Z.16025/1/2020-CPHEEO
Government of India
Ministry of Housing and Urban Affairs
{CPHEEO}

Nirman Bhawan, New Delhi
Dated: 6th March, 2023

To,
The Principal Secretary /Secretary (UD/PHED)
All States/UTs.

Subject: Addendum to the "Advisory on Water Meters, Instrumentation & SCADA", June 2020.

Dear Sir/Madam,

I am directed to forward the Addendum to the "Advisory on Water Meters, Instrumentation & SCADA", June 2020, published by the Ministry. This addendum shall be read in conjunction with the above said published Advisory.

This issue with the approval of the Competent Authority.

Yours faithfully,

(Dr. Ramakant)
Deputy Adviser (PHE)
Email: dr.ramakant@nic.in

Encl: As above.

Copy to:

(i) PPS to AS(AMRUT), MoHUA for kind information to AS(AMRUT).
(ii) PPS to Adviser (PHEE), CPHEEO & Chairman of Expert Committee & NTF for kind information to Adviser (PHEE).
(iii) Technical Head of PHED/ Jal Nigams/ Jal Boards/Water Supply and Sewerage Boards for information and necessary action.
(iv) Members of "Expert Committee for Preparation of Advisories" for kind information.
(v) Members of "National Task Force on 24x7 Water Supply" for kind information.

Addendum to the "Advisory on Water Meters, Instrumentation & SCADA" June 2020

This addendum may be read in conjunction with the **"Advisory on Water Meters, Instrumentation & SCADA" June 2020, published by CPHEEO, Ministry of Housing and Urban Affairs, Govt. of India**. The following modified content shall be referred to along with the existing Advisory.

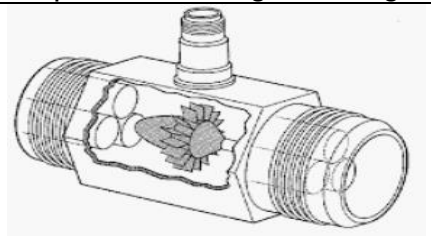
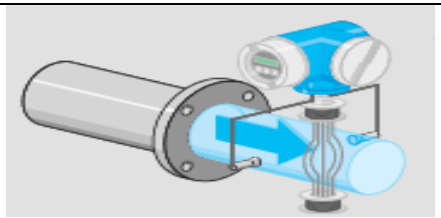
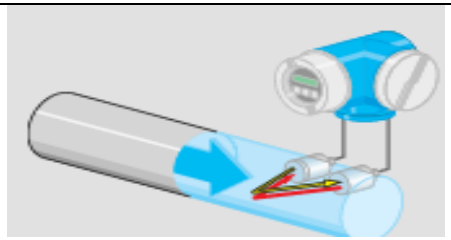
SECTION 3.0: CLASSIFICATION OF WATER METERS - The classification and features of various types of water meters are discussed in modified Table 3.1.

Table 3.1: Classification of Water Meters

S.No.	Attributes	Mechanical meters	Electromagnetic meters	Ultrasonic meters
1.	**Working principle**	Paddle Wheel, Turbine or mechanical with moving counter	Electromagnetic induction principle Faraday's Law measurement	Ultrasonic Measurement principle Time of Flight measurement
2.	**Build**	(i) Moving parts are present (ii) Mechanically & Magnetically coupled meter (iii) Dry/ Wet Dial meter	(i) No moving parts (ii) Sensor in-build (iii) Dry Dial meter	(i) No moving parts. (ii) Sensor in-build (iii) Dry Dial meter (iv) Can be inline type threaded/ flanged end or clamped on or inserted in the pipe
3.	**Available sizes**	15mm – 500mm	15mm - 3000mm	15mm - 4000mm
4.	**Application**	Domestic meter: 15mm to 40mm Bulk meter (Woltman): 50mm to 500mm or more	Domestic meter: 15mm to 40mm Bulk meter: 50 mm to 3000 mm or more	Domestic meter: 15mm to 40mm Bulk meter: 50 mm to 4000 mm or more
5.	**IS Code**	IS 4064 / 2373/ 779	IS 4064	IS 4064 and OIML R49
6.	**Water conductivity & quality of water**	Conductivity not necessary but highly critical with suspended impurity as it clogs the moving parts.	Only Conductive Fluids	Conductivity/ Non-conductivity fluids not necessary but highly critical with suspended impurity & turbidity as it deposits on the sensor face.

