

Geophone Installation Methods



Burial

According to ISEE recommendations, the hole for burying a geophone should be at least three times the height of the sensor. The bottom of the hole must be level and well-compacted to ensure solid ground coupling. Geophone spikes should be used to anchor the sensor firmly into the soil, and the surrounding area should be tightly compacted to eliminate air gaps and minimize the chance that the geophone will bounce around leading to inaccurate data.

Before covering with soil, verify the sensor's orientation with a level and perform a sensor check to ensure proper operation. Additionally, the cable should be laid out as flat and straight as possible to avoid crimping or damage.

Ideal Ground Conditions

- Soft to moderately firm soils (clay, loam, sand with cohesion)
- Easy to dig and provides tight coupling
- Not recommended for rocky, frozen, or highly compacted ground



Benefits of Burial

Excellent Ground Coupling

Direct contact with the soil ensures high-quality signal transmission.

Protection from Surface Noise

Subsurface placement reduces wind and air overpressure interference.

Stable and Accurate Results

Once aligned, the sensor stays firmly in place. Vibrations travelling through the ground are accurately captured.



Attachment

Attachment of a triaxial geophone is accomplished by bolting, clamping, or adhering the sensor directly to a rigid surface, such as concrete, rock, or structural steel. This can be done using a wall-mount bracket or a ground-leveling plate, depending on the application and the orientation required. The goal of the attachment is to achieve rigid, continuous contact between the sensor base and the surface, ensuring accurate transmission of ground vibrations without introducing resonance or mechanical decoupling.

While this method can provide reliable coupling on hard surfaces, the International Society of Explosives Engineers (ISEE) recommends using the attachment only when traditional installation methods—burial, spiking, or sandbagging—are not feasible. These alternative methods typically offer superior coupling with natural ground, resulting in better signal fidelity, particularly for low-frequency vibrations.

Proper surface preparation is essential for effective attachment. The mounting area should be clean, flat, and free of debris or loose particles, and care must be taken to minimize air gaps or unstable contact points.

Ideal Ground Conditions

- Hard, rigid surfaces (concrete pads, floors, tunnel walls)
- Steel frames or engineered platforms

Benefits of Attachment

High Precision Alignment

Ideal for tunnel monitoring where directionality matters.

Stable Ground Contact

Easily secure geophones on surfaces that are not level, like bedrock.

Minimized Measurement Errors

Keeps the geophone properly aligned, especially on uneven ground.



Triaxial Geophone
Leveling Plate
(P/N:714A1801)



Triaxial Geophone
Wall Mount Kit
(P/N:718A1101)



Sandbagging with Spikes

Sandbagging is a surface installation method used when burial or rigid attachment is not practical, particularly in areas with shallow topsoil or where minimal ground disturbance is required. Where applicable, the sod or surface vegetation is first removed to expose a bare patch of compacted soil. Minimal disruption to the underlying ground structure should be ensured.

The geophone should be placed directly on the exposed soil, with its base in firm contact with the surface. A sandbag, filled with approximately 4.55 kg (10 lb) of dry sand, is then positioned over the sensor to apply consistent downward pressure. The sandbag should be low-profile and wide, maximizing surface area coverage to prevent tipping and to maintain uniform coupling pressure across the sensor housing. It is critical that the sandbag maintains firm contact with both the sensor and the surrounding ground to suppress surface noise and ensure consistent data quality.

For enhanced coupling, especially in loose or uneven terrain, a combination of spiking and sandbagging is recommended. The geophone spikes penetrate the soil, anchoring the device in place, while the sandbag adds additional pressure and stability, improving both vertical and lateral coupling and reducing susceptibility to wind or surface vibrations.



Ideal Ground Conditions

- Loose or uneven ground where burial is impractical (gravel)
- Minimal ground disturbance is required (heritage site, sensitive area)

Benefits of Sandbagging

Quick Deployment

No digging or mounting saves installation time.

Dampens Surface Vibrations

Sandbags add pressure and mass to the geophone which enhances stability and contact and helps dampen surface vibrations.