soil
INSTRUMENTS

Man 052

Standpipe Piezometer

User Manual

What's this manual about?

This manual tells you about the Standpipe Piezometer (also known as a Casagrande Piezometer) and how to use it to monitor piezometric water levels in vertical boreholes.

Who does this apply to?

Installers, field engineers and technicians who need to monitor piezometric water levels in vertical boreholes.

Welcome!

Thank you for choosing the Standpipe Piezometer.

This manual has been written to provide you with relevant information and to guide you in best practice when using a Standpipe Piezometer in order for you to gain the most from our product.

Please read this manual thoroughly before use to help avoid any problems and keep it handy when using a Standpipe Piezometer.

Standpipe Piezometer

The Standpipe Piezometer (also known as a Casagrande Piezometer) is used to monitor piezometric water levels in vertical boreholes.

The Standpipe Piezometer typically comprises two parts; at its lowest point is a porous piezometer tip and connected to the tip is a riser pipe which continues upwards out of the top of the borehole.

Alternative filter tip types may be driven or pushed into soft soil; different tip designs are available to suit various types of ground.

The advantage of the standpipe piezometer lies in its simplicity; it is inexpensive and has no moving parts.

The piezometer can be used for in-situ permeability tests and can be adapted for remote reading.

Contents

PRECISELY MEASURED

instrumentation and monitoring

Part I – General User Guide

Contents

This section contains the following topics.

Introduction:
Important Information

The following symbols are used throughout the manual

WARNING

IMPORTANT INFORMATION

TIP

QUESTION

! Important: Failure to adhere to the warnings in this manual may result in network disruption and possible data loss.

Failure to observe the warning may result in injury, product malfunction, unexpected readings or damage to the product that may invalidate its warranty.

Tips give additional information that may be helpful when using a Standpipe Piezometer

PRODUCT CHANGES

Soil Instruments has an on-going policy of design review and reserves the right to amend the design of their product and this instruction manual without notice.

WARRANTY

Please refer to our terms and conditions of sale for warranty information provided. Batteries are a consumable item and are excluded from any warranty.

DISPOSAL

Products marked with the  symbol are subject to the following disposal rules in European countries:

- **This product is designated for separate collection at an appropriate collection point**
- **Do not dispose of as household waste**
- **For more information, contact Soil Instruments or the local authority in charge of waste management.**

System Description
Things You Need to Know About the Standpipe Piezometer

FEATURES

- Option of porous plastic or ceramic filter tips to suit site requirements
- Choice of PVC or galvanized steel riser pipe
- Drive-in tips available for driving or pushing into soft soil
- Different tip designs available to suit various types of ground
- Can measure artesian pressures using a Bourdon Gauge readout

BENEFITS

- Simple, low cost system
- Various options available to suit site applications
- Ideal for routine site investigation
- Excellent long-term reliability

System Components

THE STANDPIPE PIEZOMETER

The standpipe piezometer system in its basic form is the simplest groundwater measurement apparatus available and consists of a standpipe tube with a porous tip at its lower end, normally installed down a borehole.

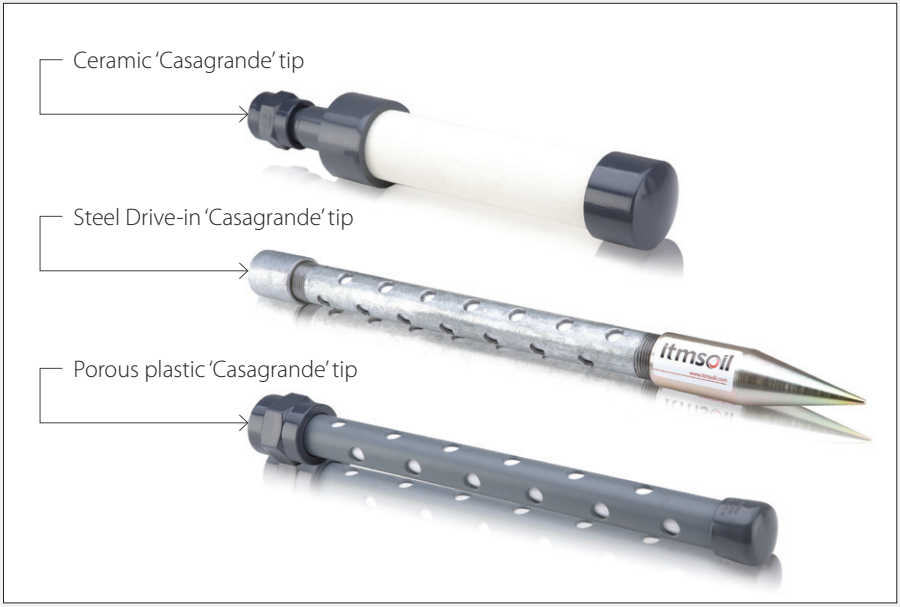
Alternative types may be driven or pushed into soft soil using different tips; ceramic and plastic tips are available to suit various ground conditions.

