

Permanent station GPS/GNSS antenna monuments and mounts supported by UNAVCO (poster for UNAVCO Science Meeting, 2010)

646 Beth Bartel March 26, 2010 [Papers and Presentations](#), [Presentations](#) 2467

Permanent station GPS/GNSS antenna monuments and mounts supported by UNAVCO

Normandeau, J., Meertens, C., Bartel, B.
UNAVCO

Abstract

We compare eight long-term monuments and mounts currently in use in UNAVCO-supported projects. The designs range in height from 0 to 3 meters; substrates into which they are installed include soil, bedrock, and concrete; and costs range from approximately \$30 to \$15000. The more expensive options may be considered more stable, but in many places outside the US, logistical, economical, and material constraints make installation of deep- and shallow-drilled braced monuments at best difficult and at worst impossible. Simpler single-mast or concrete monuments offer less expensive, more portable installation options with acceptable stability.



Summary

The common goal of all monuments and mounts is to provide a stable, long-term reference point for geodesy and geodynamics. The design and construction of monuments and mounts must take into account the local and regional geology, the local climate, and the local environment. The design and construction of monuments and mounts must also take into account the local and regional geology, the local climate, and the local environment.

When choosing a monument and mount, consider:

- Stability: Is the ground stable?
- Local climate: Is the climate stable?
- Time: How long will the monument be in use?
- Materials: Are the materials durable?
- Installation: Is the installation feasible?
- Accessibility: Is the monument accessible?
- Cost: Is the cost reasonable?

Requesting support from UNAVCO

UNAVCO is a non-profit, membership governed consortium that supports and provides Earth science geodesy, high-precision techniques for the measurement and understanding of Earth's shape and size.

Monument	Deep drilled braced	Shallow braced	Concrete pillar	Thermopile	Polar mast	Shallow foundation mast	Stainless steel pin or mast	5/8" all-thread	Custom	
Description	A 4" diameter steel pipe is drilled 10-15 feet into bedrock. The pipe is braced with 1/2" diameter steel rods. The monument is constructed from 1/2" diameter steel rods.	A 4" diameter stainless steel pipe is drilled 10-15 feet into bedrock. The pipe is braced with 1/2" diameter steel rods. The monument is constructed from 1/2" diameter steel rods.	A 4" diameter stainless steel pipe is drilled 10-15 feet into bedrock. The pipe is braced with 1/2" diameter steel rods. The monument is constructed from 1/2" diameter steel rods.	A 4" diameter stainless steel pipe is drilled 10-15 feet into bedrock. The pipe is braced with 1/2" diameter steel rods. The monument is constructed from 1/2" diameter steel rods.	A 4" diameter stainless steel pipe is drilled 10-15 feet into bedrock. The pipe is braced with 1/2" diameter steel rods. The monument is constructed from 1/2" diameter steel rods.	A 4" diameter stainless steel pipe is drilled 10-15 feet into bedrock. The pipe is braced with 1/2" diameter steel rods. The monument is constructed from 1/2" diameter steel rods.	A 4" diameter stainless steel pipe is drilled 10-15 feet into bedrock. The pipe is braced with 1/2" diameter steel rods. The monument is constructed from 1/2" diameter steel rods.	A 4" diameter stainless steel pipe is drilled 10-15 feet into bedrock. The pipe is braced with 1/2" diameter steel rods. The monument is constructed from 1/2" diameter steel rods.	A 4" diameter stainless steel pipe is drilled 10-15 feet into bedrock. The pipe is braced with 1/2" diameter steel rods. The monument is constructed from 1/2" diameter steel rods.	A 4" diameter stainless steel pipe is drilled 10-15 feet into bedrock. The pipe is braced with 1/2" diameter steel rods. The monument is constructed from 1/2" diameter steel rods.
Substrate	Bedrock, unconsolidated	Bedrock (drilled), unconsolidated (grounded)	Bedrock, unconsolidated	Permafrost	Bedrock, concrete	Bedrock	Bedrock, concrete	Bedrock, concrete	Bedrock, concrete	
Stability	High	High	High	High	High	High	High	High	High	
Install Time	1-2 days	1-2 days	1-2 days	1-2 days	1-2 days	1-2 days	1-2 days	1-2 days	1-2 days	
Labor	2-3 people, 1-2 day crew	2-3 people	2-3 people	1 person, 1-2 day crew	1 person	1-2 people	1 person	1 person	1 person	
Cost	\$1,000-15,000 (incl. drilling)	\$500	\$500-1,000	\$1,000-15,000 (incl. drilling)	\$500	\$500	\$500	\$500	\$500	
Site Impact	High	Medium	Medium	High	Low	Low	Low	Low	Low	
Drilling Requirements	Large auger, 10-15 ft hole, 4" hole	Small auger, 10-15 ft hole, 4" hole	Small auger, 10-15 ft hole, 4" hole	Large auger, 10-15 ft hole, 4" hole	Small auger, 10-15 ft hole, 4" hole	Small auger, 10-15 ft hole, 4" hole	Small auger, 10-15 ft hole, 4" hole	Small auger, 10-15 ft hole, 4" hole	Small auger, 10-15 ft hole, 4" hole	
Where Used	Flow Boundary Observatory, BORIS, TIGER, CODE, TIGER	Flow Boundary Observatory, BORIS, TIGER, CODE, TIGER	Flow Boundary Observatory, BORIS, TIGER, CODE, TIGER	Flow Boundary Observatory, BORIS, TIGER, CODE, TIGER	Flow Boundary Observatory, BORIS, TIGER, CODE, TIGER	Flow Boundary Observatory, BORIS, TIGER, CODE, TIGER	Flow Boundary Observatory, BORIS, TIGER, CODE, TIGER	Flow Boundary Observatory, BORIS, TIGER, CODE, TIGER	Flow Boundary Observatory, BORIS, TIGER, CODE, TIGER	


Antenna Mounts



SOGN mount
A geodesy tool product. Only needed for SOGN mounts.



SICO JNT7 series stainless steel adapter
Low expansion and ultra precision made in the US. Available from SICO. SOGN available from www.sicoinc.com.



Cup and brass adapter
Inexpensive but no leveling ability. Requires the antenna to be aligned to mark. SOGN custom machined.



[Download poster as a .pdf file](#)

[Download poster in original format \(.png, created in Macromedia Fireworks\)](#)

Online URL:
<https://kb.unavco.org/article/permanent-station-gps-gnss-antenna-monuments-and-mounts-supported-by-unavco-poster-for-unavco-science-meeting-2010-646.html>