



March 2004

**Deficiencies in work planning and hazards identification have resulted in electrical near misses when performing blind penetrations and core drilling.**

**Events**

Site/Facility: **Hanford Energy Research Programs**

**Electrical Near Miss during Core Drilling** -- Reference: **ORPS Report** [RL--PNNL-PNNLBOPER-2004-0001](#)

On January 24, 2004, while core drilling into a concrete floor, the drill cut through an embedded conduit containing an energized 110-volt lighting circuit causing a circuit breaker to trip. Cutting water was found dripping out of a light fixture 15 feet from the work location. A scan showed embedded material consistent with rebar.

Important Points:	<ul style="list-style-type: none"> <li>Workers believed that they were penetrating rebar because the scan indicated such and approval had been given to cut the rebar.</li> </ul>
Contributors:	<ul style="list-style-type: none"> <li>The conduit was strapped to the rebar seen by the scan equipment.</li> <li>Facility drawings were not complete as to location of the conduit.</li> </ul>

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

**Near Miss to Electrical Shock during Wall Penetration** -- Reference: **ORPS Report** [OAK--LLNL-LLNL-2003-0036](#)

On October 14, 2003, a carpenter was installing a set of key boxes to a wall when a 3-inch screw made contact with a 277-volt bus bar in a 480/277-volt panel mounted on the other side of the wall, causing arcing inside the panel.

Important Points:	<ul style="list-style-type: none"> <li>The pre-job walkdown of the job area failed to identify the electrical panel.</li> <li>The 3-inch sheetrock screw was too long for the job.</li> </ul>
Contributors:	<ul style="list-style-type: none"> <li>The carpenter believed an obstruction encountered (electrical panel) was a metal wall stud.</li> <li>Proper work controls were in not place because management failed to adequately plan the work. There was no special permit or procedure required for penetration into walls.</li> </ul>

Site/Facility: **Oak Ridge National Laboratory Central Complex**

**Electrical Near Miss during Concrete Penetration** -- Reference: **ORPS Report** [ORO--ORNL-X10CENTRAL-2003-0007](#)

On July 30, 2003, a construction worker penetrated an embedded electrical conduit containing an energized 120-volt electrical line while hand drilling into a concrete beam to install pipe hanger inserts. The worker saw sparks from the drill hole. The conduit was struck after drilling approximately 1 inch into the beam.

Important Points:	<ul style="list-style-type: none"> <li>Drawing reviews for embedded conduits were not performed.</li> <li>No lockout/tagout was used.</li> </ul>
Contributors:	<ul style="list-style-type: none"> <li>Conduits embedded in concrete structures are normally designed to be greater than 2" from the surface. The Excavation/Penetration Permit provides an exemption when drilling 2 inches or less into concrete. Drilling for this project was to depths of less than 2 inches, so no permit was required.</li> </ul>

Site/Facility: **North Las Vegas Pump House Facility**

**Electrical Near Miss during Wall Penetration** -- Reference: **ORPS Report** [NVOO--BN-NLV-2003-0003](#)

On June 24, 2003, construction personnel cut into energized 120-volt lighting circuit while drilling holes to install guardrails. The bit of the hammer drill penetrated a ½-inch conduit. Proper blind penetrations permits were in place and a Hilti Ferrosan FS10 instrument in the “Quickscan” mode was used to identify penetration locations.

Important Points:	<ul style="list-style-type: none"><li>• <b>The location of utilities was not marked on the structure as required.</b></li><li>• <b>The presence of the wiring was not identified by the Quickscan. The wiring was 6-inches within the wall, and a Quickscan observes to a depth of only 4 inches. The workers did not scan the interior side of the wall and did not know the instrument’s depth limitations.</b></li></ul>
Contributors:	<ul style="list-style-type: none"><li>• <b>Reliance was placed entirely on the Ferrosan to identify objects, including energized wiring; however, the instrument is designed to locate rebar and will not detect electrical cabling or conduit unless it contains sufficient iron (i.e., ferromagnetic detection).</b></li><li>• <b>Workers did not question instrument limitations because they frequently used it for this purpose and had not previously encountered wiring where no obstructions were identified.</b></li><li>• <b>No formal training was provided on the survey instrument because its use was considered skill-of-the-craft.</b></li></ul>

Site/Facility: **Oak Ridge National Laboratory Nonreactor Nuclear Facilities**

**Electrical Near Miss during Concrete Floor Penetration** -- Reference: **ORPS Report** [ORO--ORNL-X10NUCLEAR-2003-0009](#)

On May 20, 2003, a construction pipefitter was drilling into the concrete floor to place an anchor to stabilize/support a condensate line when the drill penetrated a 110-volt electrical conduit and wiring to a nearby outlet. The penetration caused an arc and tripped a circuit breaker. The conduit was between 1½ and 2 inches from the surface of the floor.

Important Points:	<ul style="list-style-type: none"><li>• <b>It was believed that embedded conduits in concrete slabs and walls are normally greater than 2" from the surface.</b></li></ul>
Contributors:	<ul style="list-style-type: none"><li>• <b>Facility as-built drawings show electrical conduits schematically rather than dimensionally.</b></li></ul>

### **Important Considerations for Performing Blind Penetrations (Lessons Learned)**

- Has the work area and surface to be penetrated been adequately inspected, potential hazards identified, and controls implemented? If full penetration of a floor, wall, or ceiling is to be performed, has the other side also been checked for hazards?
  - Have all available construction/as-built drawings been reviewed for hidden hazards (e.g., electrical utilities) and obstructions (e.g., rebar)?
  - Has the surface been checked for hidden hazards using survey equipment and are hazards marked?
  - Have identified electrical hazards been de-energized and locked out? Who is responsible for ensuring that electrical hazards are de-energized?
  - Is a penetration permit required? Has the permit been approved? Have the permit requirements been reviewed by all personnel involved in the penetration work? Are penetration depth limits established?
  - Has appropriately rated personal protective equipment been identified and provided? Will an electrical drill stop be used if embedded rebar is expected?
  - What actions should be taken if an obstruction is encountered (e.g., proceed or stop work and investigate)?
-