



**Deficiencies in identification and control of electrical hazards during excavation have resulted in hazardous working conditions.**

**Events**

Site/Facility: **Los Alamos National Laboratory**

**Electrical Line Struck during Building Demolition** -- Reference: ORPS Report [ALO-LA-LANL-ADOADMIN-2004-0002](#)

On March 1, 2004, a subcontractor trackhoe severed two 3-inch conduits while removing a foundation, causing a circuit breaker to trip. One conduit contained an energized 110/208-volt electrical line and the other contained a telecommunication line. The subcontractor did not know that the prime subcontractor had installed temporary utility lines to the building.

Important Points:	<ul style="list-style-type: none"> <li>• The subcontractor foreman and equipment operator believed all utilities for the building had been terminated.</li> <li>• The excavation permit was revalidated before starting the excavation but the utility locate crew did not revalidate the area containing the conduits.</li> </ul>
Contributors:	<ul style="list-style-type: none"> <li>• The utility locate crew was not notified that temporary utility lines had been installed by the prime subcontractor.</li> <li>• The prime subcontractor's person-in-charge was unaware of the installation of the temporary utility lines.</li> </ul>

Site/Facility: **Lawrence Livermore National Laboratory**

**Electrical Conduit Near Miss Incident** -- Reference: ORPS Report [OAK--LLNL-LLNL-2003-0012](#)

On March 28, 2003, a construction subcontractor hit and damaged a 2-inch rigid metal conduit containing an energized 480-volt circuit while excavating a concrete floor with a jackhammer. There was no indication of sparks or smoke, but a circuit breaker did trip.

Important Points:	<ul style="list-style-type: none"> <li>• The as-built drawings did not identify any conduit in the excavation area.</li> <li>• A ground-penetrating radar (GPR) scan conducted by a qualified subcontractor located the conduit but the GPR technology could not distinguish the conduit containing the electrical circuits from rebar.</li> </ul>
Contributors:	<ul style="list-style-type: none"> <li>• The metal conduit was on plane between two rebar mats. The conduit followed the rebar grid layout and provided no evidence that it was nothing more than rebar.</li> </ul>

Site/Facility: **Fermi National Accelerator Laboratory MINOS Construction Site**

**Accidental Contact with an Energized 480-Volt Cable** -- Reference: ORPS Report [CH-BA-FNAL-FERMILAB-2003-0001](#)

On March 6, 2003, an excavation operator cut into a known energized 480-volt cable while digging a building foundation with a trackhoe, causing a circuit breaker to trip. Laborers entered the excavation to hand dig and uncover the cable but they did not know that someone had re-closed the circuit breaker, reenergizing the cable. Water in the excavation was heated to steam by the damaged cable. The laborers immediately stopped work.

Important Point:	<ul style="list-style-type: none"> <li>• <b>The subcontractor trackhoe operator knew the cable was energized and did not communicate that information to the laborers who were hand digging.</b></li> </ul>
Contributors:	<ul style="list-style-type: none"> <li>• <b>Both the subcontractor site superintendent and the trackhoe operator knew the requirement to de-energize the cable and install a lockout/tagout before digging, but failed to do so.</b></li> <li>• <b>The circuit was re-energized before determining why the circuit breaker had tripped.</b></li> </ul>

Site/Facility: **Fermi National Accelerator Laboratory NuMI Construction Project Energized Power Cable Severed during Excavation** -- Reference: ORPS Report [CH-BA-FNAL-FERMILAB-2002-0005](#)

On December 12, 2002, an excavation subcontractor damaged a conduit containing 480-volt energized conductors while trenching to uncover a water line for demolition. After exposing the damaged conduit, an electrical subcontractor checked the conductors with a proximity detector and believing them to be de-energized, cut the conductors with a ratchet-type hand cutter, causing a ground fault and arc-flash.

Important Points:	<ul style="list-style-type: none"> <li>• <b>The subcontractors did not verify the location of all utilities before excavation per the contract specifications. They failed to review the utility drawing before and after uncovering the conduit.</b></li> <li>• <b>The subcontractors did not follow their lockout/tagout procedures before cutting the conductors.</b></li> </ul>
Contributors:	<ul style="list-style-type: none"> <li>• <b>The excavation hazard analysis did not list any specific hazards or safety procedures on how to handle unidentified utilities.</b></li> <li>• <b>The subcontractor thought the electrical line was abandoned. He failed to notify the Fermi Lab Field Construction Coordinator of the unidentified electrical line as required.</b></li> </ul>

### **Important Considerations for Excavation Activities (Lessons Learned)**

- Who will be responsible for performing utility locates (e.g., site/facility personnel, subcontractor, or local utility)?
  - What type of survey instrument will be used? Is the instrument appropriate for the task? Does the user know the instrument's limitations and is he trained to correctly interpret the instrument's response?
  - Have all available construction/as-built drawings been reviewed for buried utilities, piping systems, underground tanks?
  - Has the excavation area been checked for buried hazards using survey equipment? Have detected hazards been identified and marked on the surface and documented before excavation begins? How long has it been since the survey was performed? Is a revalidation necessary?
  - Have identified electrical hazards been de-energized and locked-out? Who is responsible for ensuring that electrical hazards are de-energized?
  - Is an excavation permit required? Has the permit been approved? Have the permit requirements been reviewed by all personnel (foreman, equipment operators, laborers) involved in the excavation?
  - Has the pre-job briefing reviewed the permit requirements and scope of the excavation? Is hand digging required? What type of tools and equipment is required? What type of personal protective equipment is required?
  - What actions should be taken if an unidentified obstruction is encountered (e.g., proceed or stop work and investigate)?
  - Have as-built drawings been update to reflect the configuration of utilities that were found during the excavation? Has utility locating tape or devices been placed before closing the excavation?
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