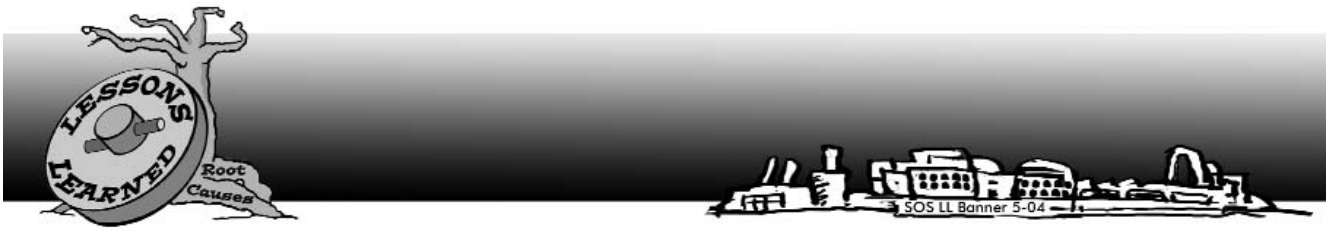


Electrical Shock

Purpose

To share "lessons learned" gained from incident investigations through a small group discussion method format.

To understand "lessons learned" through a Systems of Safety viewpoint.

TONY MAZZOCCHI CENTER
FOR HEALTH, SAFETY AND ENVIRONMENTAL EDUCATION
A PROJECT OF THE UNITED STEELWORKERS AND THE LABOR INSTITUTE

This material was produced by the Labor Institute and the United Steelworkers International Union under grant number 46DO-HT11 Susan Harwood Training Grant Program, for the Occupational Safety and Health Administration, U.S. Department of Labor. It does not necessarily reflect the views or policies of the U.S. Department of Labor, nor does mention of trade names, commercial product or organizations imply endorsement by the U. S. Government.

Lessons Learned

Volume 07, Issue 51

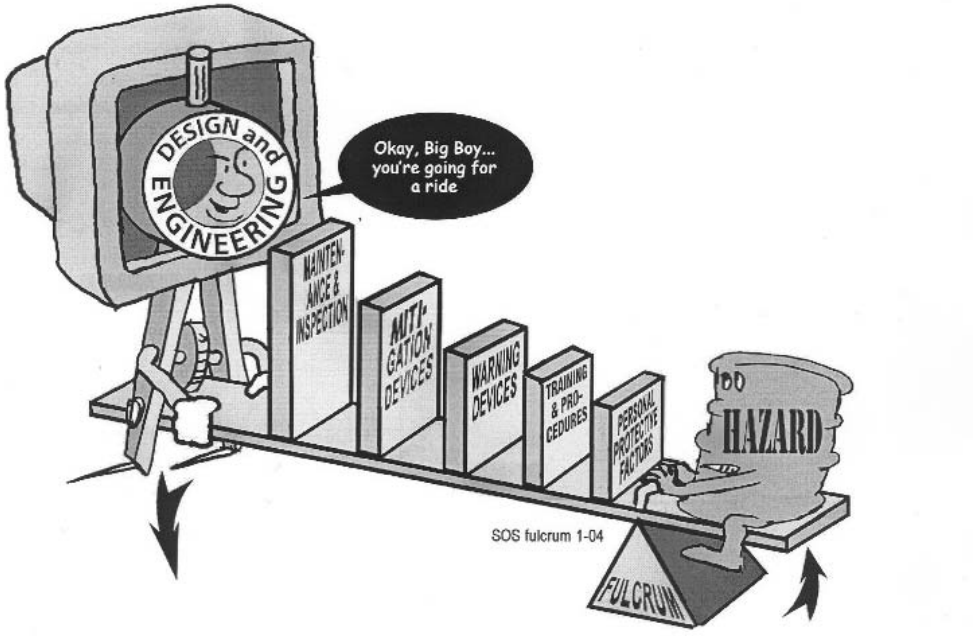
Background Information

Before beginning this Lessons Learned, please review this and the next page which contain information that will introduce the concepts of Lessons Learned and Systems of Safety.

