

Hazard Analysis of Unintentional Raising of a Pneumatic Mast of an Electronic News Gathering Van into Powerlines

The Hazard Information Foundation, Inc. (HIFI) is a non-for-profit safety public interest group, which informs the public how lives and property can be saved with reasonable engineering alternatives. HIFI is dedicated in developing system safety evaluations of hazardous equipment and operating methodologies with a historical background so that users and management can be appraised of available devices and design improvement that could be used to eliminate or minimize life taking hazards. Our evaluations are based upon the significant reduction of injury and death with the particular safeguard or design improvement. It is our belief that when users and management became aware of the available safety devices and/or design improvements there is recognition that the investment in safety benefits all concerned.

What is a Hazard?

A hazard is a condition either static or dynamic which represents an injury potential.

The Safety Hierarchy to Either Eliminate or Minimize the Hazard

- **ELIMINATE** the Hazard, to the extent reasonably possible;
- **GUARD** against the Hazard, to the extent reasonably possible;
- **WARN** against the Hazard, to the extent reasonably possible;
- If 1, 2, or 3 above cannot be achieved, then and only then rely upon human protective gear.

The Severity of the Hazard Relating to ENG Vans

HIFI is aware of ten occurrences in the United States when an ENG mast was raised into a powerline, causing three deaths and seriously maiming eleven people.¹

The Nature of the Hazard Relating to ENG Vans

The Hazard of equipment being raised, rotated, or driven into power lines has been recognized as having caused death and/or serious injury since the 1930's. As cranes, aerial lifts, dump trucks, pumpcrete machines, and other equipment such as ENG vans with pneumatic masts have increased in number because of their usefulness, so has the number of contacts with power lines.

¹ List of Occurrences

Starting in the early 1940's, Bob Jenkins, former Director of Safety for the U.S. Army Corps of Engineers, compiled a listing of seven hundred equipment/power line contacts. At that time, a six-foot clearance was considered sufficient. Mr. Jenkins added four feet to increase this clearance to ten feet, but he found this increase did not bring any reduction in power line contacts. He began to have real doubts about the effectiveness of this clearance.

Mr. Jenkins also determined that reliance upon crane operators and signalers was not an effective method of preventing power line contacts. He concluded that mobile equipment that could reach power lines needed attached physical safeguards to prevent these devastating power line contacts. He found that boom cages and insulated links used together were 90% effective, boom cages alone were 60% to 75% effective and links by themselves were 30% effective. By making cranes safer with these devices, safer performance was achieved. These same life saving attachments were also required by the Air Force and the Army in their circulars.²

During the 1950's to the 1980's, because the clearance of boomed equipment from powerlines was known to be difficult to judge visually, a number of articles and papers were published that told how use of available safety devices would either eliminate or minimize the hazard of equipment/power line contact. The following enclosures contain a few of these references:

Various excerpts from the National Safety Council's (NSC) *Accident Prevention Manual* 2nd (1951), 3rd (1955), 4th (1959), 5th, and 6th (1969) and two of its articles: Crane Contacts Can Kill (National Safety News, October 1958) and Crane Booms v. Power Lines (National Safety News, October 1958)³

U.S. Department of Interior, Bureau of Reclamation's memo dated March 14, 1973⁴

Field Evaluation of a Proximity Alarm Device dated 1976 for the Mining Enforcement and Safety Administration⁵

Two papers: Judging Clearance Distances Near Overhead Power Lines by Lorna Middendorf, a Human Factors Specialist and Problems in the Perception of Overhead Power Lines by Robert Cunitz, Ph.D. dated March/April 1995⁶

Safety Engineering Alternatives to Eliminate or Minimize Power Line Contact by ENG Vans

