

# Stopping Construction Sites From Becoming Killing Fields

By Paul E. Pritzker, P.E.

While some safety devices are not 100 percent fail safe, it does not mean that they should not be used.

*This column focuses on the electrical systems designer as a forensic investigator.*

Approximately five hundred workers a year are either killed or permanently maimed when a boom or hoistline inadvertently contacts a bare, uninsulated high-voltage powerline. Recently we completed an assignment in which we represented the estate of a young man who lost his life.

During the course of our analysis we designed a safety engineering matrix of the various factors related to his death. At the outset we researched, to enhance our empirical professional expertise, devices and/or techniques that were available to reduce the accident potential. These included a review of various IEEE, ANSI, ASE and ASME codes and standards, the principles of grounding, a test of the dielectric efficacy of insulated hooks and a study into the controversy of opinion resulting from the evaluation of proximity warning devices for cranes. I am not unfamiliar with the so-called "Dependency Hypotheses" that suggests a person who relies on a safety appurtenance that is less than 100 percent effective at all times place themselves in a false sense of security.

The owner of a small meat processing facility contracted a local engineering firm to perform general contracting. The engineering firm, in turn, subcontracted with an ornamental iron works corporation to furnish and erect the steel structure. The principals of both the general and the sub-contractor firms met at the site to schedule the steel construction. No one had alerted the local electric utility of the intent to bring in a flatbed truck of steel and a mobile crane that

would operate in close proximity to a 5-kV power line.

At 4:00 p.m. on a mid-November afternoon, a 26-year old man, employed by the steel erection subcontractor, drove a flatbed truck to the construction site with a load of steel. While standing on the flatbed truck directing the operator of the crane with hand signals, he kept signaling for the crane operator to "come down," with the boom and cable. At one point he reached up to grab the hook. As he touched it he fell to the ground. A physician who was driving by jumped from his car in a vain attempt to save his life. He observed that the victim died instantly.

The mobile crane's outrigger supports were resting on thick wooden planks. There was no grounding strap from the crane. The steel cable from the crane's extended boom contacted a high tension line. The current's path to ground went through the construction worker.

## Safety Procedures

In our analysis we expressed a strong conviction that the local crane dealer that serviced the site knew about various devices that could have been utilized to reduce the risk of death by electrocution from people in proximity to cranes on construction sites. It is, of course, possible to foresee that mobile crane booms, as they are extended and move, do come close to power lines.

The local crane servicing agency sells insulator links tested for 50-kV protection (these links are capable of protecting against ten times the shock potential that was lethal to the deceased). Insulated safety links are rated to support 5 to 50 tons with a 4 to 1 safety factor. Our client was attempting to lift a mere two tons. Given the dynamics of this particular scenario (crane cable touching power line), the use of an insulated safety link would have kept the man alive.

We stated in our testimony that additional devices were available that

the crane manufacturer/dealer knew about. One device is a dielectric shield that can be adjusted to fit all types of hydraulic cranes. Another is a proximity warning device — a solid-state electronic safety system used for detecting the electric field of any ac power line. Proximity warning devices (PWD) provide an audio and visual warning signal to alert the operator and attendant ground personnel when the boom comes within the vicinity of an energized power line.

During my deposition, the attorneys for the crane industry aggressively questioned me about the incident. They asked if I was aware of the tests that were conducted on proximity warning devices that concluded they were not fail safe? Ironically, six months previously, I attended a forensic engineering seminar in which a paper titled *Evaluation of Proximity Warning Devices for Cranes* was presented by a Dean of an engineering school.

While I did not agree with all of his conclusions it was obvious to me that the use of a proximity warning device on a mobile crane would have been a life-safety enhancement. In my comprehensive research on the topic I interviewed the chief civilian engineer of a U.S. Navy Missile Base. Every crane moved onto the base must be equipped with proximity devices.

Further research documented that one particular manufacturer has sold over 2600 proximity systems during the last 24 years. There has never been a reported accident involving power line contact on equipment with their system installed.

As an electrical engineer, I emphasized that proximity warning devices were not the only safety mechanisms. The insulator 50-kV link protection would have been a fail-safe device in this situation. Decals stating "Danger Electrocutation Hazard" on various areas of the crane provide reinforcement to crane operators and to people who are in proximity to cranes. Recognizing that STOP signs do not change human factors, danger signs



will not, per se, translate into optimum safety on the job site. This does not mean that when we cannot achieve 100 percent of a goal, the option of doing nothing is acceptable.

**Personal Reflections**

Recently I purchased a 28-ft cabin cruiser with a fly bridge. The boat is

docked on the canal outside my winter home on the West Coast of Florida. The boat is used to cruise the waters of the Peace River and the Gulf of Mexico from Tampa to Key West. Assuming I used the logic of the crane industry I would have informed the Commandant of the United States Coast Guard that, although my boat sleeps six I don't think it is prudent to

provide any PFD (Personal Floatation Devices) for each person on board. Tests have shown that they are not 100 percent safe.

Do you think the Coast Guard would accept the premise advanced by the crane industry that "those not aware of the performance deficiencies of the device can be lulled into a dependency and false sense of security." I would be crazy to use that logic to avoid the small cost of safety devices.

In my car I have an airbag and seat belts. On my boat I have a plethora of safety devices from PFD to Halon fire protection. The fact that I have dual protection on the highway and the ocean does not mean that I take chances.

Just days before trial, one week after my extended deposition testimony, the parties settled favorably with the estate of the deceased.

**Epilogue**

Quite recently I read a lead article in a Florida newspaper relating to a young man who was critically injured when a crane struck a power line. The story was disconcerting. The report concluded "no one was to blame — this type of accident can not be prevented." I took umbrage with those statements. I wrote a letter to the editor (that was published) stating, in part, "that OSHA and those in the crane and construction industries are aware of strict training procedures and have tried, over the years, to educate and warn those who come in proximity to danger. The electric utilities are vigilant in their warnings. There is no excuse to sit on our hands and continue to let this type of accident claim more victims. We worry, as we should, about the carnage on our highway during this time of year (New Year). Perhaps we should extend that same concern to reduce foreseeable electrocutions by paying attention to existing safety procedures. The force of more than 7600 volts is unforgiving." The man in Florida had an arm and leg amputated in an attempt to save his life. He too died.

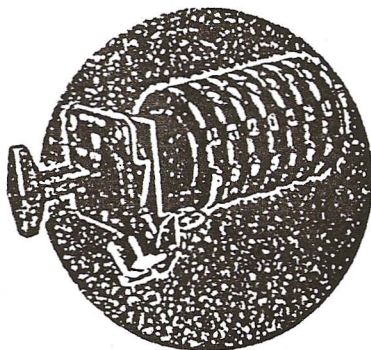
Those of us in the electrical industry should be in the vanguard for safety!

**The Author**

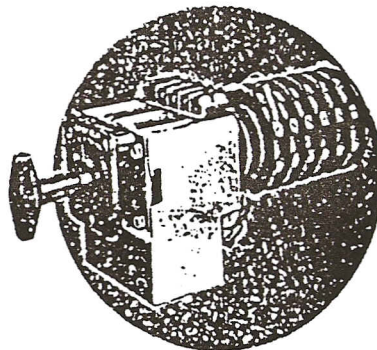
Paul E. Pritzker, P.E., is chairman of George Slack & Pritzker, Inc., Weston, MA, a consulting engineering firm.

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