The Safety Corner

From the Marine Corps Center for Lessons Learned

August 2006

Electrical Safety

This issue of the Safety Corner highlights lessons and observations about generators and electrical hazards identified from current operations in OIF.

From the Director: Welcome to the First Issue of The Safety Corner from the Marine Corps Center for Lessons Learned

Over the past few years, we have noticed that many of the lessons and documents entered into the Marine Corps Center for Lessons Learned (MCCLL) Lessons Management System (LMS) have addressed safety issues. In an effort to ensure that these safety-related observations and recommendations receive the widest possible dissemination, MCCLL has begun publication of ***The Safety Corner***. We hope that you find this publication of interest and helpful in reducing possible risks while maintaining high operational readiness.

Electrical safety may not seem like a very critical concern but as I think back on my 29 years of service the following personal electrical safety issues came to mind.

1. In 1977 when I was at Officer Candidates School we had a freak thunderstorm roll across the parade deck one afternoon. The first bolt of lightening struck a tree on the edge of the grinder the second bolt hit and killed a fellow candidate.

2. I built high tension power lines to put myself through college. One of my co-workers was severely shocked and knocked unconscious when he was struck by a live high tension power line.

3. I had just arrived at Al Asad in 2004 when a PFC on his first day in theater was electrocuted trying to repair his a/c unit.

4. Jul 2004 I identified a safety hazard at the MEF COC when a large circuit breaker panel was left open with no barrier around to prevent someone from stumbling into it in the dark.

So there are electrical issues out there and we are losing Marines and combat effectiveness. I hope this newsletter helps you identify and mitigate the risks you encounter so your Marines can continue the mission. Please call or email me your comments and suggestions.

monte.dunard@usmc.mil Telephone: 703.432.1286 DSN: 378-1286

Semper Fidelis, Col Dunard

In this Issue:

The observations and recommendations contained in The Marine Corps Center for Lessons Learned (MCCLL) Safety Corner represent the considered judgment of Marines who have identified safety issues in their units. The purpose of this newsletter is to apprise other Marines of these safety recommendations and to encourage them to enter their own lessons into the Marine Corps Lessons Management System (LMS).

Attention Safety Officers!

The Marine Corps Center for Lessons Learned is working closely with the Safety Division of HQMC to bring safety to the forefront. We need your help. We need you to register on our search enabled website at www.mccll.usmc.mil. Registering will allow you to enter your own safety lessons, briefs, photos, TTPs, SOPs and almost anything else into our system. By doing so you are passing this information along to Marines and other allied forces around the world. You will also have access to safety information submitted by your peers. We would also like to identify safety performers; so please send us write-ups and photos of you and your safety-conscious Marines.

Migrate to www.mccll.usmc.mil.

The Safety Corner

From the Marine Corps Center for Lessons Learned
August 2006

Electrical Injuries

Electrical current exposes personnel to a serious and widespread occupational hazard. Practically all members of a unit are exposed to electrical energy during the performance of their duties, and electrocutions can occur to anyone regardless of MOS. Many people are unaware of the potential electrical hazards present in their work environment, which makes them more vulnerable to the danger of electrocution.

Over the past couple of years six Class A-C mishaps were reported resulting in four Marines/sailors killed and two injured. The Army reported the loss of three Soldiers and two others who were injured as a direct result of electrocutions.

Marines can be creative in ways to wire power to workspaces and billeting areas. The source of most of this power while deployed is through the use of generators. Leaders need to ensure safety procedures are followed to prevent injury to Marines and the loss of equipment. Heat from an unprotected and overloaded circuit, or a spark from a short in a piece of equipment or loose connection, can start a fire and burn down a billeting tent or workplace building

The following is a list of items supervisors can check in their daily walkthroughs of work sections or billeting areas:

- Inspect tools, power cords, and electrical fittings for damage or wear prior to each use. Repair or replace damaged equipment immediately.
- Tape cords to walls or floors when necessary. Nails and staples can damage cords causing fire and shock hazards.
- Be aware that unusually warm or hot outlets may be a sign that unsafe wiring conditions exists. Unplug any cords to these outlets and do not use until a qualified electrician has checked the wiring.
- Risk of electric shock is greater in areas that are wet or damp.
- Make sure that exposed receptacle boxes are made of non-conductive materials.
- Know where the breakers and boxes are located in case of an emergency.
- Do not touch a person or electrical apparatus involved in an electrical accident. Always disconnect the current first.
- Do not use outlets or cords that have exposed wiring.
- Ensure all electrical equipment has the Underwriters Laboratory approval sticker.
- Ensure only trained and authorized personnel work on electrical equipment
- Clearly label and rope off all Electrical Hazards as needed to prevent personnel from touching or walking into Circuit Panels and wiring.

