

# 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 geodetic network. The monuments and mounts are designed to be stable over the long term (decades) and to be resistant to environmental changes. The monuments and mounts are designed to be stable over the long term (decades) and to be resistant to environmental changes. The monuments and mounts are designed to be stable over the long term (decades) and to be resistant to environmental changes.

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

- Stability: Is the monument/mount stable over the long term?
- Cost: Is the monument/mount affordable?
- Time: How long will it take to install?
- Labor: How many people are needed to install?
- Site: Is the monument/mount suitable for the site?
- Availability: Is the monument/mount available?

### Requesting support from UNAVCO

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

UNAVCO can provide assistance with design, availability, and construction of permanent monuments to GPS and GNSS stations.

To request support from UNAVCO, fill out a support request form at <http://www.unavco.org>. For questions, contact [unavco@unavco.org](mailto:unavco@unavco.org). For more information, visit [www.unavco.org](http://www.unavco.org).

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 4-6 feet high.	A 4" diameter stainless steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is 4-6 feet high.	A 4" diameter stainless steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is 4-6 feet high.	A 4" diameter stainless steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is 4-6 feet high.	A 4" diameter stainless steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is 4-6 feet high.	A 4" diameter stainless steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is 4-6 feet high.	A 4" diameter stainless steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is 4-6 feet high.	A 4" diameter stainless steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is 4-6 feet high.	A 4" diameter stainless steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is 4-6 feet high.	A 4" diameter stainless steel pipe is drilled 1-2 feet into bedrock. The pipe is braced with steel rods and concrete. The monument is 4-6 feet high.
Substrate	Bedrock, unconsolidated	Bedrock (drilled), unconsolidated	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, 1-2 ft hole, 4" hole	Small auger, 1-2 ft hole, 4" hole	Large auger, 10-15 ft hole, 4" hole	Small auger, 1-2 ft hole, 4" hole	Small auger, 1-2 ft hole, 4" hole	Small auger, 1-2 ft hole, 4" hole	Small auger, 1-2 ft hole, 4" hole	Small auger, 1-2 ft hole, 4" hole	
Where Used	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. Peak	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. Peak	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. Peak	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. Peak	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. Peak	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. Peak	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. Peak	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. Peak	Flow Boundary Observatory, BIRCHMOUNTAIN, COLO. Peak	


**Antenna Mounts**



**SOGN mount**  
A geodesy tool product. Only needed for a few stations.



**SICO JNT7 series stainless steel adapter**  
Low expansion and also proven used in the US National Geodetic Survey's CORS network.



**Cup and brass adapter**  
Inexpensive but no leveling ability, unless the antenna is adjusted to work.

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