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Instruction Manual

Model 1950

Borros Type
Settlement Point

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1. INTRODUCTION

The 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.

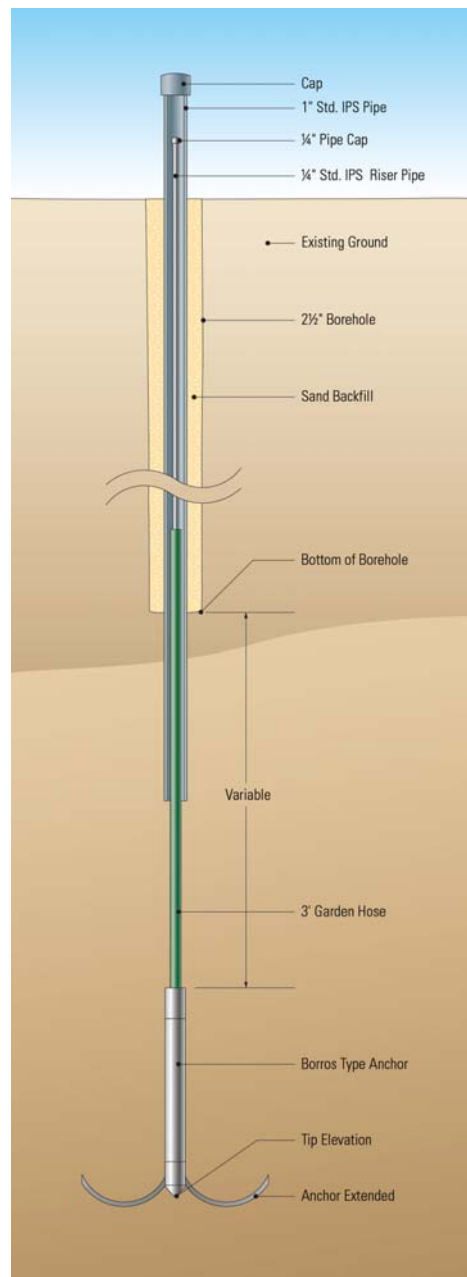


Figure 1-Typical Borros Anchor Settlement/Heave Point.

The Settlement Heave Point consist of sections of ¼ inch steel riser pipe inside sections of 1 inch steel pipe, plus a three-pronged Borros Anchor Anchor. Several Borros Anchor Settlement Points installed at different depths can reveal the amount of settlement occurring in different subsurface zones.

2. INSTALLATION

In very soft ground the Borros Anchor can be driven all the way from the surface to its desired depth. But if the ground is not soft enough to allow this then the usual practice is to drill a borehole to one meter, (3 ft) above the planned anchor location.

The prongs of the anchor are connected to the first length of ¼ inch riser pipe using a wrench,.

A 1 meter (3 ft) length of garden hose is pushed over the riser pipe.

[Note the purpose of the garden hose is to prevent dirt from being forced up between the ¼ inch riser pipe and the bottom of the 1 inch pipe which could cause them to bind together allowing the down-drag forces of the settling ground on the 1 inch pipe to push the anchor prongs and riser pipe downwards through the soil].

The first section of 1 inch pipe, **(the one with the left hand thread)** is slipped over the garden hose and connected to the body of the anchor by means of the well greased left hand thread, **which is tightened only finger tight.**

As more and more sections of ¼ inch and 1 inch pipe are added all the joints are tightened wrench tight.

The pointed body of the Borros Anchor is now driven into either the ground surface, or the bottom of the borehole for a distance of 1 meter (3 feet) by pressing or hammering on the top of the 1 inch pipe. (It is recommended that a 1 inch pipe coupling be threaded on the top of the string to prevent damage to the threads of the 1 inch pipe so that a protective cap and/or additional sections of pipe can be added later,

When the anchor body has reached the desired depth the prongs can be pushed out into the soft ground by using a wrench or wrenches to grip firmly the 1 inch pipe. Screw a ¼ inch pipe cap to the top of the ¼ inch pipe and then, by pushing (using the drill machine) or hammering by hand on the top of the riser pipe, drive the riser pipe until it moves downwards relative to the 1 inch pipe by 7 inches (175mm). This forces the anchor prongs in a circular arc out into the surrounding soil.

The 1 inch pipe can now be detached from the anchor body by rotating the 1 inch pipe in a clockwise direction to disengage the left hand thread. When certain that the 1 inch pipe is completely loose (a minimum of 15 revolutions are recommended)

The 1 inch pipe is now bumped upwards for a distance greater than the anticipated compression of the soil above the anchor location.

Screw a 1 inch pipe cap onto the top of the 1 inch pipe.

If the borehole was cased now would be a good time to remove the casing.

In the cases where the settlement point is pushed into the bottom of a borehole the borehole needs to be back filled 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 riser pipe and 1 inch pipe as more and more fill is placed. Keep the top of the 1 inch pipe between 1 and 5 feet above the surface of the fill. The material surrounding the 1 inch pipe must be hand placed to avoid damage to the installation. The 1 inch 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 inch pipe cap and set the survey leveling rod on top of the riser pipe. This may require the use of a short length of rod that will fit down inside the 1 inch pipe and rest on the top of the riser pipe. The leveling rod will then sit on the top of this rod.

When additional lengths of riser pipe and 1 inch 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 inch 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 Borros anchor.