ENCARDIO RITE
METASENSING FOR MEGA STRUCTURES

USERS MANUAL

STANDPIPE PIEZOMETER

Model EPP-10SP

Doc. # WI 6002.143_R01| March 2026

TUNNELS | HYDROELECTRIC | CONSTRUCTION | STRUCTURAL | METRO & RAIL | BRIDGES | MINING

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CONTENT

1 INTRODUCTION

Ground water table monitoring has assumed great significance in view of depleting ground water reserves. The basic measurement of ground water level can be done by Open Standpipe or constructing observation wells.

Model EPP-10SP open standpipe is used for measuring ground water level and its variation with time. It consists of a pipe that is sealed along its entire length and installed in a borehole such that it is open to water flow at bottom and open to atmosphere at the top. The intake is a slotted pipe covered with geo-textile material, to prevent soil particles from clogging the borehole.

The depth to the water level in the standpipe is measured by lowering model EPP-10/6 water level sounder (also called dipmeter) into the pipe. The water level sounder probe is lowered from the surface with the help of flat cable, with precise markings, for taking observations. The level of water in such a borehole or well corresponds to the water table at that location. The level of water in such a borehole or well corresponds to the water table at that location.

1.1 Applications

- Ground water level measurement in boreholes near dams, rivers, high rise buildings, farm houses, factories, institutes and residential areas.
- Ideal for simple ground water level monitoring.

1.2 Conventions used in this manual

WARNING! Warning messages calls attention to a procedure or practice, that if not properly followed could possibly cause personal injury.

CAUTION: Caution messages calls attention to a procedure or practice, that if not properly followed may result in loss of data or damage to equipment.

NOTE: Note contains important information and is set off from regular text to draw the users' attention.

This users' manual is intended to provide you with sufficient information for making optimum use of porous tube piezometer in your applications.

To make this manual more useful we invite your valuable comments and suggestions regarding any additions or enhancements. We also request you to please let us know of any errors that you may find while going through this manual.

1.3 How to use this manual

The manual is divided into a number of sections. Each section contains a specific type of information. The list given below tells you where to look for in this manual if you need some specific information.

For operating principle See § 2 'Operating principle".

For essential tools *and accessories:* See § 3 'Tools and accessories required for installation".

For installation of porous tube piezometer See § 4 'Installation procedure'.

For recording readings from porous tube piezometer: See § 5 'Observation sheet'.

2 STANDPIPE TUBE PIEZOMETER

2.1 Operating principle

The standpipe is set in a bore hole, which is drilled into the soil/foundation to a pre-determined depth to intercept ground water. The slotted pipe is connected by a socket to same diameter plastic stand pipes extending to the surface. The borehole is filled with pea gravel. The top of borehole is sealed with cement bentonite plug. Ground water seeps into the stand pipe through the slotted end and attains a level equal to ground water. This level is determined by an electrical sounding device model EPP-10/6 lowered from the surface.

Figure 2-1 gives a typical assembly and installation layout of the standpipe piezometer.

2.2 Description of the equipment

The open standpipe type piezometer system consists of following sub-assemblies:

2.2.1 EPP-10SP/1: Slotted PVC well screen

The intake point of the standpipe consists of a PVC slotted pipe, 1 m/2 m/3 m long, 50 mm o.d., covered with geo-textile.

2.2.2 EPP-10/2: Stopper

Bottom end of slotted pipe is plugged with a suitable PVC cap.

2.2.3 EPP-10/3: Standpipe

The standpipe consists of a series of PVC stand pipes, 50 mm o.d., 44.5 i.d., 3 m length with an inbuilt socket for jointing.

EPP-10/4: Joint for PVC tubing

These are required for jointing the available lengths of PVC tubing. The joints are suitable to ensure no leakage and are smooth and flush inside to prevent lodging of air bubbles and smooth passing of the sounder. The joiner or coupler for PVC tubing is made of rigid PVC having an internal rubber sleeve. Suitable adhesive/resin is used for jointing lengths of PVC tubing.

