation condition
- Available space and pipework to install the meters and fittings
- Power supply of the meter (where applicable)
- Manufacturer’s installation directions
- National Legal requirements (ex. Notice of Approval)

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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.

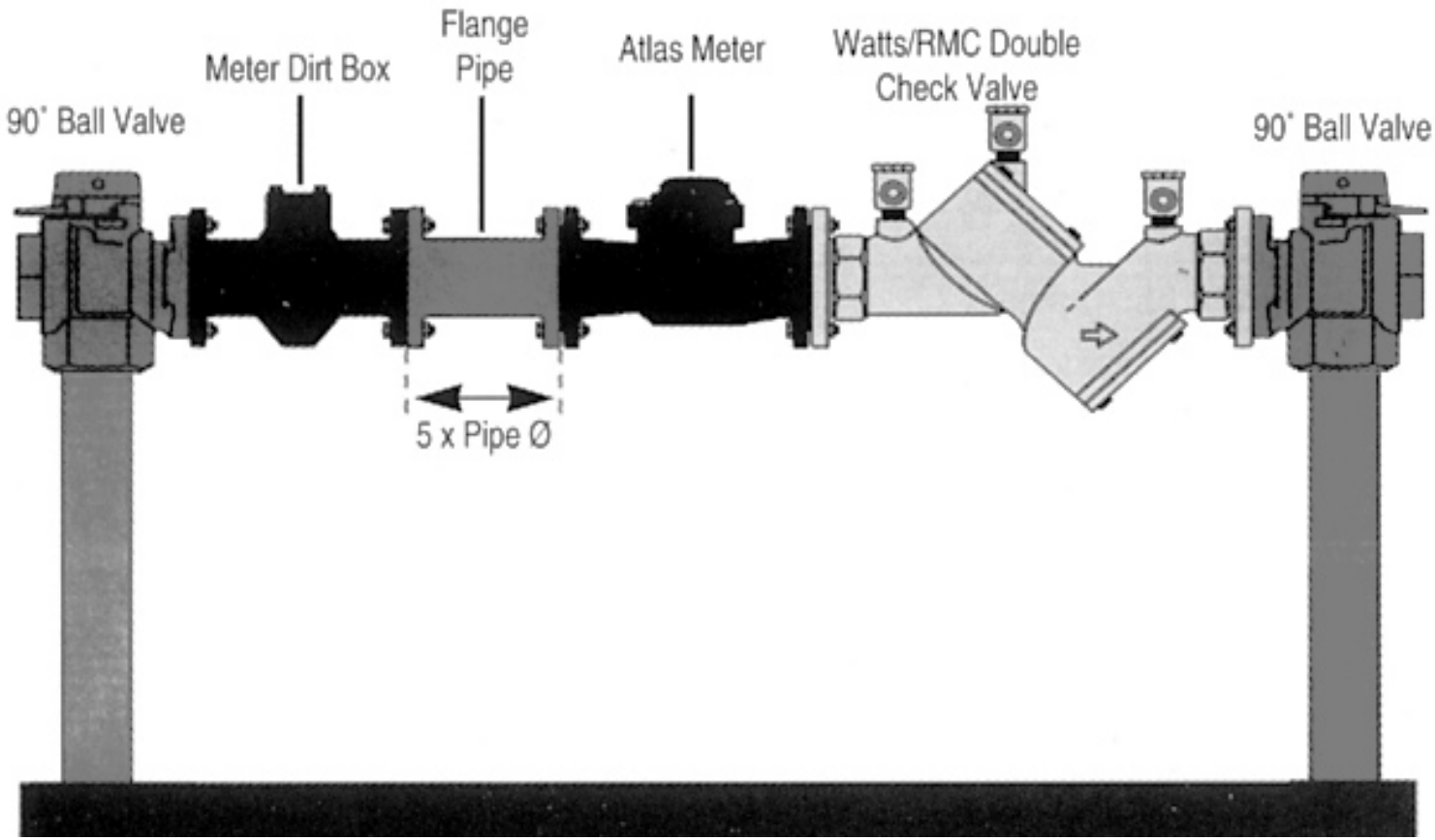
Installation
Associated Fittings

- **A water meter installation should include the following accessories UPSTREAM of the meter (as applicable):**
  - Shut-off valve
  - Flow straightening device and/or length of straight pipe
  - Strainer (ex. velocity meters)
  - Means of sealing the connection of the water meter to the water supply and sealing of all adjustment devices

