



सिंचाई एवं जल संसाधन विभाग  
हरियाणा

**STANDARD OPERATING PROCEDURE  
Water Flow Meter-WFM**



**Prepared by:  
Technical Support Agency  
(People's Science Institute),  
Atal Bhujal Yojana - Haryana**

**For  
State Project Management Unit  
Atal Bhujal Yojana  
Irrigation and Water resources Department  
Govt of Haryana**

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## **1.0 Introduction:**

The availability and depletion of ground water is increasingly pointed as the limiting factor for sustainability. A lot of focus, especially in dark zone area, where farmers are cultivating water intensive crop by using ground water need to create timely awareness of their consumption. The preservation of natural resources in general and water in particular, is a vital requirement for sustainable survival of the human species. Various approaches have been proposed to improve the management of ground water including awareness campaigns, efficient intervention/practices, rain water harvesting structure, crop diversification, and rain waste water reuse.

One approach that offers various fringe benefits is that the installation of a novel low-cost Woltmann type of water flow meter on water sources to understand the rate of discharge. It will ensure that the utility of ground water and will aware of consumption patterns, which leads to more responsible behavior. It will not for billing purposes, but will capture and process the data. In view of the importance and utility of ground water monitoring under Atal Jal, attempt has been made to prepare a guideline to standardize the procedures and methodology for data collection, collation and integrating with the common database.

A waterflow meter is a scientific instrument will be installed for the measurements of the volume of water discharged from the source of water like bore well/ tube well. Management of water resources in a system is a function of the measurement of flow of water at source and its effective usage. Therefore, metering fulfils the need to know accurately the volume of water available and used in various crop, by clear understanding of water balance. Therefore, water flow meter is an excellent application of the principle "to measure, is to know". The knowledge of how much water is being used in the farming.

Water flow meters consist of four basic components: (i) a sensor to detect the flow, (ii) a transducer to transmit the flow signal, (iii) a counter to keep track of the total volume of water passed, and (iv) an indicator to display the meter reading.

## **2.0 Objectives:**

The primary objective of Atal Bhujal Yojana is “to improve the sustainable management of groundwater resources in the water stressed areas of the district” through community engagement at Gram Panchayat level. The present scheme also aims at community engagement and inculcates behavioral changes for judicious ground water management at Gram Panchayat level. One of the critical steps in the implementation of the Atal Jal program is preparation of water budget at GP level and prepare community- led water Security Plan for sustainable ground water management through a combination of demand side / supply side measures. Understanding the ground water regime as well as ground water dynamics in terms of discharge is prerequisite, to work out the water budget and decide the management interventions. This would essentially require data on all aspect of water in time and space.

## **3.0 About Standard Operating System (SOP):**

This SOP has been prepared to direct field personnel for identify and installation of water flow meter on water sources like bore well/tube well for collecting the rate of discharge at GP level. This SOP is designed to help District Implementation Partners (DIPs), District Project Management Unit (DPMU) and other field staff or staff in-charge for routine observation and data collection of the volume of water discharge through borewell/ tube well installed for irrigation of various crops.

## **4.0 About Woltmann Water Flow Meter:**

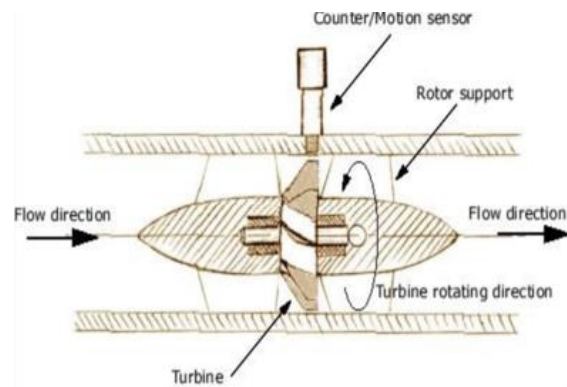
It is a mechanical volumetric Horizontal (WS) types of water flow meter device installed for the measurements of the volume of water or discharged from the source of water like Tube well/bore well during the irrigation or throughout the water system. Such types of Horizontal Woltmann meters have their inlets and outlets directly in line with the pipeline, and the axle of the helical vane is parallel to the flow. Water flows directly through the meter with minimal disturbances by the meter body. Horizontal Woltmann meters are used in a large range of pipe sizes, typically having a diameter between 40 mm and 600 mm. Woltmann meters are affected by flow distortions or changes in meter dimensions that may interfere with the way water passes through the meter. Deposits in the meter can cause overregistration at medium flows and underregistration at low flows. All Woltman meters have dry, sealed dials. The easy passage