2.2.4 EPP-10/5: Water level sounder

The Encardio-rite model EPP-10/6 water level sounder is designed to measure the elevation of the ground water in bore holes, stand pipes and wells. The water level sounder is required to be lowered from the surface with the help of the connecting cable for taking observations. The model EPP-10/6 comprises of a specified length of flat cable made of high tensile virtually non-expandable, non-stretchable polyethylene coated flat tape having markings at an interval of every 1 cm, connected at one end to a weighted probe of stainless steel. The unit is battery operated complete with an on-off switch, buzzer, red LED for power on and signal, flat cable connected to a probe, winding reel and carrying handle. The probe gives sound and green light signal when water in the borehole/well makes a contact with the tip. The moisture resistant electronics and standard 9 V PP-3 size battery are housed in a hub on the cable reel. The hub can be easily accessed to replace the battery without disassembling the entire cable reel. The cable reel is rugged, light weight and easy to carry.

2.2.5 EPP-10/6: pipe cap assembly

The pipe cap assembly is fixed to the top of the PVC tube at the top.

2.2.6 EPP-10/7: Chequered plate lockable cover

A 250 mm x 250 mm chequered plate hinged cover with locking arrangement is provided for mounting at top of standpipe piezometer.

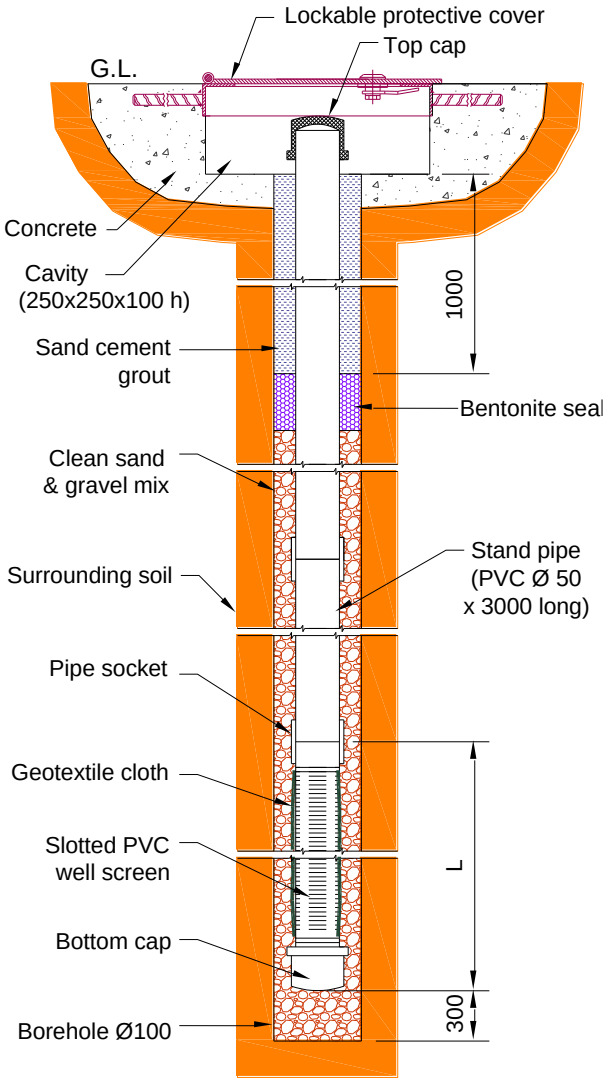


Figure 2-1 Installation schematic of porous tube piezometer

3 TOOLS & ACCESSORIES REQUIRED FOR INSTALLATION

The following tools and accessories are required for installation of the open standpipe type piezometer.