Installation
Associated Fittings

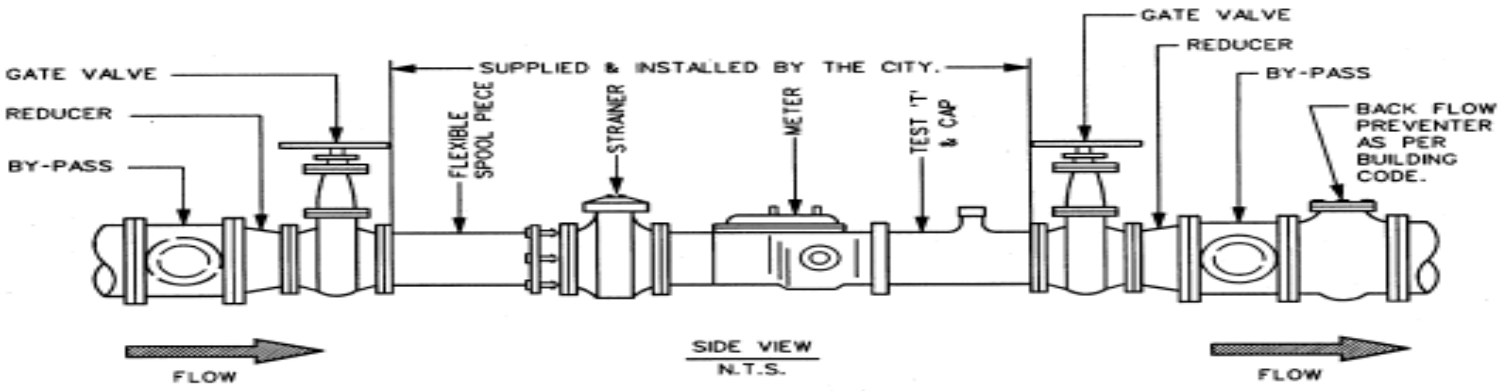
- **A water meter installation should include the following accessories DOWNSTREAM of the meter (as applicable):**
  - Adjustable length device to allow for easy installation and removal of the water meter
  - A device including a drain valve which may be used for pressure monitoring, sterilization and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