of water through Horizontal Woltman meters reduces pressure loss through the meter. However, since the transducer needs to turn the circular movement of the impeller

through 90 degrees to connect it to the counter, greater torque is required, which reduces the meter's sensitivity to low flows. Another limitation of Woltman meters is that they are sensitive to disturbances in the flow passing through them. Bends or valves close to a Horizontal Woltman meter can affect the meter's accuracy. Spiraling flow, caused by two successive bends in different planes, is particularly unfavorable for their accuracy. It has a single range accuracy and is variable i.e.,  $\pm 0.5\%$  and  $\pm 5\%$ . The accuracy of water flow meter performance is related to linearity and repeatability and is directly the volume of flow passing through them.

#### 4.1 Working Principles:

Such types of water flow meter work by measuring the speed of water flowing through the pipe that causes a piston/turbine to rotate. The volumetric flow meter of water is proportional to the rotational speed of the blades.

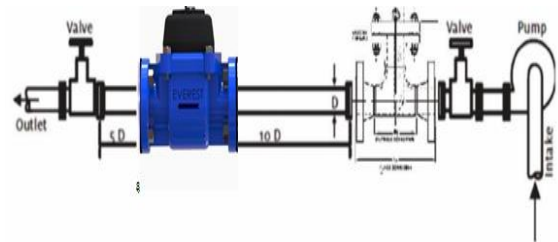


##### 4.1.1 Salient Features:

- Velocity type meter, free maintenance with long working life.
- Class B & ISO 4064 with supreme accuracy & long term reliability.
- Low head loss, dry dial resistor ensures clear reading.
- Not affected by external magnetic field.
- Highly sensitive to low rate & very accurate over its entire flow range

##### 4.1.2 Installation Requirement:

- The meter can be installed in any position with direction of flow meter as indicated by arrow cast in the meter body with the register face upward.
- The meter must be 10 diameter straight pipes ahead of the meter and 5 diameter straight pipes after to ensure proper flow through the meter.
- Pipe line should be flushed before installation.
- The meter should be constantly full of the water during operation.
- It is essential to install the flowmeter co-axially to the pipeline without protruding any packing or gasket into the water flow stream.



- The installations are strictly carried out as per manufacturers' recommendations. In the case of differential pressure type flow meter, the impulse piping requires special care in respect of slope and protection.
- Similarly, long disturbance free straight sections should be provided for uniformity. Installation should be vibration free as moving parts in the flowmeter wherever present will get worn out in addition to the effect on overall accuracy of the flowmeter.
- The water flow meter being a delicate instrument shall be handled with great care.
- Rough handling including jerks or fall is likely to damage it and affects its accuracy.
- The WFM shall be installed at a spot where it is readily accessible.
- To avoid damages and overrun of the meter due to intermittent water supply system, it is always advisable to install the meter, so that the top of the meter is below the level of the communication pipes so that meters always contain water, when there is no supply in the line.
- The meter shall preferably be housed in a chamber with the lid for protection; it should never be buried underground nor installed in the open, so that water may not directly fall on the meter. It should be installed inside inspection pits, built out of bricks or concrete, and covered with the lid. It should not be suspended.
- The meter shall be installed so that the longitudinal axis is horizontal and the flow of water should be in the direction shown by the arrow cast on the body.
- Before connecting the meter to the water pipe, it should be thoroughly cleaned by installing in the place of the water meter a pipe of suitable length and diameter and letting the passage of a fair amount of water flow through the pipework to avoid the formation of air pockets.
- It is advisable that the level of the pipeline where the meter is proposed to be installed should be checked by a spirit level
- Before fitting the meter to the pipeline check the unions nuts in the tail pieces and then insert the washers. Thereafter screw the tail pieces on the pipes and install the meter in between the nuts by screwing.
- To avoid its rotation during the operation, the meter should be kept fixed with suitable nonmetallic clamps.
- Care should be taken that the washer does not obstruct the inlet and outlet flow of water.
- The protective lid should normally be kept closed and should be opened only for reading the dial.
- The meter shall not run with free discharge to the atmosphere. Some resistance should be given in the downside of the meter if static pressure on the main exceeds 10 m head.