S.No.	Attributes	Mechanical meters	Electromagnetic meters	Ultrasonic meters
7.	**Accuracy**	> 2%+ to 5%+	± 0.5% or better	± 0.5% or better
8.	**Field accuracy**	Practically impossible due to wear & tear of moving parts, chocking of strainer & filter, etc.	Achievable	Achievable
9.	**Wet calibration**	Possible	Possible	Possible for inline & clamped and not possible if its inserted
10.	**Flow tube available**	It has flow meter with the compulsory requirement of inlet filter /strainer	Yes	Yes for inline & clamp-on and no flow tube is available for insertion type since, sensors are installed at the site by making holes in the running pipe.
11.	**Installation perfection**	Good but precision is based on-site layout and human error.	Good	Good
12.	**Field check**	Not Possible	Possible	Possible
13.	**Regular maintenance required.**	Very high as it regularly chocks with the suspended solids.	Less	Less for inline and clamped on type but regular cleaning of sensor is essential for insertion type
14.	**Periodic maintenance**	Very high as it has a lot of moving parts and wear & tear is a regular issue. We do not come to know wear and tear as no warning available other than the high-pressure drop.	Less & replacement of the sensor is a remote possibility due to its rugged construction. The expected life of the sensor is a minimum of 10 years. Hence the cost of ownership is very less.	Very less & very easy without any shutdown in case of clamp on. No maintenance is required for inline type. But insertion requires regular cleaning of the sensor. The estimated life of the sensor is minimum of 10 years.
15.	**Replacement / Removal of the sensor**	Possible & requires very frequently. Generally, meters & dial requires replacement. The	Difficult / Time consuming & requires shutdown.	Easy and can be done without disturbing the process for clamp on and insertion type.

S.No.	Attributes	Mechanical meters	Electromagnetic meters	Ultrasonic meters
		estimated life is only within 1 year.		Not required for inline type IP-68 meters
16.	**IP-68 Sensor availability**	Available but a lot of failure due to moving parts.	Yes	Yes
17.	**Wet calibration facility at the manufacturer's place**	Yes	Yes	Yes
18.	**Verification of accuracy at site**	Not Possible.	Possible	Possible for inline type and clamp on, and not possible for insertion type
19.	**Lining**	No lining but has moving parts like a turbine, paddlewheel, etc.	PU lining available.	Food grade coating with Drinking water certificate available for clamp on. No lining is required for inline and insertion types.
20.	**Operating at low velocity**	Poor	Good	Good
21.	**Cost**	Low initial cost but the high cost of maintenance due to moving parts and more frequent replacements like jamming of rotating wheels, counters, etc.	Cost increases with diameter.	Moderate. The sensors are clamped over the outer surface of pipe for diameters from DN500 to DN4000
22.	**Advantages**	(i) Suitable for higher flows (ii) Can sustain hostile flow conditions (iii) External & internal regulator facilitates easy calibration (iv) Less Pressure loss (v) Robust construction (vi) Easy Maintenance	(i) Most sensitive 15 mm to 50 mm as per IS 779: 1994 and 15 mm to 100 mm as per ISO 4064 (ii) Less sensitive to flow disturbances and ready for Automatic Meter reading for water SCADA compliant (iii) Straight reading cyclometer	(i) Most sensitive 15 mm to 50 mm as per IS 779:1994 and 15 mm to 100 mm as per ISO 4064 (ii) Less sensitive to flow disturbances and ready for Automatic Meter reading for water SCADA compliant (iii) Straight reading cyclometer