Electrical Wiring (Taqaddum Base Operations)

LESSON ID: 39145

During his tenure as Taqaddum Base Operations the Current Operations Officer in May 2005, Major Glenn Gerichten observed problems with the camp's electrical wiring design. Due to the limited availability of earth moving equipment aboard base combined with the utilization of over 100 generators to power the camp (almost all of the electrical wiring from power generation assets are designed for low voltage and to be laid above ground) there were numerous power problems aboard the camp. The camp's use of Mobile Electric Power Distribution Systems (MEPDIS) to power multiple subsections within the power grid vice use of larger power systems which power regional grid sections, has led to an ad hoc methodology of laying electrical wiring. This is not only hazardous, but has led to numerous power outages as wires are cut, slashed, or crushed due to vehicular or Material Handling Equipment (MHE) traffic. It is recommended that during the planning and design phase in establishing a semi-permanent expeditionary camp, electrical wiring should be… buried underground and a regional grid should be established. This will ensure that the camp wiring can withstand the normal wear and tear of an expeditionary camp infrastructure and reduce power outages as a result of vehicular traffic. This will significantly reduce maintenance repair time and funds required to replace damaged cable systems. CWO5 Greg Manke, Utilities Officer, Marine Corps Engineer School adds: “Get Utilities Marines in on the planning phase so the camp power grid can be properly laid out and enforce vehicular traffic routes so vehicles aren't running over cables and cutting them.”

The Safety Corner

From the Marine Corps Center for Lessons Learned

August 2006

Electric Shock First Aid!

The severity of electric shock is dependant on the amount of electric current which passes through the body. This current is based upon the voltage and the resistance of the path it follows through the body. Other factors include the person's overall health and how quickly the person is treated.

Call 911 (or your local emergency number) immediately if any of these signs or symptoms occur:

- Cardiac arrest
- Heart rhythm problems
- Respiratory failure
- Muscle pain and contractions
- Seizures
- Numbness and tingling

While waiting for medical help, follow these steps:

1. **Look first. Don't touch.**
   The person may still be in contact with the electrical source. Touching the person may pass the current through you.
2. **Turn off the source of electricity if possible.**
   If not, move the source away from you and the affected person, using a non conducting object made of cardboard, plastic or wood.
3. **Check for signs of circulation (breathing, coughing or movement).**
   If absent, begin (CPR) immediately.
4. **Prevent shock.**
   Lay the person down and, if possible, position the head slightly lower than the trunk, with the legs elevated.

Caution

- Don't touch the person with your bare hands if he or she is still in contact with the electrical current.
- Don't get near high-voltage wires until the power is turned off. Stay at least 20 feet away — much farther if wires are jumping and sparking.
- Don't move a person with an electrical injury unless the person is in immediate danger.

Incidental Generator Operators

LESSON ID: 41584

Craig Mears, a Tactical Safety Specialist with MCB Quantico, observed a serious problem with incidental generator operators. Because of the constant use of tactical generators aboard bases, it was observed that many units are allowing incidental generator operators to perform functional checks on generators. Improper or inadequate training of many of these incidental generator operators concerning the inherent dangers with electricity, presents a high probability for a potential class "A" mishap.

By establishing clear training policies for incidental generator operators that established minimum training levels and operational boundaries, it mitigated hazards associated with working on generators.

Add Electrical Transformers Into The Utilities T/E

LESSON ID: **37751**

While stationed at a Forward Operating Base, MSgt Martin Harkless made observations about generator use and fuel consumption aboard the base. His recommendations could significantly improve generator support while reducing man hours and increasing safety.

