

## Excavating in the Vicinity of High Voltage Underground Cables

Keyhole coring, like all excavation involving jack hammers, augers, drills, back hoes, concrete cutting saws, bar holing devices or even hand digging, represents a potential hazard to crews working in an area where electrically charged cables are shallowly buried (less than 8-12 inches) beneath the base of the paved surface, should the excavation device make contact with that cable.

### Equipotential Bonding

This paper discusses the advantages of using Equipotential Bonding to reduce the risk of injury to the operator.

The purpose of equipotential bonding is to bring metallic objects such as the excavation equipment and the electrical cable to the same potential, thus reducing the shock hazard to the operator.

The use of acceptable equipotential bonding methods should be considered when you are within the limits of approach of a buried electrical circuit where there is a possibility that the excavating equipment will make contact with that circuit and become energized. The application of equipotential bonding is to protect the operator from those harmful shock currents emanating from the energized equipment.

**This document is a guideline** and does not necessarily provide the only acceptable means of dealing with the issues of coring or excavating in the vicinity of buried facilities.

The information in this document should be considered in conjunction with current legislation and regulations, and is not intended to replace any internal safety policies your company adheres to.

### What is the Difference Between Grounding and Bonding?

**Grounding** is a method of connecting an isolated conductor to some type of ground in order to trip the circuit as quickly as possible and minimize voltage rise on the circuit. Grounding, by itself, does not protect an operator from harmful shock currents.

**Bonding** is a method of physically interconnecting conductive parts to maintain a common potential. The objective of bonding is to avoid harmful shock currents by minimizing any potential difference across the operator's body. Sometimes referred to a "bird on the wire" phenomenon, an adequately sized jumper cable is used to tie the coring equipment to a bonding point such as an equipotential bond or ground mat at the operator's feet.

Equipotential bonding is required to protect an operator from harmful shock currents if the excavation device comes in contact with an electrically charged object or cable. The operator is protected by making him, like a bird on an energized wire, part of an entire energized system in which the operator's hands and feet are all at the same potential, with the result that there will be limited current flow through the operator.

### Recommended Procedures for Keyhole Coring When in the Vicinity of Buried Electrical Plant

- **Always obtain proper locates from all utility owners.**

- When underground electrical plant is found to be in the vicinity of the area to be keyhole cored, ensure (using a locator or other method) that there is a **minimum of 8-12 inches clearance** between the base of the pavement to be cored and the top of the buried electrical plant.
- If proximity of buried electrical plant cannot be accurately established, or has less than 8-12 inches of clearance from the bottom of the pavement layer to the top of the buried electrical plant, refer to procedures below and consider employing an **Equipotential Bond Mat** and associated procedures.

## Suggested Safe Work Practices for Coring in the Vicinity of High Voltage Underground Cables Utilizing Equipotential Bond Mat

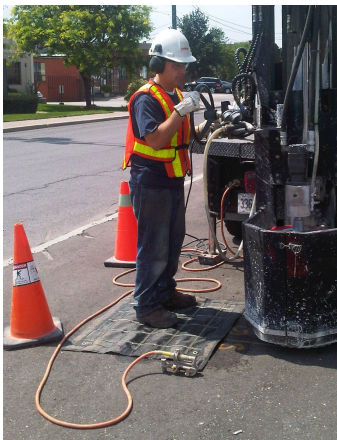
### Preparation Prior to Going to Job Site

- Obtain proper work permits and notify the local utilities, as appropriate or required by local laws and regulations.
- Develop a written “Safe Work Plan”.
- Ensure all equipment is in good working condition.
- Ensure all workers are appropriately trained and briefed on the Safe Work Plan

### Personal Protective Equipment

- Portable Equipotential Bond Mat.  
**NOTE: Get the right Equipotential Bonding equipment and ensure that it is properly installed in accordance with the manufacturers instructions.** [See: ASTM F2715-09 Standard Specification for Temporary Protective Equipotential Bond Mat To Be Used on De-Energized Equipment.]
- Fire Resistant clothing compliant with local regulations and procedures.
- Eye Protection compliant with local regulations and procedures.
- All other Personal Protective Equipment as required by your company standards and procedures.

### Setting Up the Job Site



**NOTE: Local utility or company policies may differ from these procedures and should take precedence.**

- Designate the area around the coring vehicle as a potentially “Danger High Voltage” area with flagging or pylons located 4 ft (1.2 meters) from the coring vehicle and job site, to help prevent “step and touch” potential electrocution risks.
- The coring vehicle should be bonded into the Equipotential zone (connected to the mats being used by the operators).
- Follow the manufacturers instructions in connecting the Equipotential Bond Mat to the vehicle.

### Excavation / Cutting Procedure

- All workers within the demarcated work site should be on a bond mat that is electrically bonded to the equipment being operated.
- The coring operator should not move from the bonding mat while the coring process is in progress.
- Once the core has been cut to just below the depth of the pavement, the coring drum should be retracted out of the ground and to its highest position on the coring mast. This will help to ensure that electrical connection cannot occur between the underground cable and equipment.
- Before stepping off the mat or exiting the area, the operator and any other workers within the demarcated zone should check around them to ensure that no contact can occur between the underground cable and the coring equipment.