S.No.	Attributes	Mechanical meters	Electromagnetic meters	Ultrasonic meters
			(iv) Do not measure the air in the pipe (v) No Orientation issue. (vi) Life of meter 10 to 15 yrs.	(iv) Do not measure the air in the pipe (v) No Orientation issue. (vi) Life of meter 10 to 15 yrs.
23.	**Disadvantages**	(i) Less sensitive to low flow (ii) Approach conditioning piping is required (iii) Not available in metrological classes in BIS. (iv) Limited to higher flows. (v) Multi pointer meter (Analogue type) (vi) Bush leak problems (vii) Air escape holes create a problem during submergence.	(i) Costlier than mechanical meters (ii) Water must be free from solid dirt particles	(i) Costlier than mechanical meters (ii) Water must be free from solid dirt particles
24.	**Representation**			

SECTION 4.3 Ultrasonic Water Meters (Modified) and SECTION 4.3.1 Transit time Ultrasonic Flow Meters are modified and may be read in inclusion with the guidelines, as follows.

4.3 Ultrasonic Water Meters

Ultrasonic flow meters utilize the properties and behaviour of sound waves passing through moving water. The ultrasonic meters are of two types depending on different working mechanisms viz, Transit time meters and Doppler meters. The ultrasonic meters are also available as clamp-on, insertion type and inline type.

4.3.1 Transit Time Ultrasonic Flow Meters

Transit time ultrasonic flow meters are based on the phenomenon that sound waves slow down when moving through the water against the flow, and speed up when they move with the flow. A transit time ultrasonic meter has two sound transducers mounted at opposite sides of the pipe at an angle to the flow. Each of these sound transducers will in turn transmit an ultrasound signal to the other transducer. The differences in the transit times of the signals determine the flow velocity and flow rate.

	
Domestic Ultrasonic Meter DN15 to DN40	Bulk Ultrasonic Meter DN50 to DN300

The accuracy of the transit time ultrasonic meters depends on the ability of the meter to accurately measure the time taken by the ultrasound signal to travel between the sound transducers. Larger pipes have longer path lengths and thus the speed of the signal, and the flow rate can be measured with higher accuracy. Transit time meters work better in clean fluids and thus are ideal for drinking water pipes. They measure the average velocity of fluid but are sensitive to the velocity profile in a pipe. In some cases, multi-beam devices are used to improve meter accuracy.

Permanently installed transit time meters are often called wetted transducer meters since their sound transducers are in direct contact with the fluid. These meters are very reliable and

typically have relative errors between 0.25% and 1%. They can be used on pipes ranging from 10 mm to greater than 2 m in diameter, although they are not often used on small diameter water pipes. The ideal flow velocity range for good accuracy is 0.5 to 10 m/s.

The In-line type meter, IP 68 Protection class is constructed as a vacuum chamber of moulded composite material or suitable metal body. Thus, the electronics are fully protected against penetration of water. Water consumption is measured electronically, as a volume, using the ultrasound signal. Through two ultrasonic transducers, an audio signal is sent with and against the flow direction. The ultrasonic signal traveling with the flow will be the first to reach the opposite transducer, while the signal running against the flow will be received a little later. The time difference, between the two signals, can be converted into flow velocity, and thereby also into a volume. The measuring principle is called 'bidirectional ultrasound technique based on the transit time method', which is a proven, long-term stable and accurate measuring principle.

Clamp-on transit time meters use sound transducers that are clamped externally onto the walls of a pipe to provide portable non-intrusive flow measurement. Practically, they can be used on any pipe material including metals, plastics, fiber, cement and lined or coated pipes. A disadvantage is that the ultrasonic pulses must traverse pipe walls and coatings, and therefore the thicknesses and acoustic properties of these elements must be known. Deposits on the inside pipe surface can affect signal strength and performance.

Modern clamp-on meters incorporate microprocessors that allow mounting positions and calibration factors to be calculated for each application and can provide accuracies of 0.5% to 2%. The advantages of transit time flow meters include high accuracy and reliability, which makes them cost-effective for use in large pipes. The clamp-on version of the meter is easy to install without the need to shut down the pipe. However, transit time flow meters are sensitive to distortions in the velocity profile of a pipe, require an electricity supply, and are not suitable for dirty waters.