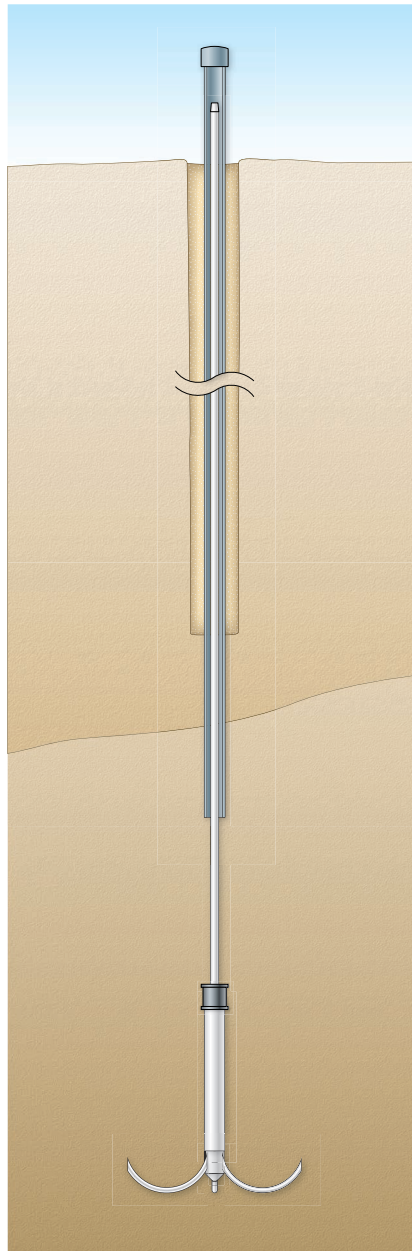




Model 1950

Borros Type Settlement Point

Instruction Manual



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TABLE OF CONTENTS

1. INTRODUCTION	1
2. INSTALLATION	2
3. TAKING READINGS	3
4. DATA REDUCTION	4

1. INTRODUCTION

GEOKON Model 1950 Borros Anchor Type Settlement Point is designed to measure subsurface settlements. Its primary use is the measurement settlements in soft ground due to the placement of surcharges, fills, and embankments on the ground surface. It may also be used to measure heave. It consists essentially of a small diameter riser pipe anchored at depth using a Borros Anchor. This riser pipe is surrounded by a larger pipe that isolates it from downdrag forces caused by the settling soil above the anchor. Settlements of the anchor are measured using conventional level survey techniques to the top of the riser pipe.

The settlement heave point consist of a three-pronged borros anchor and sections of 1/4" schedule 40 steel riser pipe inside sections of 1" schedule 40 steel pipe. The pipes are assembled together with couplings to the required anchor depths. Several borros anchor settlement points installed at different depths can reveal the amount of settlement occurring in different subsurface zones.