Creating a safe and healthy workplace requires a never ending search for hazards that sometimes are not obvious to us. These hazards exist in every workplace and can be found by using various methods. Lessons Learned are just as the name suggests: learning from incidents to prevent the same or similar incidents from happening again.

Systems Are Not Created Equal: Not equal in protection and not equal in prevention.

Using our Systems Focus to uncover system flaws or root causes is only one part of controlling hazards. We also need to look at the systems involved to decide on the best way to deal with the problem. The most effective way to control a hazard is close to its source. The least effective is usually at the level of the person being exposed. The system of safety in which the flaw is identified is not necessarily the system in which you would attempt to correct the flaw.



Major Safety System	Design & Engineering	Maintenance & Inspection	Mitigation Devices	Warning Devices	Training & Procedures	Personal Protective Factors
Level of Prevention	**Highest—the first line of defense**	**Middle—the second line of defense**				**Lowest—the last line of defense**
Effectiveness	**Most Effective**	←			→	**Least Effective**
Goal	*To eliminate hazards*	*To further minimize and control hazards*				*To protect when higher level systems fail*
EXAMPLES OF SAFETY SUB-SYSTEMS**	**Technical** Design and Engineering of Equipment, Processes and Software Management of Change (MOC)** Chemical Selection and Substitution Safe Siting Work Environment HF **Organizational *(must address a root cause)*** Staffing HF Skills and Qualifications HF Management of Personnel Change (MOPC) Work Organization and Scheduling HF Work Load Allocation of Resources Buddy System Codes, Standards, and Policies**	Inspection and Testing Maintenance Quality Control Turnarounds and Overhauls Mechanical Integrity	Enclosures, Barriers Dikes and Containment Relief and Check Valves Shutdown and Isolation Devices Fire and Chemical Suppression Devices Machine Guarding	Monitors Process Alarms Facility Alarms Community Alarms Emergency Notification Systems	Operating Manuals and Procedures Process Safety Information Process, Job and Other Types of Hazard Assessment and Analysis Permit Programs Emergency Preparedness and Response Training Refresher Training Information Resources Communications Investigations and Lessons Learned Maintenance Procedures Pre-Startup Safety Review	Personal Decision-making and Actions HF Personal Protective Equipment and Devices HF Stop Work Authority

HF - Indicates that this subsystem is often included in a category called Human Factors.
* There may be additional subsystems that are not included in this chart. Also, in the workplace many subsystems are interrelated. It may not always be clear that an issue belongs to one subsystem rather than another.
** The Codes, Standards and Policies and Management of Change sub-systems listed here are related to Design and Engineering. These subsystems may also be relevant to other systems; for example, Mitigation Devices. When these subsystems relate to systems other than Design and Engineering, they should be considered as part of those other system, not Design and Engineering.

Revised October 2006

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Title: Electrical Shock

Identifier: Volume 07, Issue 51

Date Issued: June 1, 2007

Lessons Learned Statement:

The use of damaged electrical equipment led to the electrical shock injury of an employee. ***Systems of Safety*** are utilized to prevent this type of injury. The protection provided by installing a **Maintenance and Inspection** ***System of Safety*** whereby qualified electricians are the only ones allowed to inspect and repair electrical equipment, cords and plugs, will prevent this type of injury from occurring.

Training operators and management in "Safe Electrical Work Practices" is a vital **Training and Procedure** ***System of Safety*** that is required to prevent injuries from electrical shock.

The hazards presented by hoist equipment that requires the manual installations of heavy cords and plugs can be eliminated by a **Design and Engineering** ***System of Safety***. Designing better or permanent electrical power supply systems for the hoists would have prevented the electrical shock injury that occurred when an operator had to manually maneuver and insert the hoist plug.