Sl no.	Description	Qty.
1.	Tool Box	1 no.
2.	PVC jointing compound	As required
3.	Carbon tetrachloride (commercial).	As required
4.	Hacksaw with 150 mm blade	1 no.
5.	Hacksaw blades	6 nos.
6.	Surgical blade with holder	1 no.
7.	Tooth brush	1 no.
8.	Pliers 160 mm (Taparia)	1 no.
9.	Small plastic mug	1 no.
10.	Cloth for cleaning (lintless)	1 no.
11.	Coarse brass wire mesh and tie wire	As required
12.	Araldite	1 packet
13.	M-seal compound	2 packets
14.	Embury paper	5 nos.
15.	Flat file	1 no.
16.	Digital multimeter	1 no.
17.	Nylon chord	As required
18.	Pipe holding clamp	1 set.
19.	Sand measuring pipe 4" dia GI pipe 1m long pipe closed at one end	1 no.
20.	Sand tempering pipe 3" dia GI pipe 1 m long with handle at one end and pipe closed at other end	1 no.

4 INSTALLATION PROCEDURE

4.1 Installation in bore holes

The drilling of the bore holes is generally an activity to be performed by the civil construction agency. A minimum 100 mm diameter cased hole is advanced to about 30 to 60 cm distance below the planned elevation for the bottom of the porous tube by jetting or by other accepted procedures. Use of bentonite or drilling mud is not permitted. The stabilization of the borehole walls is maintained using the drilling casings. The drilling casings are gradually pulled out of the borehole after lowering the piezometer tip up to the desired depth. The procedure of installation inside the bore holes is outlined below:

4.2 Preparation of the borehole before installation

Measure the depth of the borehole and the water level in the drilled bore hole. Wash the cased borehole up to its bottom with clean water before installation of the piezometer. The clean water is circulated using a pump until the discharge is clear. After the bore hole is clean saturated sand shall be poured into the casing to fill the bottom of the porous space. The sand backfill shall consist of clean sand, which shall satisfy the filter requirements vis-a-vis the surrounding soil as closely as possible. No silt size particle shall be present in the sand.

4.3 Lifting of the casing

The casing shall be withdrawn in increments of 15 cm or less as the lifts of saturated sand are placed to support the borehole, to avoid any sloughing/caving-in of the ground/earth material. The sand in the bottom of the hole shall be tamped with a bar or pipe, before installation of the porous tube.

4.4 Preparation of the standpipe before installation

1. Clean the PVC stand pipe with carbon tetrachloride. Apply PVC jointing compound over the male part of the stand pipe. Please ensure that the joining surfaces are not very smooth. If they are smooth, make them rough by rubbing with emery paper.
2. Assemble the slotted PVC pipe to the flared end of a 3 m standpipe by the EPP-10/3 top adaptor and check the joint between the tip and the standpipe for leak-proof functioning by filling water in the tube assembly.

4.5 Lowering of the Standpipe inside the borehole

1. Check the depth of the borehole again and ensure that the designated elevation has reached.
2. Place the tip lowering frame over the borehole.
3. Lower plastic standpipe into hole holding top end with a clamp such that it does not slip into the borehole accidentally.
4. Attach 3 m length of rigid PVC pipe to slotted pipe length using pipe socket and PVC jointing compound.
5. Lower assembled slotted and plastic standpipe into hole holding top end with a clamp such that the assembly does not slip into borehole.
6. Connect successive lengths of 3 m PVC pipe to assembled portion using the bell shaped self socket pipe end and PVC jointing compound. Lower into borehole till bottom is reached.
7. If casing is used for preventing the borehole walls from collapsing, successively pull it out as borehole is back filled.
8. Pull stand pipe assembly by 30-60 cm. Fill with saturated mix of sand and gravel up to around 1 m below the ground surface and if possible, tamp with a rod.
9. Fill remaining 1 m length of borehole with a 4:1 sand cement grout.

10. Fix chequered plate cover in position.

NOTE: Keep top of raiser pipe covered with PVC pipe cap when observations are not being taken.