² Electrocution Protective Devices for Cranes, March 22, 1962

³ Attached

⁴ Attached

⁵ Attached

⁶ Attached

During the 1980's some concerned individuals found that operators and workers were unable to adequately judge the distance between the boom and the power lines. Some employers purchased safety equipment to prevent equipment /power line contacts. For example, James R. Andrews, a Vice-President for Safety for Fred Weber, Inc., a highway contractor in St. Louis, Missouri, purchased fifteen SigAlarms in 1990 to install on all of Weber's cranes and on a pumpcrete machine. This purchase and installation was made after a trusted and safety-conscious, longtime employee was instantly electrocuted when steel curb forms carried on a flatbed truck equipped with a crane were being unloaded every few feet in a stop-and-go operation. The deceased employee and the crane operator did not see the single-phase 7,200-volt powerline. With SigAlarms on its cranes and pumpcrete machine, Weber Construction has not had a powerline contact since 1990. Mr. Andrews found that with safer cranes, safer operations were achievable.⁷

In 1983 the U.S. Immigration and Naturalization Service also did not wish to have the Border Patrol rely on operator visual estimates of clearances when using its vehicles equipped with collapsible pneumatic masts. Some masts would elevate night vision surveillance sensors some 40 feet. Night surveillance operations required fast set-up without lights so their presence will not be disclosed. They usually park on rural roads where electric power lines are sometimes overhead. It installed SigAlarms on these vehicles to prevent the masts from being raised when the vehicles were parked under an unseen power line. For nearly 20 years it has had no powerline contacts. George Van Horn, a research and development officer for the U.S. Immigration Service is a well-respected authority with years of previous experience with the U.S. Army's Electronic Proving Ground at Fort Huachuca, Arizona.

A Berkley, California pumpcrete company, which did not want to rely on operator visual estimates of clearances, installed SigAlarms on its entire fleet of pumpcrete machines. Since the installation, its crews have not experienced any powerline contacts.⁸

The U.S. Army Corps of Engineers, New Orleans District, included requirements for proximity alarms, boom cages and insulated links in its construction contracts.⁹

The use of SigAlarms has gained significant acceptance by construction companies which own cranes. It has come to our attention that Zhckary Construction Co. of San Antonio Texas has purchased some 200 Sigalarms and requires their use on cranes used by their subcontractors.

Six manufacturers of ENG vans offer SigAlarms as optional equipment, which can be wired so the mast cannot be raised when parked under or immediately adjacent to a powerline. These firms are: BAF, Shook, Wolfcoach, Frontline, Gerling and Brickford.¹⁰

⁷ Affidavit of Mr. Andrew's

⁸ Berkley Concrete Pumping

⁹ Construction Solicitation and Specifications dated May 19, 2000, page 01100-6

¹⁰ BAF Communications, High Voltage Power Line Proximity Warning System

Over 117 Sigalarm units have been sold for installation on ENG vans since September 10, 1999. Most were sold directly to ENG van manufacturers. The following 10 U.S. TV stations have purchased SigAlarm units:

WQAD TV 8, Moline, Illinois
WABC TV, New York, New York and Washington, D.C.
WSBA, Washington, D.C.
WTTG, Washington, D.C.
KIRO, Seattle, Washington
KXLY, Spokane, Washington
KSTP, St. Paul, Minnesota
WKMG, Miami, Florida
WLTW, Miami, Florida
KTVK, Phoenix Arizona

Other TV stations that have installed SigAlarms on their ENG vans are as follows:

The New York Times Company and its affiliates:

W-HNT TV, Huntsville, Alabama, 3 units
KFSM TV, Fort Smith, Arkansas, 3 units
WREG TV, Memphis, Tennessee, 4 units
WQAD TV, Moline, Illinois, 2 units
WNEP TV, Moosic, Pennsylvania, 4 units
WTKP TV, Norfolk, Virginia, 3 units
KFOR TV, Oklahoma City, Oklahoma, 3 units
WHO TV, Des Moines, Iowa, 3 units
CBC, Canadian Broadcast Corp., 8 units
BCTV, Western Canada, 2 units
SHAW Communications, Vancouver, B. C.¹¹

