

# Heave/Settlement Point

## Application

The heave/settlement point is used to monitor settlement under surcharges or embankments. It is also used to monitor heave (uplift) resulting from excavation or grouting.

The Borros-type anchor is designed for soft clays. It is difficult to extend the prongs of the anchor in other types of soil, such as stiff, over-consolidated clays, shales, dense sand, or sand and gravel.

## Description

A heave/settlement point consists of a three-pronged anchor, a 1/4-inch inner pipe, and a one-inch outer pipe, both steel. The inner pipe is attached to the anchor and is free to move inside the one-inch outer pipe.

An optical survey is used to determine the elevation of the top of the inner pipe. Changes in its elevation indicate an equivalent amount of settlement or heave at the anchor.

## Typical Installation

Drill a borehole to a depth slightly shallower than the intended depth of the anchor. Flush debris from the borehole.

Remove the special coupling supplied with the anchor and thread it onto the bottom length of one-inch pipe. Tighten it with a wrench so that it will not loosen.

Thread the first full length of 1/4 inch pipe onto the pipe supplied with the anchor and tighten it with a wrench.

Next, grease the one-inch threads on the anchor. Then slide the one-inch pipe over the 1/4 inch pipe until it meets the anchor. Hand-tighten the one-inch-pipe to the anchor. Do not over-tighten, since the pipe must be detached from the anchor later.

Lower the anchor and pipe into the borehole, adding additional pipe sections of both sizes as needed.

When the anchor reaches the bottom of the borehole, push or drive the

one-inch pipe into the ground until the anchor is at the specified depth.

Secure the top of the one-inch pipe to hold the anchor in place. With the outer pipe held securely, push the inner pipe downwards about 7 inches to fully expand the legs of the anchor. Use the drill rig to do this.

Detach the one-inch pipe from the anchor by rotating it in a clockwise direction for at least 15 complete turns. Then pull the one-inch pipe upwards, away from the anchor, until the distance between the bottom of the pipe and the anchor is slightly greater than the maximum expected settlement or heave.

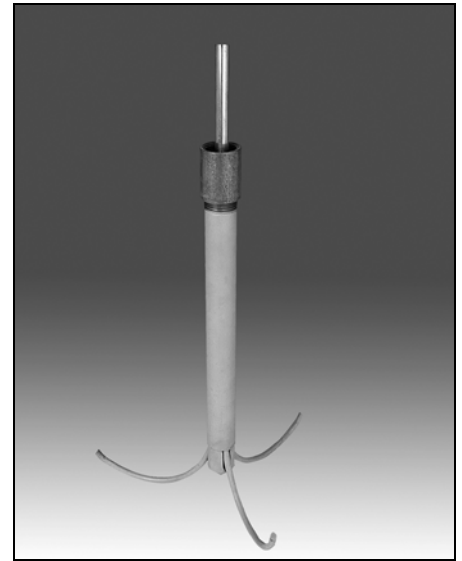
It is important, both during and after installation, to prevent rocks or other debris from entering the annular space around the inner pipe.

Withdraw the drill casing, if used, and backfill the annular space around the one-inch pipe with bentonite grout or as specified.

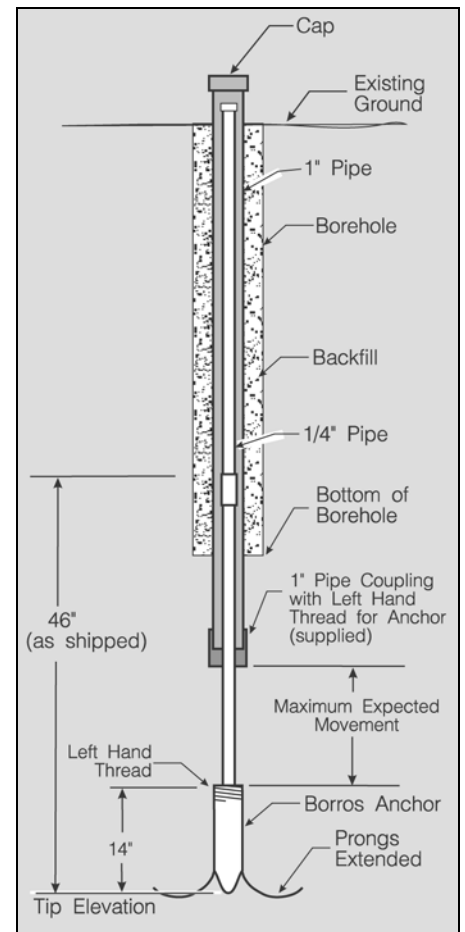
Protect the installation with an empty 50 gallon drum or some other large, highly visible object.

As the embankment continues to rise, add sections of inner and outer pipe to maintain the top of the pipe 1 to 5 feet above the surface of the fill. Place the fill around the pipe by hand to avoid damaging the installation. The top of the inner pipe should be optically surveyed before and after adding each section. If this is not possible, be sure to measure the added length of the inner pipe.

In excavations, sections of inner and outer pipe are removed to maintain the top of the pipe at a manageable 1 to 5 feet above the surface. The top of the inner pipe should be optically surveyed before and after removing each section. If this is not possible, be sure to measure the subtracted length of the pipe.



Borros-type anchor



Typical Installation

## ORDERING INFORMATION

### Heave/Settlement Point . . . . .51808000

The anchor is approximately 14 inches (356 mm) tall. The permanently attached ¼ inch pipe extends approximately 32 inches (813 mm) above the top of the anchor. A special left-hand threaded coupling is included with the anchor.

Users should obtain the required lengths of ¼ inch and one-inch pipe locally. The anchor has standard NPT threads. Users in UK should order, or obtain locally, BSP to NPT thread adaptors for both the 1-inch and ¼ inch pipes. Users with other size pipes and threads can usually find adaptors to NPT or BSP threads locally.