Groundwater can enter the tube only through the tip and therefore the water pressure at the tip corresponds to the height of the water column above the tips elevation.

The water surface is detected using a Water Level Meter, which is lowered on a calibrated cable inside the standpipe and emits an audio (buzzer) and visual (light) signal on contact with the water.

A Bourdon pressure gauge connected to the top of the standpipe enables reading under artesian conditions.

Standpipe Piezometer Tip Components



STANDPIPE PIEZOMETER TIPS (BOREHOLE)

There are two 'Casagrande' type borehole piezometer tips available for borehole installations; ceramic and porous plastic.

Both have low resistance to air entry qualities and a permeability of 3 x 10-4 m/s. The diameters range from 32mm to 50mm.

These tips are intended for borehole installations in saturated soils and rocks with heavy gauge, rigid PVC end-threaded standpipe tubing.

STANDPIPE PIEZOMETER TIPS (DRIVE-IN)

There are two drive-in tips with associated galvanised mild steel end threaded standpipe tubing available; the 'Casagrande' tip and the 'Cambridge' tip.

Both have low resistance to air entry qualities and a permeability of 3 x 10-4 m/s. The diameter of the tips are 43mm for the 'Casagrande' tip and 27mm for the 'Cambridge' tip.

The 'Cambridge' Drive-in Piezometer is suitable for installation in soft soils to a depth generally no greater than about 10 metres. The tip comprises a cylindrical porous plastic element, which is protected by a conical ended steel guard. The guard is driven just beyond the element by a mandrel when the Piezometer is at the desired elevation; this is particularly suited for installation in very soft material where there is a high risk of smearing the element.

WATER LEVEL METER

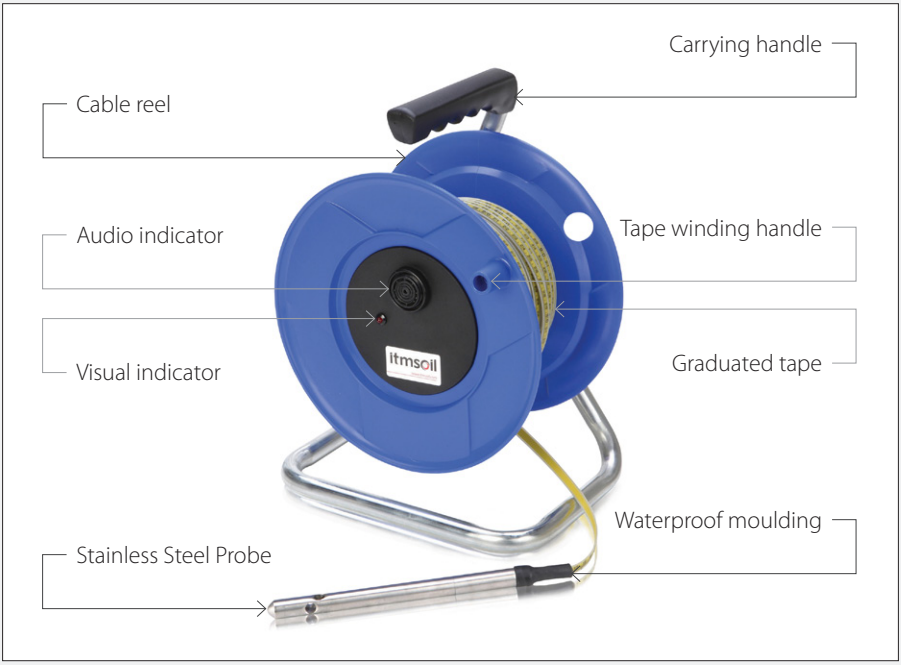
The Water Level Meter comprises a Stainless Steel probe fitted to a flexible graduated cable which is wound on to a hand reel containing a transistorised switched circuit, audio (buzzer) and visual (LED light) indicators and a battery.

The meter is simple to use and being portable, can be used at many locations. The tape design prevents it from sticking to wet surfaces, such as the lining of a borehole, ensuring accurate measurements.

There are two versions of the Water Level Meter; one with a small diameter probe and one with a standard diameter probe.
The standard probe version is also available with an optional digital temperature indicator.

For further information on the Water level Meter, please refer to datasheet ***W7 – Water Level Meter*** which can be downloaded from our ***website www.itmsoil.com*** or our support ***site www.itmsoilsupport.com***

Water Level Meter Components



REMOTE READING SYSTEMS

The Standpipe Piezometer can be simply adapted for remote reading using a single electric pressure transducer that is suspended within the standpipe tube at a specific depth and terminated at a remote reading station. Any change in water 'head' above the transducer can be detected and related to the pressure at the piezometer tip.