Installation Diagram



New Zealand

Installation Diagram



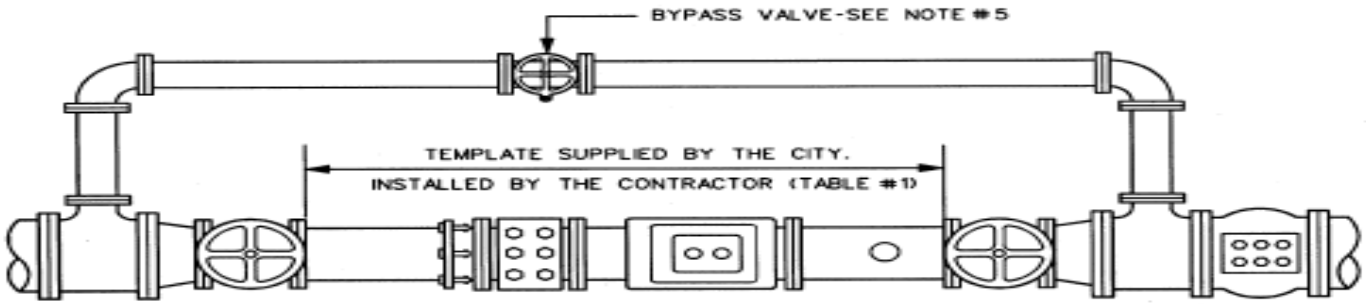
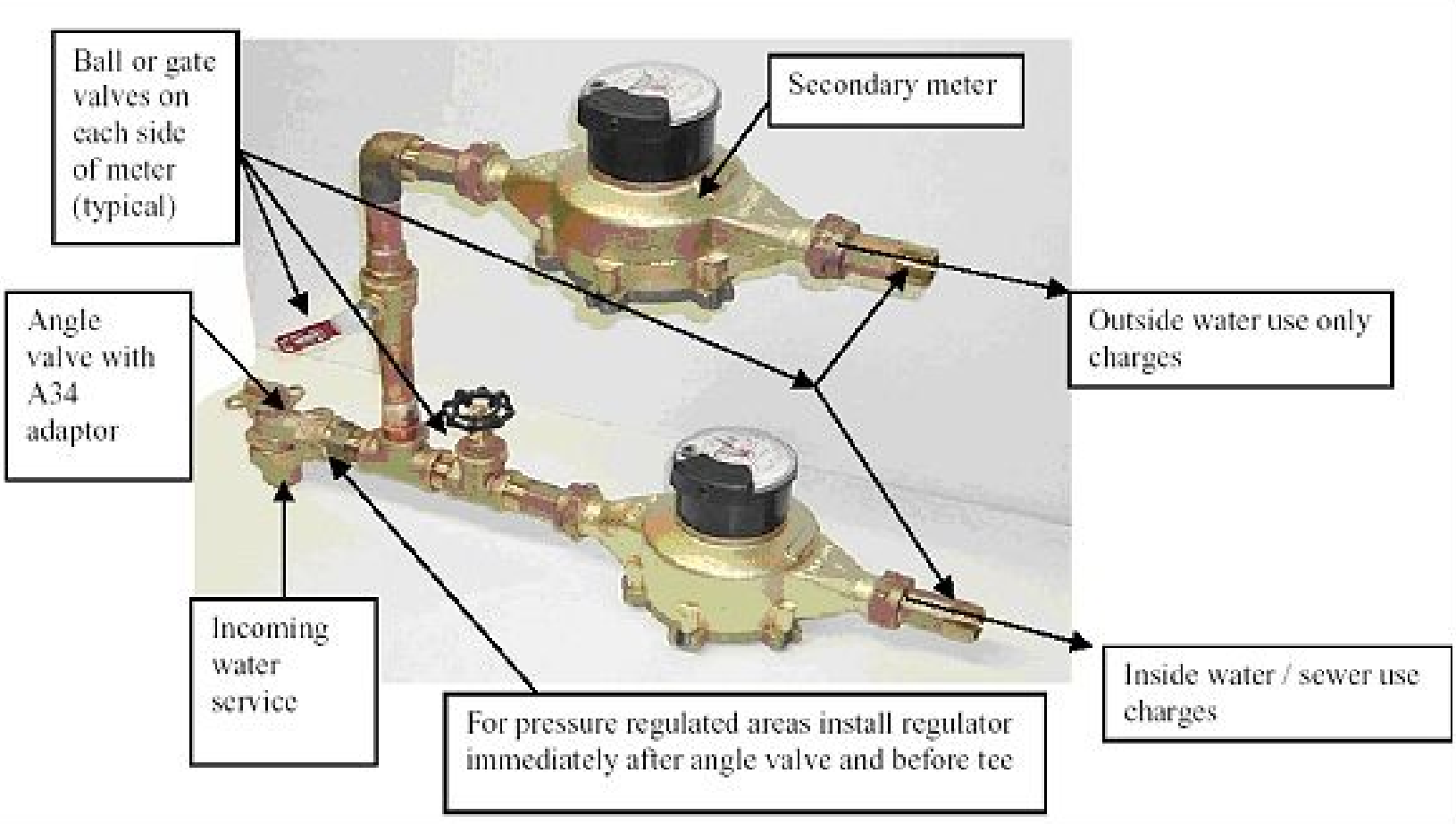


