



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

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"> The pre-job walkdown of the job area failed to identify the electrical panel. The 3-inch sheetrock screw was too long for the job.
Contributors:	<ul style="list-style-type: none"> The carpenter believed an obstruction encountered (electrical panel) was a metal wall stud. 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.

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"> Drawing reviews for embedded conduits were not performed. No lockout/tagout was used.
Contributors:	<ul style="list-style-type: none"> 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.

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">• The location of utilities was not marked on the structure as required.• 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.
Contributors:	<ul style="list-style-type: none">• 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).• 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.• No formal training was provided on the survey instrument because its use was considered skill-of-the-craft.

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

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)?
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