

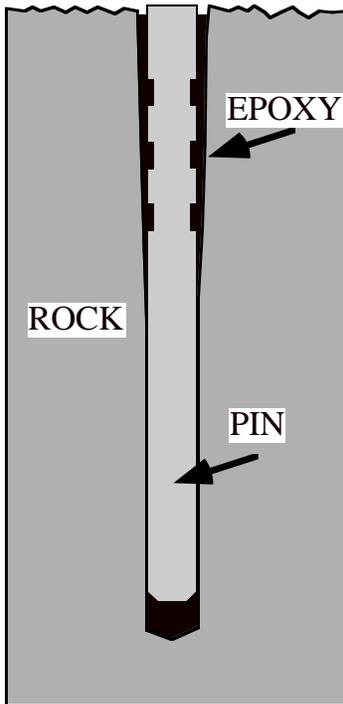
## INSTALLATION OF STAINLESS STEEL PINS AS GEODETIC MARKERS

*NOTE: These instructions assume you are using version 2 of the 6" x 1/2" diam. stainless steel pins developed at NCSU. See the separate document on pin specifications and fabrication details.*

First, stamp the station name on the top of the pin. Four letter names are standard. We use 1/8" rotary stamp kits for this purpose. We have devised a steel tube fitted to a footplate to hold the pin steady during stamping. Stamp the name around the hole taking up about half of the pin's top, as indicated in the figure, right.



At a site with competent bedrock (not a boulder!) find an area in which to install the pin. Choose a local high, so the pin will rarely sit in a pool of water. Drill a hole with a rotary hammer drill and a 1/2" carbide hammer bit. We can recommend the following drills: the Ryobi ER-160 (gasoline-powered), the Bosch 7/8" Rotary Hammer model 11207VS and the Hilti TE-22 (both of which require a portable generator to power them, via a heavy extension cord) and for remote areas where it is not easy to bring gasoline or a generator the cordless battery powered Hilti TE-10A with several pre-charged battery packs. All these drills use SDS bits. We prefer bits with 8" of drilling length. 10" & 12" lengths are more common, but involve extra weight & cost.



### PLAN A: Friction fitted and Epoxied

The hole should be about 1/2" deeper than the pin, as shown in the schematic section, left. The preferred method is to achieve a friction fit between the pin and the rock. This is usually possible using a 1/2" drill bit. The hole tends to widen near the top because the bit pivots about its tip early in the drilling. Drill the hole, and blow all dust out of the hole with a long flexible tube. See how far the pin will fall into the hole. If the top 1/2"-3/4" of the pin sticks out of the hole then a good fit should be possible. If more than 1" sticks out it will probably be too hard to insert the pin, and you should consider plan B. If the pin falls all the way down into the hole then a friction fit is impossible, and you must epoxy the pin into place. After a little practice all will be obvious. Practice at home, not in the field! You will notice the same bit drilling different sized holes in different types of rock.

Given a suitable hole proceed as follows. Remove the pin. Squirt a little Hilti C-100 epoxy into the hole, and charge the grooves in the pin with the epoxy. We recommend latex gloves so you can use your fingers. Hammer the pin into the hole until it is flush with the rock surface. Use a suitably shaped piece of aluminum

between the pin and the hammer to prevent damage to the pin. The epoxy should squirt out of the hole. With practice you use just the right amount of epoxy to prevent waste. No air spaces should remain in the hole.

PLAN B: Epoxied. If the rock is such that the hole is too tight for the pin, use a 5/8" bit to drill a wider hole, and simply epoxy the pin in place.

NOTES: Be sure to use Hilti C-100 epoxy - it is reliable and widely available. Take plenty of spare carbide bits for the drill. If you have to press down hard on a drill the bit is too blunt!

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Note added in 1998. If you intend to use the Tech2000 antenna mast with this marker, it is a good idea to have the pin 'bottom out' on the rock, since the mast exerts strong downwards force on the pin. This requires a little extra care during the drilling. If the hole is longer than the pin then at a minimum you must ensure that this space is completely full of epoxy.