4.6 Measurement of water level

1. Unlock the top cap and remove the PVC pipe cap.
2. Switch on the indicator.
3. Lower probe into well. When probe tip and housing touches water, the probe will give a sound alarm and green light signal.
4. Hold flat cable against the reference and read depth from the cable marking.

NOTE: Top of the well is usually taken as the reference.

5. Remove probe carefully from the well winding the flat cable on the cable reel.
6. Replace PVC pipe cap and lock the top cap.

4.7 Cleaning indicator

1. Wash probe and cable with a laboratory-grade detergent. Rinse with clean/distilled water.

NOTE: The probe has a diameter of 12.7 mm. The 3 mm long tapered tip of the probe is insulated from the main housing by a 15 mm long white nylon spacer. The probe will give sound and light signal when the water in the borehole/well makes simultaneous contact with the tip as well as the lower end of the housing. In case of any deposit on the nylon spacer, carefully remove it as it may be conductive and impair performance.

Figure 4-1

2. Remove oily deposits with dishwashing detergent, after testing its effect on a short length of cable. Do not leave the cable immersed in detergent for a long time. Rinse in clean/distilled water.
3. Wipe the reel with a damp cloth taking care that water does not enter the hub.

4.8 Replacing battery

The indicator uses a 9 V PP3-size battery. Battery must be replaced if indicator fails to buzz or show green light signal when probe tip and housing contact water. To replace battery:

4. Release the cable locking assembly.
1. Remove the SS screw on the hub to gain access to battery holder.
2. Remove battery terminal from the 9 V PP3 size battery. Replace battery with new one and connect battery terminal.
3. Secure the hub with SS screw.
4. Secure the cable locking assembly.

5 OBSERVATION SHEET

5.1 Data sheet for Standpipe Piezometer readings

Project:

Client:

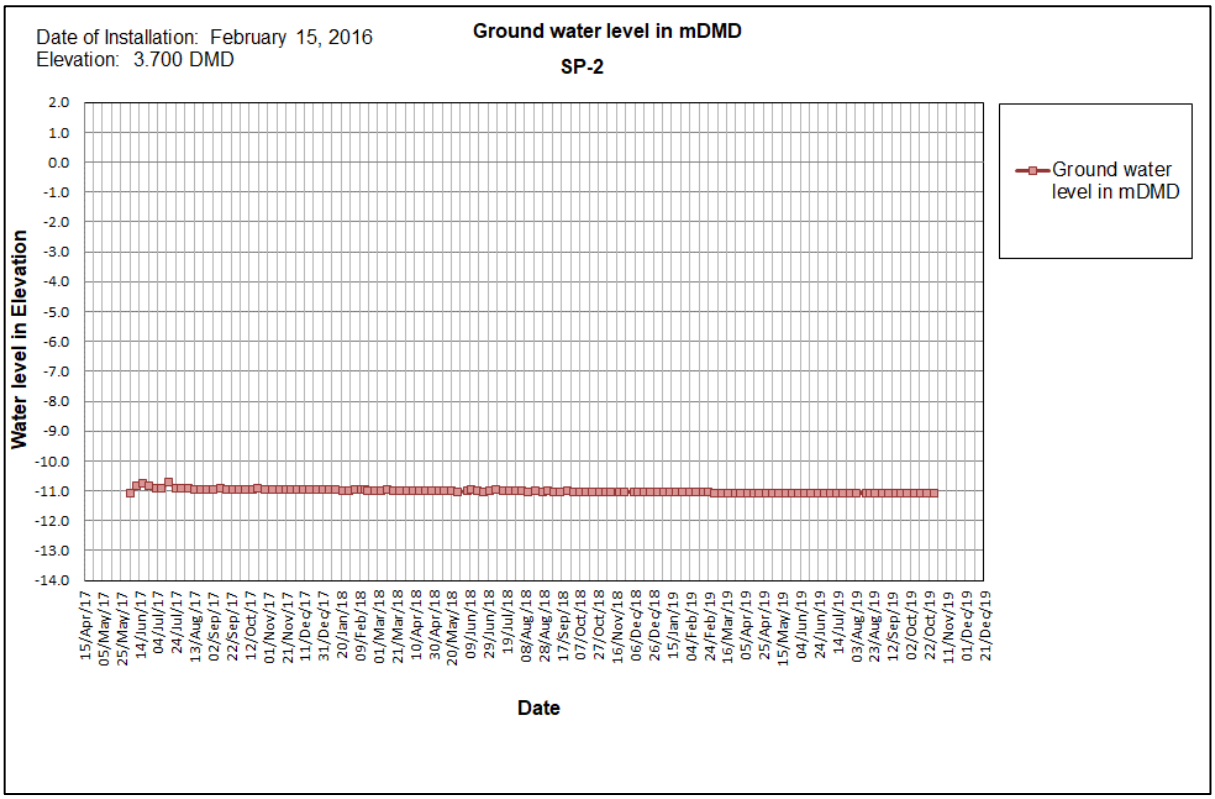
Consultants:

