

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

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

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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 it take to install?
- Labor: How many people are needed?
- Materials: Are the materials available?
- Cost: How much will it cost?

Requesting support from UNAVCO

UNAVCO is a non-profit, membership-based organization that supports and provides Earth science geodesy. High-precision techniques for the measurement and understanding of Earth's shape and orientation in space and time.

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 1-2 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 1-2 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 1-2 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 1-2 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 1-2 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 1-2 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 1-2 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 1-2 feet into bedrock. The pipe is braced with 1/2" diameter steel rods. The monument is constructed from 1/2" diameter steel rods.	UNAVCO works with customers to design and construct monuments and mounts that meet their specific needs. We offer a wide range of monuments and mounts, including 1/2" diameter steel rods, 1/2" diameter stainless steel rods, and 1/2" diameter stainless steel rods.
Substrate	Bedrock, unconsolidated	Bedrock (drilled), unconsolidated (grounded)	Bedrock, unconsolidated	Permafrost	Bedrock, concrete	Bedrock	Bedrock, concrete	Bedrock, concrete		
Stability	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		
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		
Cost	\$1,000-15,000 (incl. drilling)	\$500	\$500-1,000	\$1,000-15,000 (incl. drilling)	\$500	\$500	\$500	\$500		
Site Impact	High	Medium	Medium	High	Low	Low	Low	Low		
Drilling Requirements	Large auger, 10-15 ft depth, 4" dia. hole	Small auger, 1-2 ft depth, 4" dia. hole	Small auger, 1-2 ft depth, 4" dia. hole	Large auger, 10-15 ft depth, 4" dia. hole	Small auger, 1-2 ft depth, 4" dia. hole	Small auger, 1-2 ft depth, 4" dia. hole	Small auger, 1-2 ft depth, 4" dia. hole	Small auger, 1-2 ft depth, 4" dia. hole		
Where Used	Flow Boundary Observatory, BARTON TOWER, CODE PEARL	Flow Boundary Observatory, BARTON TOWER, CODE PEARL, SOUTH POLE, etc.	Network and CODE	Flow Boundary Observatory	TANDEM POLARNET, South Pole	Flow Boundary Observatory	Flow Boundary Observatory, New Zealand	Galaxy Way, Southampton, UK, Antarctic, etc.		


Antenna Mounts



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



SICO JNT7 series stainless steel adapter
Low expansion and ultra precise. Made in the USA. Available from the University of Colorado, Boulder. SOGN available from www.unavco.com.



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



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