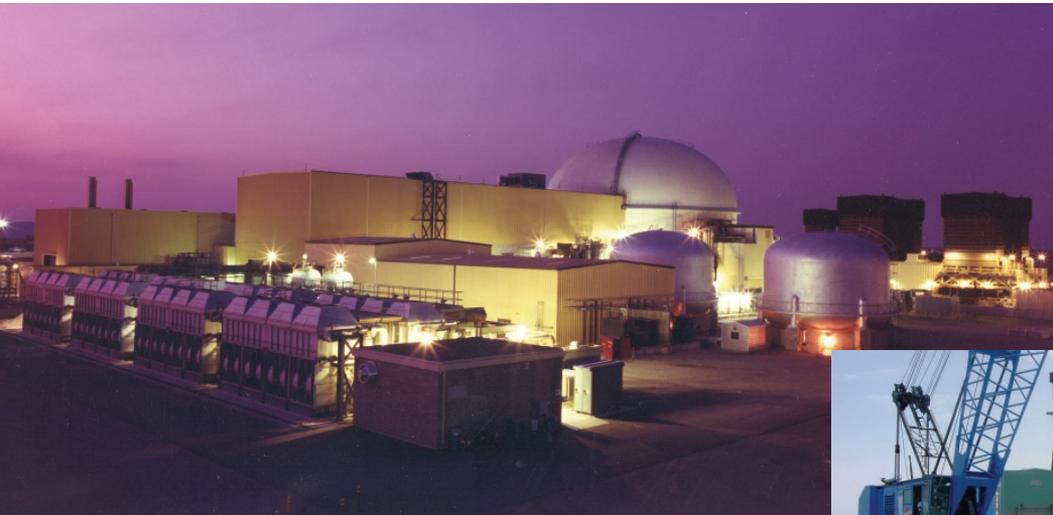


Making a model safety program even better: *How Fluor Hanford Defends Against Electrical Accidents*

Application Note



For decades, the Department of Energy's Hanford Site in south-eastern Washington produced nuclear materials that helped win the Cold War and conducted research that contributed to the nation's commercial nuclear power industry.

Today everything has changed.

The sprawling 586-square-mile Hanford site is now the world's largest environmental cleanup project. Fifty million gallons of high-level radioactive waste in 177 underground storage tanks; 2,300 tons of spent nuclear fuel; 20 tons of material laced with plutonium; and 25 million cubic feet of solid waste. The job is expected to last a generation or more.

And instead of weapons and national defense, the focus for the 3,500 employees of Fluor Hanford, one of the prime contractors for the cleanup, is safety. When an unrated multimeter caused an injury accident at another Department of Energy (DOE) site late last year, Hanford Electrical Safety Program coordinator Paul Case took immediate action.

A Robust Program

A veteran of more than 30 years in the industry, Paul Case began his apprenticeship in 1974 with IBEW Local 112 in Kennewick, Wash. He worked for ten years as a construction electrician, then as a maintenance electrician on the Hanford Site.

Case was part of a team that developed the Hanford Electrical Safety Program following a series of electrical safety incidents in the early 1990s. Today, he administers the program as Fluor's Electrical Safety Program Coordinator.

"We have developed a robust electrical safety program here, addressing both installation safety issues and worker safety," Case says. Case is the interface between the Hanford Electrical Codes Board, which focuses on design and installation standards (relying on the National Electrical Code), and the Hanford

Workplace Electrical Safety Board (HESB), which focuses on safe work practices. The safety board bases its decisions on OSHA electrical rules and National Fire Protection Association Standard 70E (NFPA 70E) work practices. Case is also the interface between the multiple contractors on the Hanford Site.

The members of both electrical safety boards stay on the lookout for emerging safety issues. That means sharing information, both about best practices and, as happened in December 2005, those considered less than the best.

Early that month an electrician performing a zero energy check on a circuit at the DOE's Fernald Environmental Management Project, a former nuclear fuel production facility northwest of Cincinnati, was burned by an arc flash. He escaped severe injury, but the incident focused attention on the digital multimeter that failed and caused the accident.

It turned out that the meter wasn't tested and rated by a nationally-recognized testing laboratory (NRTL) like Underwriters Laboratories. In addition, it wasn't rated under the CAT (category) system set up by the American National Standards Institute (ANSI), the Canadian Standards Association (CSA), and the International Electro-Technical Commission (IEC) for voltage test equipment.

Why even try such a meter? The culprit was convenience. The techs owned rated meters, but they weren't in easy reach. Case says instruments used in an area where they might become contaminated by radiation need to be protected and "surveyed in" to a work area. Already on site, the techs decided to go with the meter in hand instead of going to get a fully rated instrument.

Safety at Fluor Hanford

Fluor Corporation is one of the world's largest publicly owned engineering, construction and maintenance services firms, a Fortune® 500 company with more than 30,000 employees in more than 25 countries.