Quick Guide to Installing a Standpipe Piezometer

Follow the precautions outlined in this manual at all times to ensure the correct working order of your instrument.

It is essential that the equipment covered by this manual is handled, operated and maintained by competent and suitably qualified personnel.

To guide you in the competence required for installing each instrument in our product range, Soil Instruments provide you with a recommended skill level in all of our manuals and datasheets.

BOREHOLE INSTALLATION:

Soil Instruments recommend an **basic** skill level for installing a Standpipe Piezometer.

Ensure that no slurry or drilling material is present in the borehole as this will contaminate and block the sand cell and piezometer tip filter element. If present, clean out the borehole immediately before installing piezometer.

The installed depth of the piezometer tip is usually taken to be from ground level to the mid point of the tip. Therefore, when specifying borehole depth, allowances must be made for the length of the sand cell around the tip.

STEP	ACTION
1	Finalise the installed reduced level of the piezometer tip, length of sand cell and length of the Bentonite plug seal above the sand cell
2	Specify borehole diameter
3	After borehole completion, ensure total depth is as specified using a weighted measuring tape

STEP	ACTION
4	Determine the precise depth to the bottom of drill casing (if present)
5	If clean water is not already present in the borehole, fill it with water to cover the distance of the sand cell and the Bentonite plug
6	Pour coarse, clean filter sand through the water to the base of the piezometer tip and allow to settle. Tamp the sand to form a firm base
7	Using PVC cement, connect the piezometer tip to the first length of standpipe tubing using the appropriate coupling supplied

Make sure that the surfaces to be joined are clean and dry.

STEP	ACTION
8	Lower the tip and the tubing down the borehole making additional threaded or push-fit connections with PVC cement to the standpipe tube as required, until the piezometer tip reaches the sand filter
9	Slowly pour coarse, clean filter sand through the water until the sand filter is at the required distance
10	Allow the sand to settle before taking a depth measurement with a weighted measuring tape
11	Withdraw the drill casing (if present) until the bottom of the casing is approximately 0.3 metres below the top of the sand filter
12	Slowly pour Bentonite pellets through the water until the plug seal is at the required distance and tamp the pellets

Take care not to block the drill casing with the Bentonite pellets. If necessary withdraw the casing as the Bentonite plug is formed.

STEP	ACTION
13	Push an end cap over the standpipe tube to prevent accidental entry of soil, fill and debris and to prevent subsequent blockages
14	Backfill the borehole with grout or specified backfill material, withdrawing the drill casing as the backfilling proceeds
15	Construct Headworks (if required)

DRIVE-IN INSTALLATION: Drive-in Standpipe Piezometers are installed in soft to firm soils to a maximum depth of 10 metres using either a 'Casagrande' or 'Cambridge' tip.

'CASAGRANDE' TIP

STEP	ACTION
1	Excavate a starter pit to remove grass and root material
2	Measure and mark on the standpipe tubes the ground level corresponding to the required installation depth of the tip centre
3	Connect the tip to a 1metre length of steel standpipe tube and the jar plate
4	Hold the assembly vertical and drive down with the driving monkey
5	Connect further standpipe tubes as required, repositioning the jar plate as driving proceeds, until the ground level mark coincides with the actual ground level
6	Seal the top of the standpipe to prevent accidental entry of soil, fill and rock and to prevent subsequent blockages
7	Backfill the starter pit with concrete and/or construct 'Headworks' (if required)

'CAMBRIDGE' TIP

STEP	ACTION
1	Excavate a starter pit to remove grass and root material
2	Measure and mark on the standpipe tubes the ground level corresponding to the required installation depth of the tip centre
3	Connect the tip to a 1metre length of steel standpipe tube and the jar plate
4	Hold the assembly vertical and drive down with the driving monkey
5	Connect further standpipe tubes as required, repositioning the jar plate as driving proceeds, until the ground level mark coincides with the actual ground level
6	Remove the driving head and insert the mandrel and installing rods into the standpipe to locate the conical end of the steel guard
7	Extend the guard to expose the porous tip by gently pushing the installing rods, or by tapping with a hammer
8	Remove the mandrel assembly
9	Seal the top of the standpipe to prevent accidental entry of soil, fill and rock and to prevent subsequent blockages
10	Backfill the starter pit with concrete and/or construct 'Headworks' (if required)

TELESCOPING STANDPIPE TUBING

Telescoping Standpipe Tubing is installed when an excessive amount of settlement is expected. It comprises of two tubes that are capable of telescoping into each other once the skin friction of the soil drags on the outer skin.

Typically they are supplied in three metre lengths as a complete unit.

Two 'O' rings are used between the inner and outer tube to stop ingress of material.