Energized power lines have two measurable characteristics--an electric field and a magnetic field. Both of these fields surround the wire for its entire length from its origin to its destination. The electric field (sometimes referred to as an electrostatic field) is the same as a capacitance or the difference of potential of the energized wire to the ground. The higher the voltage supplied to the wire, the stronger the field, which is not dependent on current flow. The strength of the electric field is proportional to the voltage on the line and, inversely, proportional to the distance from the powerline. As the antenna on proximity alarm is moved closer to the line, the electric field is stronger and, therefore, produces a stronger signal. This is ideal for detecting the presence of powerlines. This is the system that SigAlarm uses, which makes it a reliable and effective aid in detecting power lines.¹²

¹¹ Listing of Sigalarm Users

¹² Sigalarm Principle of Operation

To Err is Human, Design Forgives

Work practices that rely upon the user's attention and an operator's visual estimates of clearance are totally unreliable, since human behavior is not programmable. Reporters, who are always under stress to be the first to get the news out and often must work in unusual places, in inclement weather and at night, deserve reliable protection.

A pneumatic mast mounted on a mobile vehicle is hazard-free from powerline contact when equipped as follows:

A SigAlarm wired so that the mast cannot be raised when located under and or immediately adjacent to a powerline.

Insulation incorporated in the design of the antenna or other accessories mounted on top of the mast as a redundant safety feature.

These improvements will make ENG vans safe for their intended use and powerline contacts almost impossible.

The injury-free performance experience of a safety device is the most authoritative evaluation that can be made. SigAlarm was first marketed in the early 1960's, and there is no record of a malfunction's causing injury in its nearly forty years of use. The same is true for insulated boom cages and insulated links. OSHA regulations mention the availability of these devices but do not require their use. Many have realized the value of these devices and have voluntarily begun using them because they consider that providing a safe workplace is a moral responsibility that has a higher calling than waiting for mandatory regulation.

It is a shortsighted approach to rely solely on safety training. There is no substitute for physical safeguards to prevent hazards. Training is always an essential component of safe operation, but it is not a substitute for use of proven safety accessories.

It is in the best interests of TV broadcast companies, ENG van assemblers and component manufacturers to ensure that the SigAlarm, which detects the electric field and has proven reliability, be used to prevent the raising of a pneumatic mast when under or immediately adjacent to powerlines.

The California General Industry Safety Orders state that approval can be granted for a product *with demonstrated competence in the field*, which the SigAlarm has certainly achieved.¹³

Recommendations

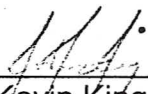
The California Occupational Safety and Health Standards, Title 8. Division 1, Chapter 4. Subchapter 5, Group 2, High-Voltage Electrical Safety Orders, Article 40, Electronic News Gathering, par. 2981, needs to have some means to ensure that employees and

¹³ Title 8, Section 3206

employers are informed of the safeguards, which have proven field service in saving lives. The following wording would achieve this goal:

To prevent serious injury or death from unintentional raising of pneumatic masts on ENG vans into overhead powerlines and reliably control this hazard, the following measures can be taken:

1. Provide and install an electric (electrostatic) field detector to prevent the mast from being raised when the ENG van is parked under or immediately adjacent to overhead powerlines. Such detector should also prevent the mast from being raised until the van is positioned at least thirty feet lateral distance from the powerline. Further, the manufacturer shall certify the installation is calibrated and locked into adjustment for that particular van to ensure that the mast cannot be activated when the ENG van is parked under powerlines or immediately adjacent to them.
2. For failsafe redundancy, insulating materials should be incorporated in the design of accessories that are mounted on the top of the pneumatic mast to prevent current flow in excess of five (5) miliamps when contact is made with 7,500-volt powerlines.
3. Training needs to include (a) a summary of previous injuries due to inadvertent raising of pneumatic masts on ENG vans into powerlines, (b) the propensity for error- provocative circumstances during use of ENG vans and (c) the need for proven safety accessories on ENG vans as standard equipment.



Kevin King, President
Hazard Information Foundation, Inc.
PO Box 3962
Sierra Vista, AZ 85636
520-458-4100