TABLE #1

METER SIZE	TEMPLATE LENGTH
75	1300
100	1500
150	1800

City of Ottawa
Canada

Installation
Two Meters



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

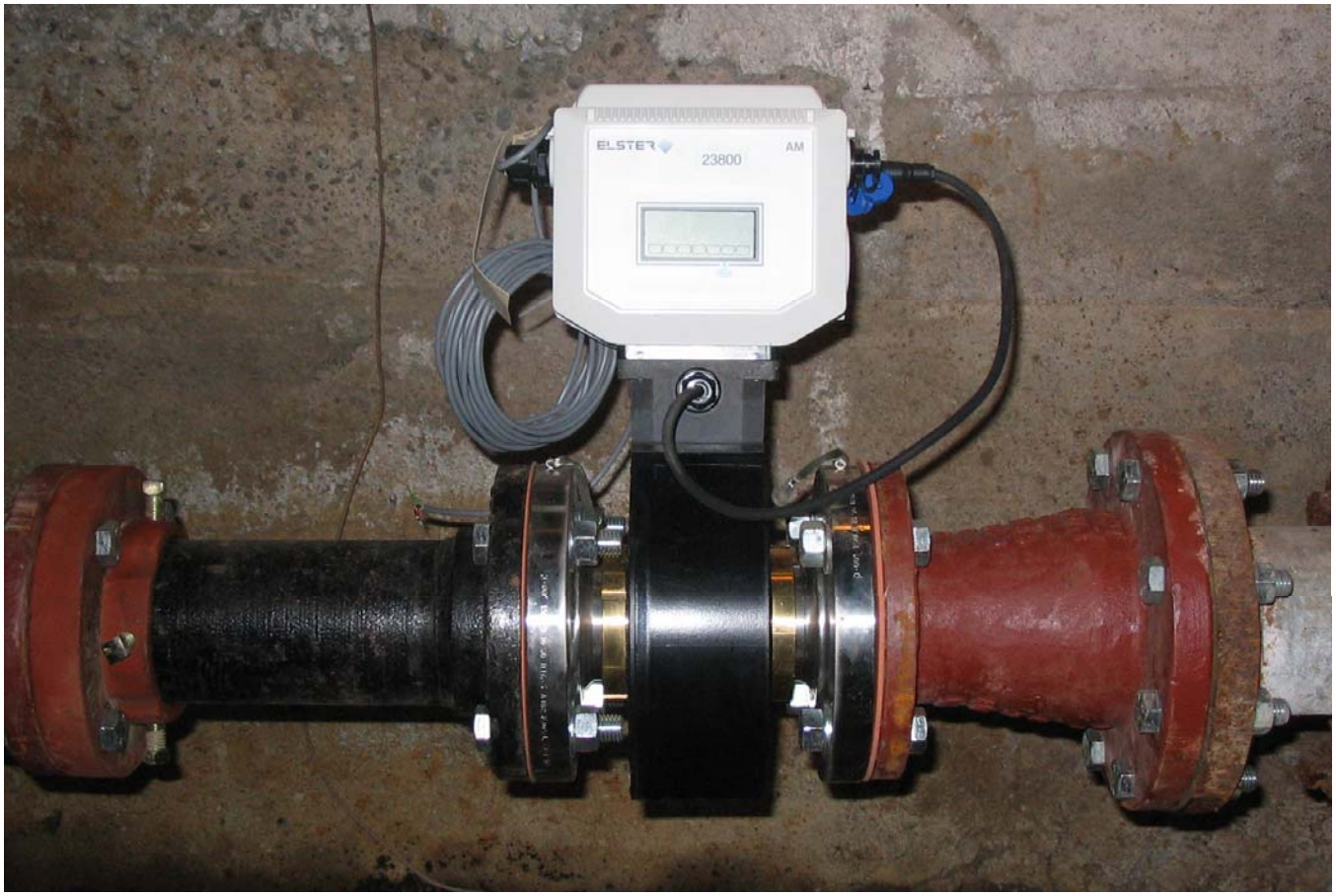
Inside Installation

City of Melville
Canada

Inside Installation

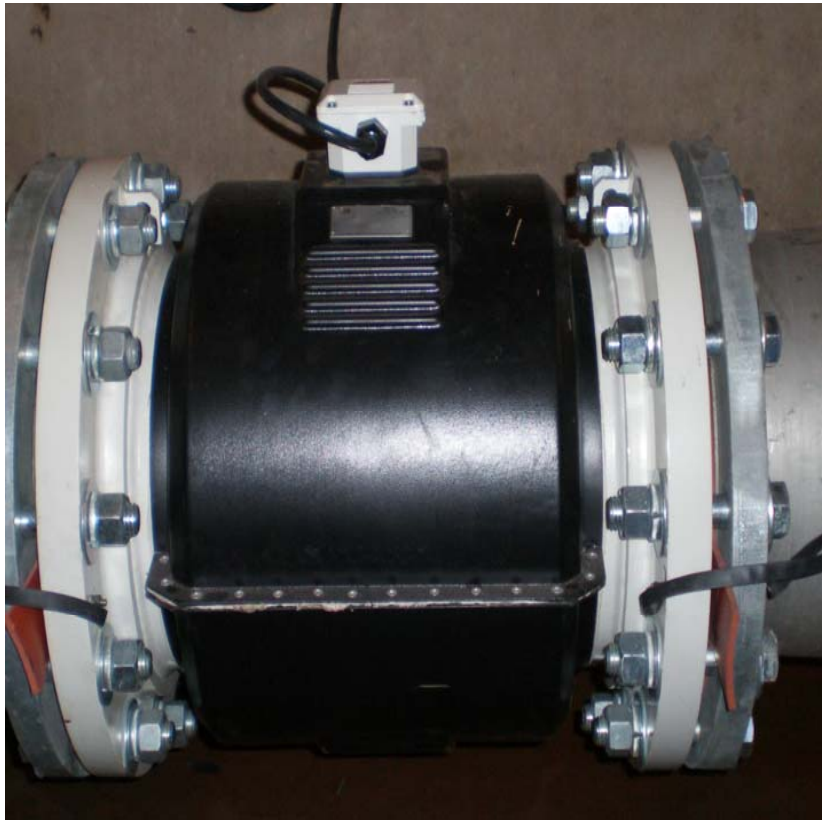
West Quinte, Ontario, Canada
Removal of Turbine Meter