Contractor:

Instrument name:

	Standpipe	
As Built Coordinates:	**E-495818.278, N-2791313.367**	10-04-2016
Pipe top elevation, m DMD:	3.695	3.700
Depth of bottom of Standpipe from pipe top level, m (approx):	30	
Installation Date	15.02.16	

	SP-2						
	Depth of water from top, m	***Drawdown***	**Ground water level in mDMD**	*Alert*	*Action*	*Alarm*	*Site Observation*
16-Feb-16	5.380	0.000	-1.685				
17-Feb-16	5.392	-0.012	-1.697				**Data took before Rain at 3:30PM**
18-Feb-16	5.401	-0.021	-1.706				
20-Feb-16	5.399	-0.019	-1.704				
21-Feb-16	5.394	-0.014	-1.699				
22-Feb-16	5.390	-0.010	-1.695				
23-Feb-16	5.387	-0.007	-1.692				
24-Feb-16	5.416	-0.036	-1.721				
25-Feb-16	5.430	-0.050	-1.735				
28-Feb-16	5.351	0.029	-1.656				
6-Mar-16	5.292	0.088	-1.597				
14-Mar-16	5.465	-0.085	-1.770				
20-Mar-16	5.490	-0.110	-1.795				
28-Mar-16	5.454	-0.074	-1.759				
4-Apr-16	5.501	-0.121	-1.806				
11-Apr-16	5.524	-0.144	-1.829				



5.2 Frequency of observation

Initial readings must be carefully taken and recorded at the time of installation. The frequency of taking readings may be decided in consultation with the project authorities. During the period when underground water table fluctuation is expected to be more the readings shall be taken more frequently.

6 ENVIRONMENTAL RESPONSIBILITY DECLARATION

Encardio Rite Group ("**Encardio**") is committed to ensuring full compliance with environmental responsibilities under all applicable Indian environmental statutes, collectively referred to herein as the **"Law(s)"**. This declaration is applicable to all products manufactured and marketed by Encardio.