The telescoping sections compensate for the settlement that would otherwise render the installation useless by bending the tube to a point that the Water Level Meter probe would be unable to travel down the tube.

The standard three metre length will allow for one metre of settlement. It is supplied with a threaded male end on the inner tube and a threaded female end on the outer tube for ease of installation.

Installation of telescoping tubing follows the same process as standard tubing, although it must be assured that the telescoping sections are fully extended to allow for maximum settlement compensation.

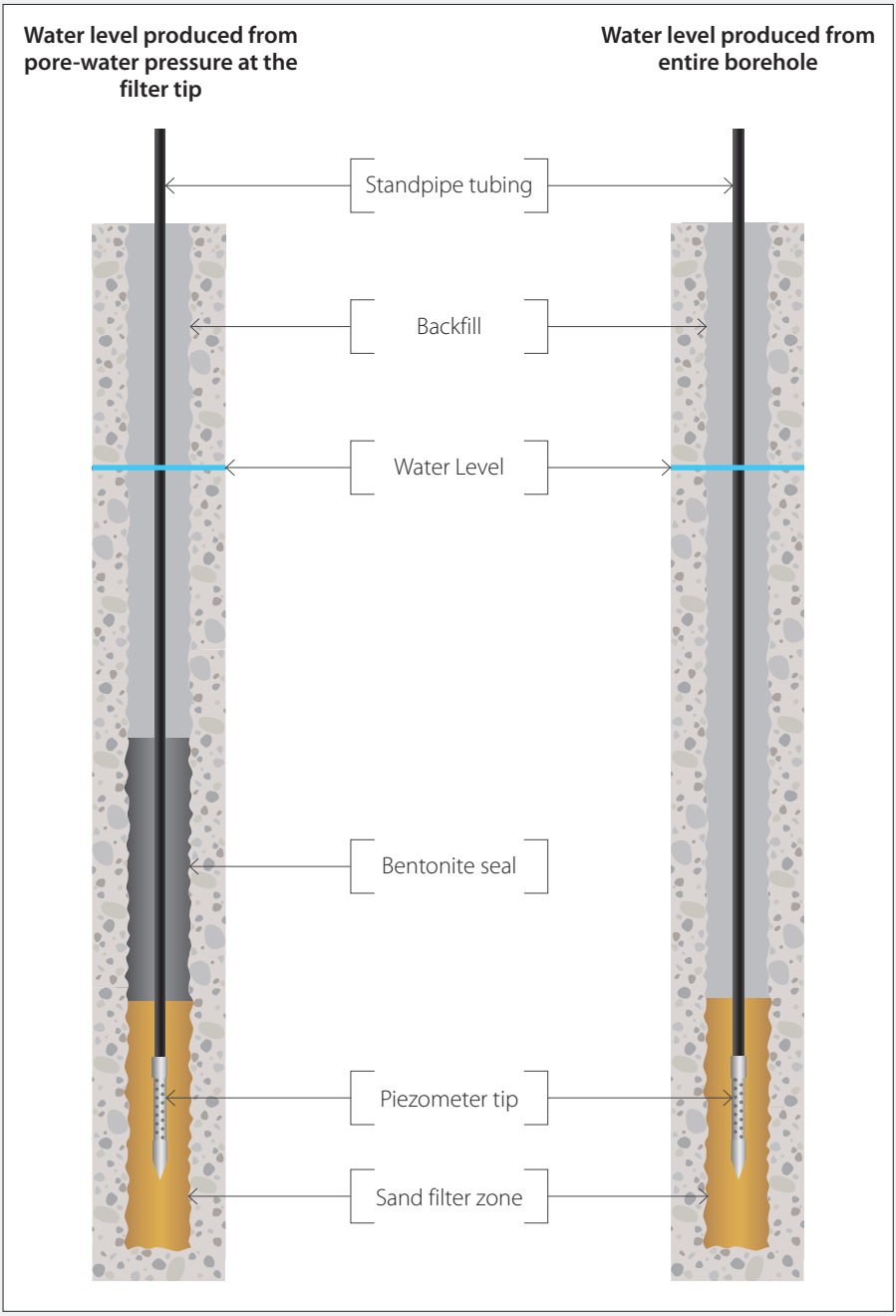
If settlement and heave are expected, the telescoping tubing should be installed at half extension, allowing for half (0.5) metre of travel in each direction.

Part II - Appendices

Contents

This section contains the following topics.

Appendix B - Standpipe Piezometer Installation Types



SUPPORT

www.itmsoilsupport.com

+44 (0) 1825 765044

Bell Lane, Uckfield, East Sussex
TN22 1QL United Kingdom

t: +44 (0) 1825 765044
f: +44 (0) 1825 744398

e: info@itmsoil.com
w: www.itmsoil.com