Inside Installation



West Quinte, Ontario, Canada
Installation of New Electromagnetic Meter

Inside Installation



DN 400
Electromagnetic Meter
CFB Trenton, Canada

Outside Installation

Chiang Mai
Thailand

Outside Installation

Chiang Mai
Thailand

Outside Installation

Ghana
Africa

Outside Installation

Malaysia

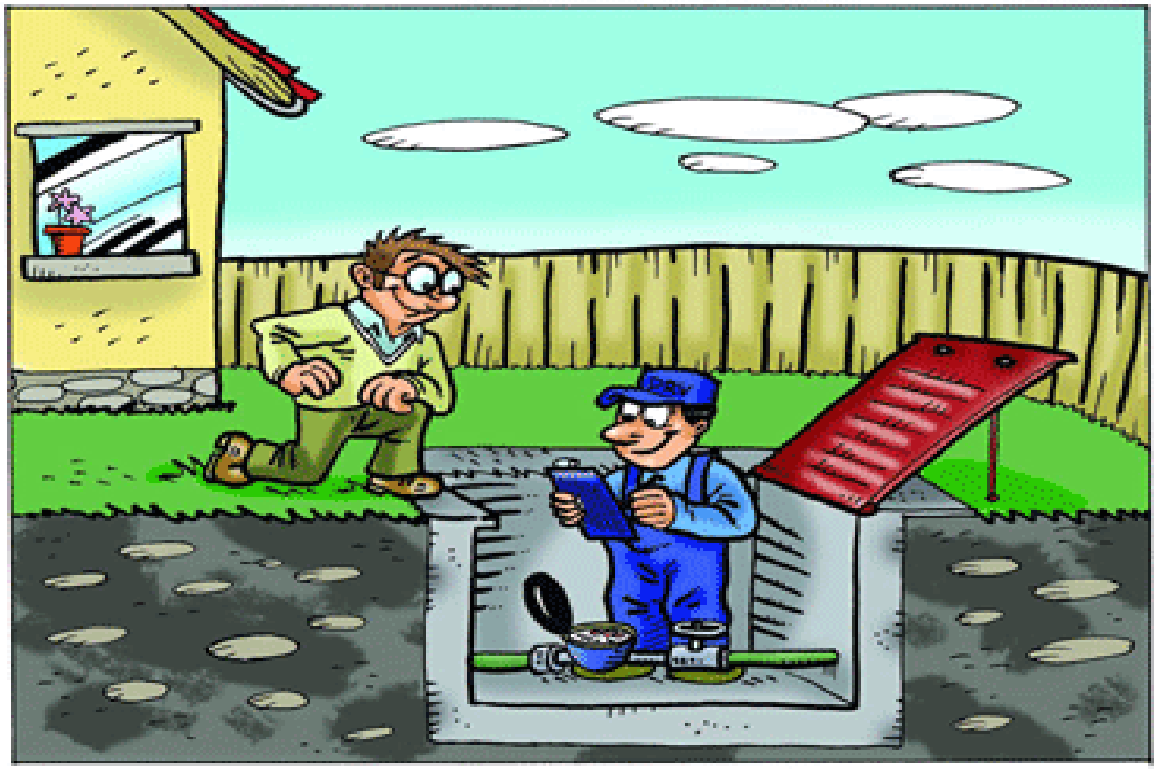
Outside Installation

Singapore

Outside Installation

United Kingdom

Meter Pit Installation



Hungary

Meter Pit Installation

USA

Meter Pit Installation

Yuma, Arizona
USA

Meter Pit Installation

USA

Meter Pit Installation

Frozen Meter in Meter Pit
Nephi, Utah
USA

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
- Mounted in correct orientation (as marked on meter)

Installation
Specific Requirements

Other factors to consider:

- Install adequate tampering safeguards
- Ensure there is a location for discharging of water during in-situ testing (large meters only)
- Meter pit shall be protected from flooding and rainwater
- Precaution shall be taken to prevent meter from damage caused by unfavourable hydraulic conditions (ex. cavitation, surging and hammer)

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."

Hydraulic Disturbances
Types of Disturbances

Velocity Profile Distortion:

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

Swirl:

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

Methods of Eliminating Disturbances

- Minimize abrupt reduction in pipe size “coning down”
- In-line valves remain fully open when meter is in service
- Straight pipe upstream and downstream of meter (U10, D5)

Methods of Eliminating Disturbances

- Flow control valves, check valves, pressure regulators to be installed downstream of meter
- Avoid piping with two or more bends in different planes:
- Install a compatible flow straightener upstream of the meter