- A meter shall be located where it is not liable to get the severe shock of water hammer which might break the system of the meter.
- Owing to the fine clearance in the working parts of the meters they are not suitable for measuring water containing sand or similar foreign matter and in such cases a filter or dirt box of the adequate effective area shall be fitted on the upstream side of the meter. It should be noted that the normal strainer fitted inside a meter is not a filter and does not prevent the entry of small particles, such as sand.
- Where intermittent supply is likely to be encountered the meter may be provided with a suitable air valve before the meter in order to reduce inaccuracy and to protect the meter from being damaged. At higher altitude, if the meter is installed as above, the problem will be eliminated.
- Every user expects a problem-free installation of the meter and thereafter only accurate reading. Regular monitoring is desirable in order to avoid failures.
- The meter is installed in the pipeline using flanged or threaded connections giving due consideration for conditioning sections. It should be seen that stress-free installation is carried out in the pipeline.
- It is essential to install the flowmeter co-axially to the pipeline without protruding any packing or gasket into the water flow stream. In the case of ultrasonic meter, the probes are welded on the pipeline which requires care to see that no projection is protruding in the pipeline.
- Installation in 'U' shape is essential for intermittent water supply.
- Flow meters should be provided with battery backup in order to retain integrator reading during the failure of electric supply

#### **4.1.3 Procedure for Conducting the Test:**

- Water Flow Meter is fixed on a test bench horizontally or vertically or in any other position for which it is designed and with the direction of flow as indicated by the arrow on its body.
- By adjusting the position of regulating valve on the upstream side, the rate of flow is adjusted. At the desired rate of flow, the difference in pressure gauge readings fitted on the upstream and downstream side of the water meter is noted.
- The flow is now stopped with regulating valve and the measuring chamber is emptied and zero water levels on the manometer attached to the measuring chamber are correctly adjusted.
- The initial reading of the water meter from its recording dial is noted. Now the flow at the set rate is passed through the water meter and the discharge is collected in the measuring chamber.

- After passing the desired quantity of water through the meter, the flow is once again stopped. The discharge as recorded by the measuring chamber is noted. The final reading of the water meter is noted.
- The difference between the initial and final readings of water meter gives the discharge figure recorded by the water meter. Now the discharge recorded by measuring tank is treated as ideal.
- The discharge recorded by water meter is compared with this ideal discharge. If the quantity recorded by water meter is more than the ideal, the meter is called running fast or vice versa. The difference in the quantity recorded by the meter from the ideal quantity is considered as an error. This error is expressed in percentage.

## **5.0 Site Selection:**

- The site will be selected at GP level with accurate latitude & longitude information by taking consent of tube well/bore well owner.
- Total 10 number of tube/bore well will be selected for the installation of water Flow meter in each GP.
- The tube/bore well should be same as the tube/bore well selected as for monitoring well.
- The diameter of tube/bore well, flow pipes in the selected area should be generally of 3 inches (80mm) and 4 inches (100mm).
- The required information will be taken on framed consent format.



## 5.1 Consent Format: Consent will be taken on the attached format by the Farmers.

### अटल भूजल योजना हरियाणा सिंचाई एवं जल संसाधन विभाग हरियाणा

#### सहमति पत्र

राज्य		जिले का नाम	
ब्लॉक का नाम		ग्राम पंचायत का नाम	
गांव का नाम		ट्यूबवेल/ बोरवेल मालिक का नाम	
ट्यूबवेल/ बोरवेल मालिक के पिता का नाम		ट्यूबवेल/ बोरवेल मालिक का संपर्क नंबर	
ट्यूबवेल/बोरवेल		डिलिवेरी पाइप साइज़	
Latitude of source		Longitude of source	
ट्यूबवेल/बोरवेल के माध्यम से सिंचाई के अंतर्गत आने वाला क्षेत्र (एकड़ में)	रबी-	खरीफ़-	ज़ायद-