1. **Scope:** This declaration binds and guides every stakeholder involved in the product's lifecycle including individuals, institutions, organizations, or entities hereinafter referred to collectively as the **"User(s)"**.
2. **Waste Segregation and Handling:** All Users are required to manage the product and any waste generated from its use in accordance with the law, including proper segregation of waste at the source into biodegradable, recyclable, and hazardous categories; authorized disposal of all end-of-life products, electronic components, batteries, and packaging materials only through government-authorized collection, recycling, or refurbishing systems; and ensuring that products bearing the crossed-out wheeled bin symbol are not mixed with general household or municipal waste streams.
3. **E-Waste Disposal and Battery Waste Management:** All electronic and electrical equipment and components manufactured or sold by Encardio must be disposed of only through authorized recycling or refurbishing facilities as per applicable law, ensuring no harm to human health or the environment; users shall ensure that all used items are returned to designated collection points and shall also maintain proper documentation and adhere to return, reporting, or record-keeping obligations; products nearing end-of-life must not be discarded along with general household waste, as improper disposal of e-waste may lead to toxic chemical release and pollution.
4. **Plastic Waste Management:** Users must not discard plastic components or packaging into unsorted municipal waste; instead, they should separate and hand over such plastic waste to authorized waste processors and ensure that no banned plastic items, as notified under law, are used or circulated.
5. **Industrial and Hazardous Waste:** If the User operates any facility where industrial, hazardous, or biomedical waste may arise due to the installation, maintenance, or testing of the product, all necessary consents and permits must be obtained and renewed from competent authorities; adequate protective measures must be taken to ensure no harm is caused to the environment or human health; and such waste must be stored, treated, and disposed of in accordance with the law.
6. **Pollution Control:** Users operating manufacturing, repair, or testing premises must not emit air or water pollutants beyond prescribed limits, must operate only after securing applicable consents under the law, and must maintain environmental records and submit reports as required
7. **Record Keeping and Reporting:** All Users associated with Encardio must maintain comprehensive records of production, sales, collection, and disposal in accordance with applicable Law(s) and submit timely reports to regulatory authorities.
8. **Contact and Support:** Encardio urges all Users to act responsibly and support sustainable environmental practices by adhering to this declaration and the Law. For safe disposal and further compliance assistance, Users are encouraged to contact their local municipal waste authorities, or authorized recyclers. Non-compliance with the above obligations may constitute a violation of Indian environmental laws and attract penalties under the relevant Law(s). Users can contact Encardio at:

Contact Number: +91 522 2661039-42

Website**:** https://www.encardio.com/

7 WARRANTY

The Company warrants its products against defective workmanship or material for a period of 12 months from date of receipt or 13 months from date of dispatch from the factory, whichever is earlier. The warranty is however void in case the product shows evidence of being tampered with or shows evidence of damage due to excessive heat, moisture, corrosion, vibration or improper use, application, specifications or other operating conditions not in control of Encardio-Rite. The warranty is limited to free repair/replacement of the product/parts with manufacturing defects only and does not cover products/parts worn out due to normal wear and tear or damaged due to mishandling or improper installation. This includes fuses and batteries.

If any of the products does not function or functions improperly, it should be returned freight prepaid to the factory for our evaluation. In case it is found defective, it will be replaced/repaired free of cost.

A range of technical/scientific instruments are manufactured by Encardio-rite, the improper use of which is potentially dangerous. Only qualified personnel should install or use the instruments. Installation personnel must have a background of good installation practices as intricacies involved in installation are such that even if a single essential but apparently minor requirement is ignored or overlooked, the most reliable of instruments will be rendered useless.

The warranty is limited to as stated herein. Encardio-rite is not responsible for any consequential damages experienced by the user. There are no other warranties, expressed or implied, including but not limited to the implied warranties of merchantability and of fitness for a particular purpose. Encardio-rite is not responsible for any direct, indirect, incidental, special or consequential damage or loss caused to other equipment or people that the purchaser may experience as a result of installation or use of the product. The buyer's sole remedy for any breach of this agreement or any warranty by Encardio-rite shall not exceed the purchase price paid by the purchaser to Encardio-rite. Under no circumstances will Encardio-rite reimburse the claimant for loss incurred in removing and/or reinstalling equipment.

A lot of effort has been made and precaution for accuracy taken in preparing instruction manuals and software. However best of instruction manuals and software cannot provide for each and every condition in field that may affect performance of the product. Encardio-rite neither assumes responsibility for any omissions or errors that may appear nor assumes liability for any damage or loss that results from use of Encardio-rite products in accordance with the information contained in the manuals or software.

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