Methods of Eliminating Disturbances

- To reduce swirl the water feed line should be connected as shown in Figure 1

a) Bad connection

b) Good connection

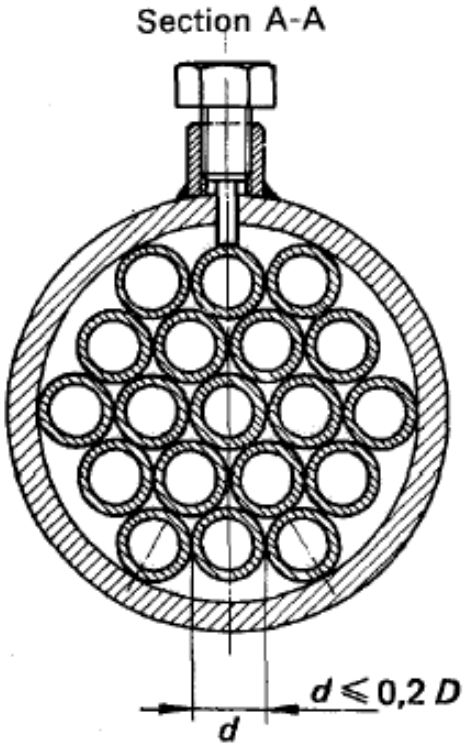
Key

1 feed line

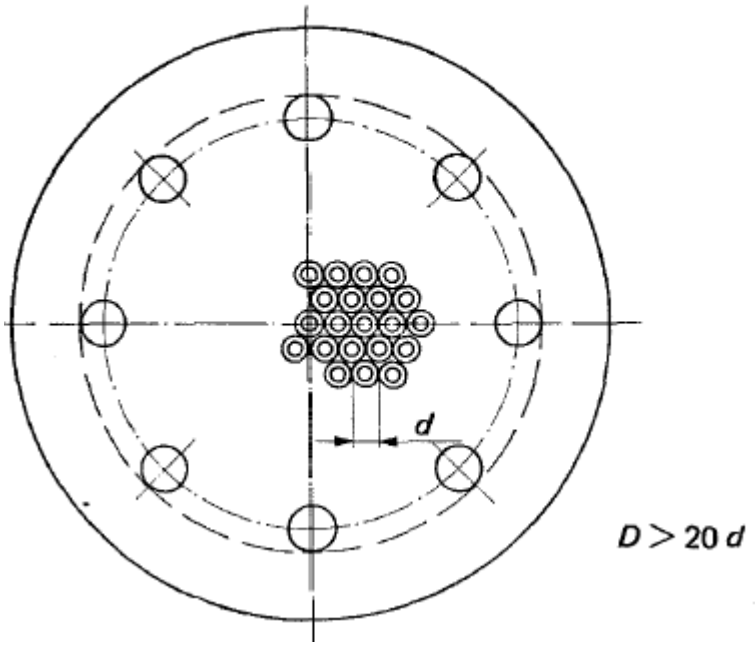
2 main line

Figure 1 — Water feed line connection to main line

Flow Straighteners (OIML D7)