Since Fluor started work at Hanford in 1996, the company has reduced OSHA-recordable injuries by more than 80 percent and recorded injury rates among the lowest of any major Department of Energy (DOE) contractor. Seven Fluor Hanford projects have achieved Star Status in the DOE's Voluntary Protection Program, for achieving and maintaining injury and illness rates at least 50 percent to 75 percent better than industry averages.

Fluor Hanford attributes its improved safety record to involving employees in every step of the cleanup work, from planning work through incorporating lessons learned. Education is a major contributor to that performance. The Volpentest HAMMER (Hazardous Materials Management and Emergency Response) Training and Education Center at Hanford has conducted more than 325,000 student days of training since opening in 1997. Electricians and supervisors go through an initial 16-hour safety training course, followed by an eight-hour refresher every three years. They have an extensive library of safety information available on the corporate intranet. And at Hanford, they keep their eyes open.



'Unfortunate Good News'

Case calls the Ohio incident "unfortunate good news." "It's hard to think of every situation and say 'hey, we'd better go look at this,'" he says. "Typically there's some trigger that kicks you into action. Luckily this trigger wasn't a more serious incident."

It was enough, though, to persuade the Hanford team to examine the test equipment on site to make sure each tool was 1) NRTL listed and labeled, and 2) for use by electricians, rated for CAT III or CAT IV operating conditions. They checked 420 test instruments – multimeters and process calibrators – and found that 76 of them were not NRTL listed.

Many of those were 'old favorite' tools sometimes 15 or 20 years old. Non-listed meters were removed from service unless their use was restricted to circuits below 50 volts. The team also temporarily removed all meters not rated at CAT III or higher, to avoid the temptation to use a meter outside its rated capability.

The incident stimulated a refresher course on meter safety for more than 150 electricians and supervisors at the Hanford operation

'A Deep Concern for Safety'

In early January, Fluke delivered four meter safety seminars for the Hanford team. Electricians at one of Hanford's many facilities were instrumental in coordinating the scheduling for the Fluke seminars. The craftsmen at Hanford are an integral part of all safety efforts and are heavily involved in the HESB, which is the key to its success.

"This provided another opportunity to impress on our electricians, instrument test supervisors and safety professionals the importance of using the right meter in the right situation," Case says. "I got a lot of feedback. Everyone was very impressed and felt they were very valuable. I liked the information about how transients can trigger an arc flash, and the way you can actually use the instrument to test itself."

"I really appreciate Fluke stepping up and offering to do the seminars," he says. "Of course they have an interest in selling products, but I think they also have a deep concern for the safety of the workers. They don't want people to get hurt. I don't know any other reason they'd step up and spend the resources to put on these seminars. I think it was really great, and I'm really appreciative."



Improving your Electrical Measurement Safety

Checking Your Meter and Leads

Look for Independent Testing and Certification

Verify your test tools have been tested and certified by two or more independent testing laboratories, such as UL in the United States, CSA in Canada and TÜV in Europe.

Inspect your tools

- Check for a broken case or a faded display.
- Inspect your test leads and probes for frayed or broken wires and be sure they have shrouded connectors, finger guards, double insulation, a minimum of exposed metal at the tip, and are CAT rated for equal or above your meter.
- Use the continuity function to check test lead resistance.

Verify rating and construction

- Look for 600 or 1000 V CAT III or 600 V CAT IV ratings on the front or back and a double insulated symbol on the back.
- Check the manual to verify that the ohms and continuity circuits are protected to the same level as the voltage test circuit.
- Make sure the amperage and voltage of meter fuses meets safety standards. Fuse voltage must be as high or higher than the meter's voltage rating.
- Use the resistance feature to verify the fuse value is close to zero.
 - Plug test lead in V/W input. Select W.
 - Insert probe tip into mA input. Read value.
 - Insert probe tip into A input. Read value.

Setting Up a Safety Program

An effective safety program includes the following four elements:

- Management commitment and employee involvement
- Worksite analysis
- Hazard prevention and control
- Ongoing safety and health training

Visit www.fluke.com/safety for more details. The Fluke safety training kit includes information on:

- Establishing a safety policy
- Identifying a safety officer
- Designing and implementing a safety training program
- Conducting annual program reviews

Understanding CAT Ratings

Relevant safety standards include ANSI S82.02, CSA 22.2-1010.1 and IEC 61010. They cover systems of 1000 volts or less, including 480-volt and 660-volt, three-phase circuits, and they differentiate the transient hazard by

- location.
- potential for harm.
- voltage level.

ANSI, CSA and IEC define four measurement categories (CAT) of over-voltage transient impulses.

The rule of thumb is that the closer the technician is working to the power source, the greater the danger and the higher the measurement category number.

- **CAT IV** is associated with the origin of installation: power lines at the utility connection (service entrance) and any overhead and underground outside cable runs that could be affected by lightning or other surges.
- **CAT III** covers distribution level wiring: 480-volt and 660-volt circuits such as three-phase bus and feeder circuits, motor control centers, load centers and distribution panels. Permanently installed loads are also CAT III, as are large loads that can generate their own transients.
- **CAT II** covers the receptacle circuit level and plug-in loads.
- **CAT I** refers to protected electronic circuits.

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