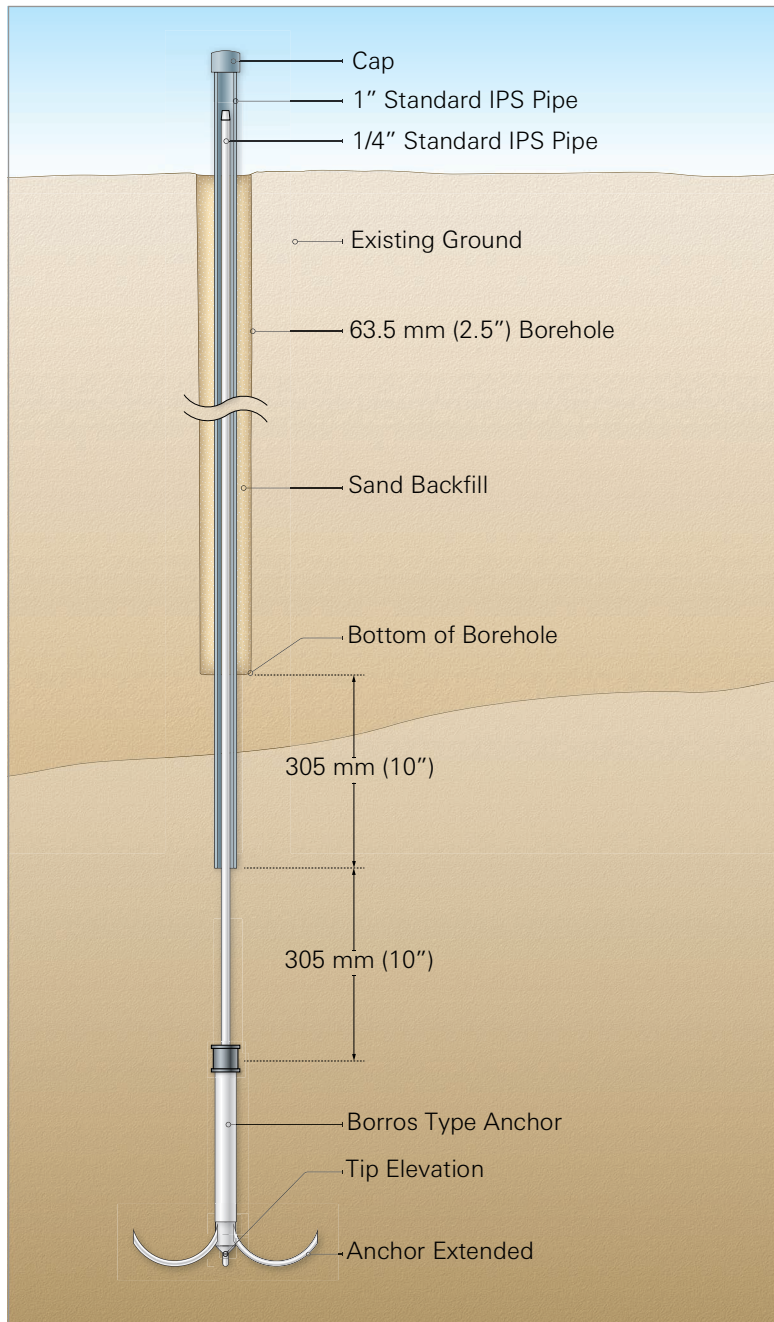


FIGURE 1: Typical Heave/Settlement Point Installation

2. INSTALLATION

In very soft ground the anchor installation can be driven all the way from the surface to its desired depth. However, if the ground is not soft enough to allow this, a borehole must be drilled down to 1 m (3') above the planned anchor tip location.

The procedure for assembling the heave/settlement point is as follows:

1. Connect the anchor to the first length of 1/4" riser pipe using a wrench.
2. Push a 1 m (3') length of tubing over the riser pipe. Tubing is available for purchase through GEOKON (TUB-400), or can be customer supplied (a garden hose can be used).
 - The inner diameter of the tubing must fit over the 1/4" riser pipe, which has an outer diameter of 14 mm (0.540").
 - The outer diameter of the tubing must be no wider than 25.4 mm (1").

Note: The purpose of the tubing is to prevent dirt from being forced up between the 1/4" riser pipe and the bottom of the 1" pipe which could cause them to bind together allowing the down-drag forces of the settling ground on the 1" pipe to push the anchor prongs and riser pipe downwards through the soil.

3. The first section of 1" pipe, with a left hand thread, is slipped over the tubing and connected to the body of the anchor by means of the well greased left hand thread, which is tightened only finger tight.
4. Additional pipe sections are assembled as the anchor is driven/lowered into the soil/borehole (Step 5). All of these couplings must be tightened wrench tight.
5. Drive the pointed body of the anchor into the ground surface (or into the bottom of the borehole for a distance of 1 m or 3') by pressing or hammering on the top of the 1" pipe.

Note: It is recommended during this process that a coupling be threaded on the top of the 1" pipe to prevent damage to the threads.

Important! Do not drive the assembly via the 1/4" pipe. This would prematurely engage the anchor prongs.

6. When the anchor tip has reached the desired depth secure the 1" pipe in position. With the pipe clamped, screw a 1/4" pipe cap to the top of the 1/4" pipe.
7. Drive the 1/4" pipe downwards approximately 175 mm (7") relative to the 1" pipe using a hydraulic drilling machine or hammering by hand. This operation will extend the anchor prongs and secure it in the soil.
8. Detach the 1" pipe from the anchor by rotating the pipe in a clockwise direction for a minimum of 15 revolutions.
9. Raise the 1" pipe upwards for a distance greater than the anticipated compression of the soil above the anchor location.
10. Screw a pipe cap onto the top of the 1" pipe.
11. If a borehole was drilled:
 - a. Remove casing from the borehole if applicable.
 - b. Fill the annular space around the outside of the 1" pipe with clean sand. If grout is used it should have the same stiffness as the surrounding soil.

For settlement points in fills or surcharges it will be necessary to add additional lengths of 1/4" riser pipe and 1" pipe as more and more fill is placed. Keep the top of the 1" pipe between 0.3 m to 1.5 m (1' to 5') above the surface of the fill. The material surrounding the 1" pipe must be hand placed to avoid damage to the installation. The 1" pipe should be clearly flagged so that it is not damaged by construction equipment.

3. TAKING READINGS

Readings are taken using standard level surveying techniques referenced to the elevation of some stable bench mark where there is no settlement.

To take elevation readings remove the 1" pipe cap and set the survey leveling rod on top of the 1/4" riser pipe. This may require the use of a short length of rod that will fit down inside the 1" pipe and rest on the top of the 1/4" riser pipe. The leveling rod will then sit on the top of this rod.

When additional lengths of riser pipe and 1" pipe are added it will be necessary to do this while survey readings are being taken. In this way a reading can be taken before and after adding the new lengths. If this is not possible then keep an accurate record of the length of the riser pipe added.

After reading replace the 1" cap.

4. DATA REDUCTION

The current elevation reading minus the initial elevation reading will give the amount of settlement that has occurred at the elevation of the tip of the anchor.

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