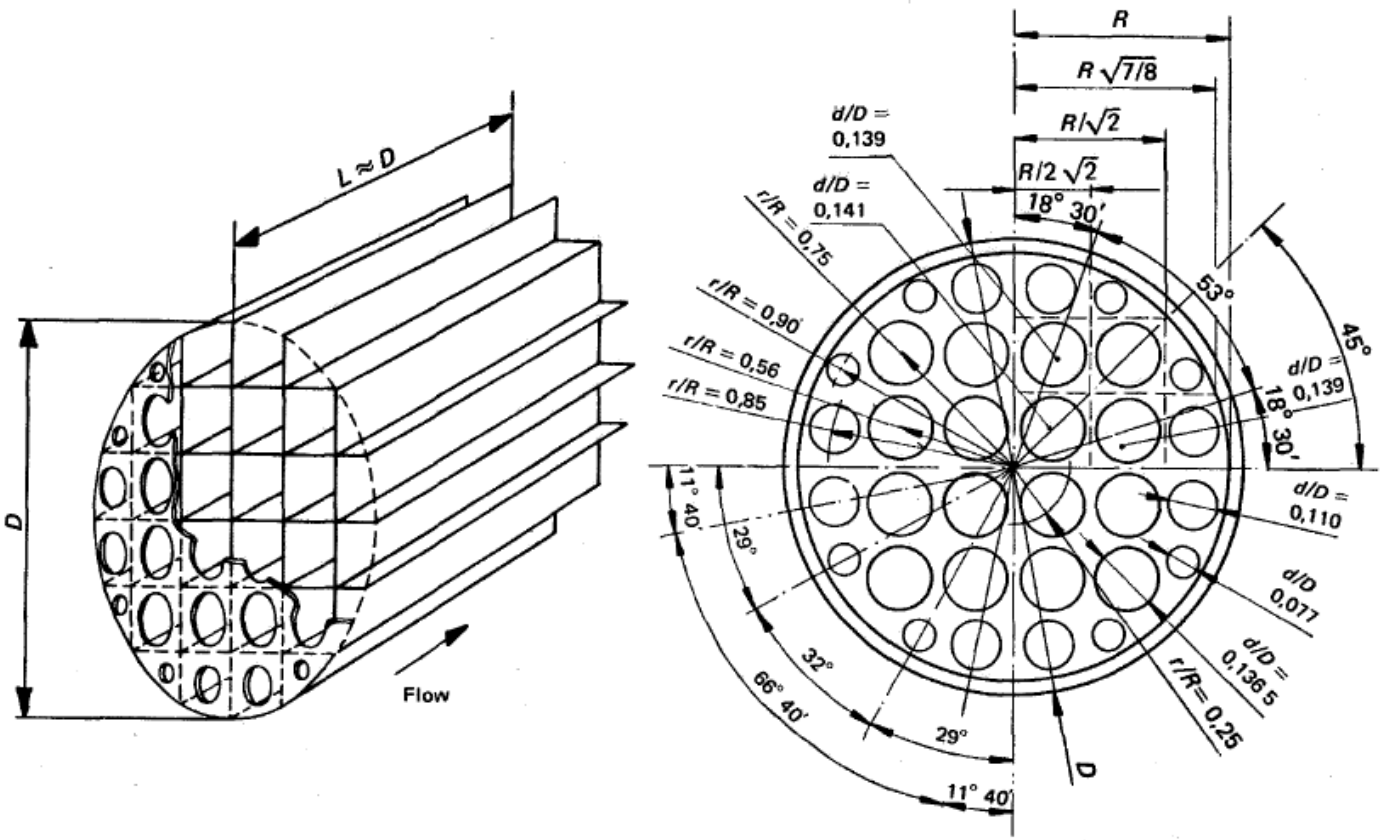


Tube Bundle



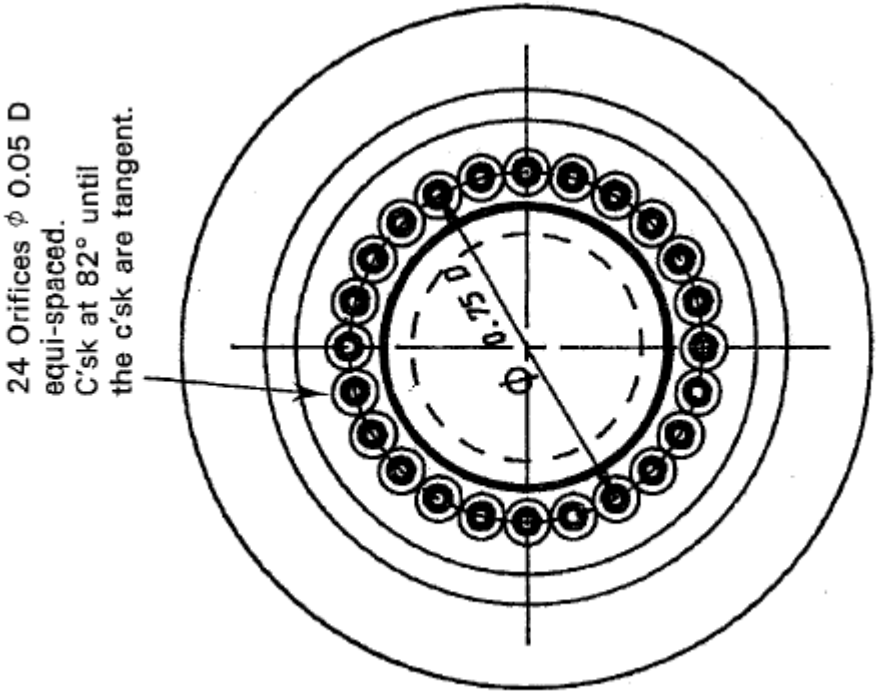
Perforated Plate

Flow Straighteners (OIML D7)



Zanker Type

Flow Straighteners (OIML D7)



NBS

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Questions or Comments