- अटल भूजल योजना हरियाणा, सहभागी भूजल प्रबंधन हेतु केंद्र सरकार एवं विश्व बैंक द्वारा वित्त पोषित योजना है, जिसमें आपकी ग्राम पंचायत सहित 1669 ग्राम पंचायतें शामिल हैं। इस कार्यक्रम का मुख्य उद्देश्य सामुदायिक हितधारकों की प्रभावी भागीदारी के माध्यम से भूजल संसाधनों का प्रबंधन करना है। साथ ही, इस योजना के तहत ग्राम स्तर पर जल सुरक्षा योजना तैयार करना है, जिसमें कि जल संतुलन और जल बजट बनाना एक प्रमुख घटक हैं।
- जल संतुलन और जल बजट की प्रभावी गणना करने के साथ-साथ भूजल निष्कर्षण की प्रकृति को समझने के लिए, इस योजना में व्यक्तिगत बोरवेल पर जल प्रवाह मीटर (वाटर फ्लो मीटर) लगाने की योजना है।
- जल प्रवाह मीटर (वाटर फ्लो मीटर) की स्थापना विभाग द्वारा वित्तपोषित है तथा बोरवेल मालिक से संचालन एवं रखरखाव सहित किसी भी प्रकार का शुल्क नहीं लिया जाएगा। इस फ्लो मीटर का उद्देश्य केवल भूजल के बहाव को मापना है। इस मीटर के माध्यम से एकत्र किए गए डेटा का उपयोग केवल भूजल प्रबंधन योजना के लिए किया जाएगा और किसी भी समय बोरवेल मालिक से कोई भी वित्तीय/नियामक शुल्क नहीं लिया जाएगा। साथ ही, इस मीटर के माध्यम से एकत्र किए गए डेटा का उपयोग पानी के कनेक्शन और/या कृषि विदुत्त कनेक्शन की अनुमति प्रदान करने अथवा न करने के निर्णय लेने के लिए नहीं किया जाएगा।

#### मालिक की सहमति

मैं \_\_\_\_\_ पिता का नाम \_\_\_\_\_ गांव \_\_\_\_\_  
ग्राम पंचायत \_\_\_\_\_ ब्लॉक \_\_\_\_\_ जिला \_\_\_\_\_ ट्यूबवेल / बोरवेल का मालिक हूँ।

इस पत्र के माध्यम से, मैं अपने नलकूप/बोरवेल पर जल प्रवाह मीटर (वाटर फ्लो मीटर) की स्थापना के साथ-साथ जल प्रवाह मीटर के माध्यम से डेटा की आवधिक रिकॉर्डिंग/संग्रह/निगरानी की अनुमति देने के लिए अपनी सहमति देता हूँ एवं मेरे नलकूप/बोरवेल पर जल प्रवाह मीटर (वाटर फ्लो मीटर) की स्थापना से मुझे किसी भी प्रकार की आपत्ति नहीं है। साथ ही, मेरे द्वारा किसी भी समय इस जल प्रवाह मीटर (वाटर फ्लो मीटर) को जानबूझकर नुकसान नहीं पहुंचाया जायेगा।

डी.आई.पी. प्रतिनिधि का नाम एवं हस्ताक्षर  
नाम-

नलकूप/बोरवेल मालिक के हस्ताक्षर  
दिनांक:

## 6.0 Installation Procedure:

The supplier will visit the site to assess the accessibility of the site before the deployment/installation of water flow meter. Woltmann Water Flow Meters including all arrangements for installation on the identified tube well/bore wells used for irrigation at the designated sites in the Gram Panchayat. The exact location of installation of Water Flow Meters within the Gram Panchayat would be provided by the DIP verified by concerned District Project Management Unit (DPMU). Installation will be as per supplier guideline.

## 7.0 Payment System:

No money will be charged from the farmers. The Payment of water flow meter shall be paid by Atal Bhujal Yojana after successful installation, testing and receipt of final acceptance from concerned Nodal officers. Minimum payment would be done after successful installation and testing of five hundred, flow meter on pro data basis.

## 8.0 Data collection & Frequency of Measurement:

DIPs will be responsible for measuring the data on crops basis fortnightly. If there is more than one crop in a season, the data will be collected separately for each crop. DPMU groundwater experts will randomly verify the measurement process and data collection, besides that they also calibrate and validate the data collected by DIP team. Data will be collected on the enclosed format:

### 8.1 Data Collection Format:

Water Floe Meter				Date										
Discharge	Pipe Size	Pump Type	Capacity (HP)	From	To	Site Name	Well ID	Geo Tag	Season	Crop Name	Area Under Crop	No of days of Irrig,	Irr Hrs	Irr. Method

## Quality control & Operation

Calibration and validation of the installed system shall continue during the entire Warranty period on half yearly basis. Flow water Meter should have removable mechanism for easy maintenance.