One Forward Operating Base consumed over 1,152 gallons of fuel per day for the fifteen generator sites required to power the camp. The distance between each of the workspaces became the main contributing factor in determining generator requirements. Many of the sections became islands unto themselves, located great distances apart from the other work areas. As a result, these sections required their own generator sites, which led to: more fuel, more moving parts, and more labor in order to set up and maintain these generators.

There is a more efficient solution that could be employed without having to detract from each section's flexibility in establishing their locations. Electrical transformers could be used to accomplish this same task with only two generator sites and 432 gallons of fuel.

Implementing electrical transformers into the utilities T/E could have saved an estimated 720 gallons of fuel per day, untold numbers of generator parts, and an exponential number of labor hours used for generator site set up and repairs. Although these changes would have an initial expense in both dollars and training, this initial cost would be recouped by fuel and parts savings alone. [MCCLL Note: Current T/E USMC generators are not of sufficient voltage to power such transformers. Electrical grids operating at bases in Iraq are a mix of high voltage commercial and military generators. A temp loan of transformers from the U.S. Army should be considered. CWO Manke's earlier comment on Lesson 31935, on having utilities Marines involved in planning also applies here.]

Additional benefits include maximum power distribution and a consolidated location of generators. Transformers are noise free and virtually maintenance free with no consumables. They require little monitoring and have a low failure rate. The reduction in fuel requirements will also lessen the logistical support needed for daily operations, reduce the workload of generator operators and the need for incidental operators.

Log on to www.mccll.usmc.mil and post comments to these lessons.

The Safety Corner

From the Marine Corps Center for Lessons Learned
August 2006

What kinds of injuries result from electrical currents?

There are four main types of injuries: electrocution (fatal), electric shock, burns, and falls. These injuries can happen in various ways:

- Direct contact with the electrical energy
- When the electricity arcs (jumps) through a gas (such as air) to a person who is grounded
- Thermal burns including flash burns from heat generated by an electric arc, and flame burns from materials that catch on fire from heating or ignition by electrical currents.
- High voltage contact burns can burn internal tissues while leaving only very small injuries on the outside of the skin.
- Muscle contractions, or a startle reaction, can cause a person to fall from a ladder, scaffold or aerial bucket. The subsequent fall or drop of a piece of equipment fall can cause serious injuries.

Reported Mishaps

2 April 03 – A LCpl riding in a 7-ton came in contact with a low hanging power line. The LCpl was electrocuted and died as a result.

15 Aug 03 – A Cpl was testing a 1000 watt flood light set for serviceability on a generator. The Cpl received a high voltage shock. His heart had stopped beating and he was pronounced dead on the scene.

03 Oct 03 – A USMC Civilian was electrocuted while working in a radar shop trouble shooting a piece of radar equipment. The exact cause of the electrocution was unavailable.

13 May 04 – A PFC at Al Asad was attempting to repair an A/C unit outside his tent when he was electrocuted. The PFC was not an A/C mechanic and had no training on A/C units.

28 Jan 05 – A Sgt was electrocuted while conducting a dismounted search in Al Anbar Province. The Sgt Inadvertently walked into a hanging high voltage wire.

14 Oct 05 – A Capt was conducting a security patrol on a roof when his M16 came too close to a power line. An arc caused 3rd degree burns to his hands and the loss of one finger.

ELECTROCUTION CLAIMS 1 SOLDIER'S LIFE

Army PLR 05150 dtd Sept 2005

A 24 year-old Army SGT was using a power washer to clean an Army vehicle at the motor pool. Two Soldiers attempted to unplug the power washer and received minor shocks. The SGT was transported to the local hospital where he was pronounced dead. Initial reports indicated a faulty Ground in the washer.

Live electrical wires like the one at left are found frequently throughout Iraq. The one pictured was located on Al Asad. It looks like someone tried to tape the ends of the wires for protection, but not much else was done. A hazard like this needs to be identified and marked to avoid traffic from coming in contact with these wires.

Live wires and junction boxes also need to be protected from the elements to prevent electrical shorts or "electrically charged puddles" from forming.

Thanks to the sharp eye of Craig Mears, he identified the electrical hazard and was able to have this immediately corrected to prevent accidental contact.

Photo from Craig Mears, Tactical Safety Specialist