

# 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 the monuments and mounts currently in use in geodesy is to provide a stable, long-term reference point for the geodesy and geodesy-related activities. The monuments and mounts are used to provide a stable reference point for the geodesy and geodesy-related activities. The monuments and mounts are used to provide a stable reference point for the geodesy and geodesy-related activities.

### When choosing a monument and mount, consider:


- Stability: location, geodesy-related activities, and geodesy-related activities
- Cost: budget
- Time: time to install
- Availability: availability of materials and equipment
- Durability: durability of materials and equipment
- Accessibility: accessibility of the monument and mount

### Requesting support from UNAVCO

UNAVCO is a non-profit, membership-based organization that supports and provides geodesy and geodesy-related activities. UNAVCO can provide assistance with design, availability, and construction of geodesy monuments and mounts. To request support from UNAVCO, please contact [unavco@unavco.org](mailto:unavco@unavco.org) or call 1-800-451-7263.

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 steel rods and concrete. The monument is made of steel pipe and concrete.	A 4" diameter steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is made of steel pipe and concrete.	A 4" diameter steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is made of steel pipe and concrete.	A 4" diameter steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is made of steel pipe and concrete.	A 4" diameter steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is made of steel pipe and concrete.	A 4" diameter steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is made of steel pipe and concrete.	A 4" diameter steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is made of steel pipe and concrete.	A 4" diameter steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is made of steel pipe and concrete.	A 4" diameter steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is made of steel pipe and concrete.	UNAVCO works with customers to design and construct monuments and mounts. The monuments and mounts are made of steel pipe and concrete. The monuments and mounts are made of steel pipe and concrete.
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 diameter auger, 10-15 ft depth, 4" hole	Small diameter auger, 1-2 ft depth, 4" hole	Small diameter auger, 1-2 ft depth, 4" hole	Large diameter auger, 1-2 ft depth, 4" hole	Small diameter auger, 1-2 ft depth, 4" hole	Small diameter auger, 1-2 ft depth, 4" hole	Small diameter auger, 1-2 ft depth, 4" hole	Small diameter auger, 1-2 ft depth, 4" hole	Small diameter auger, 1-2 ft depth, 4" hole	
Where Used	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. STATE	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. STATE	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. STATE	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. STATE	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. STATE	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. STATE	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. STATE	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. STATE	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. STATE	


**Antenna Mounts**



**SOGN mount**  
A geodesy monument. Only needed for GPS/GNSS.



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Low expansion and high precision. Made in the USA. Available from [www.sicotech.com](http://www.sicotech.com).



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