Discussion:

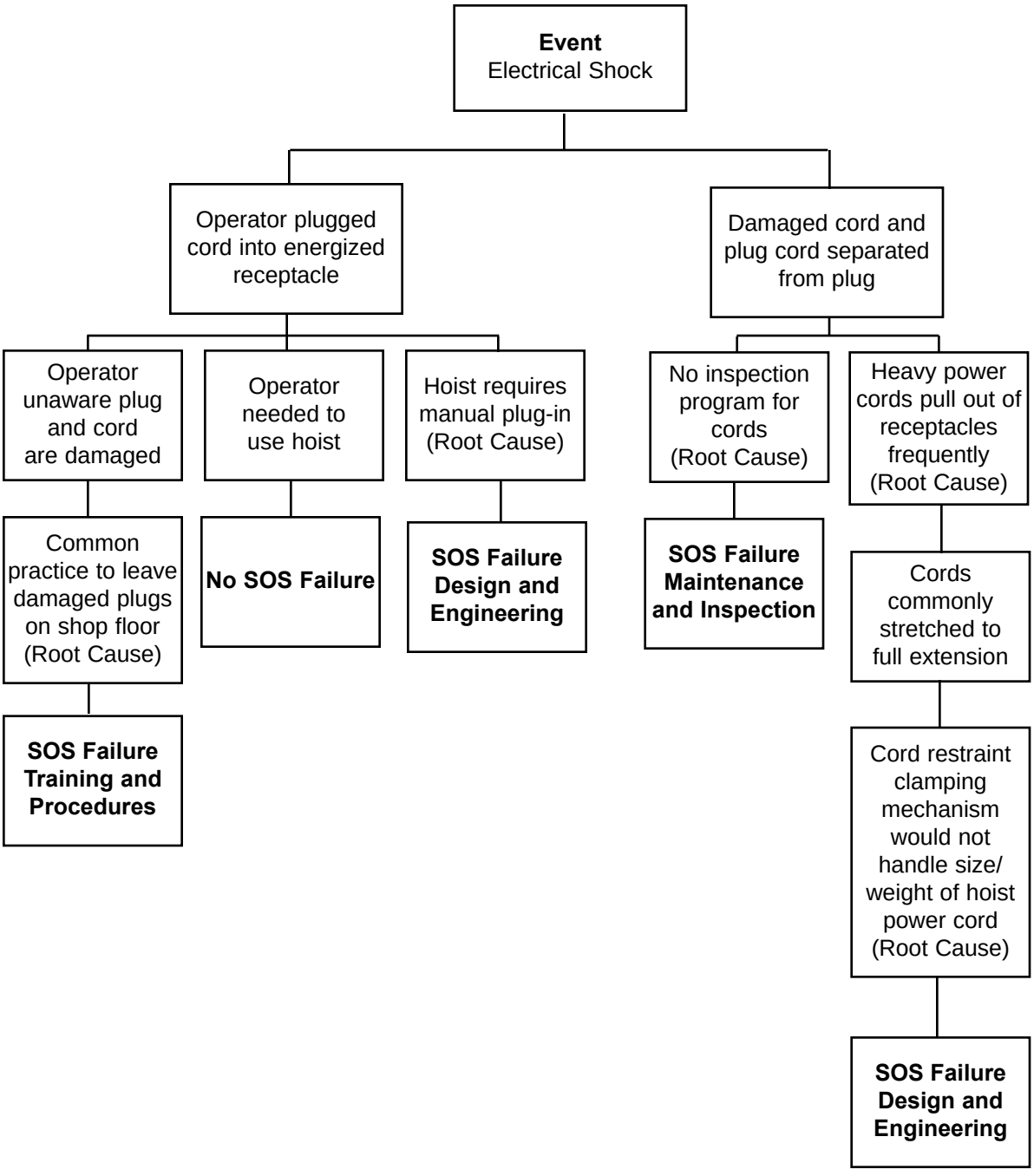
An operator was performing debris removal activities that required the use of a hoist with a long reach. The only suitable hoist available for the job was a hoist that had a power cord which had a surgeon's glove taped over the cord's plug. At the direction of the Shift Operations Manager, the glove was removed and the cord inspected by the operator who determined it was usable. The operator then plugged it into a receptacle that was labeled "CAMS ONLY." At the moment that the plug was being inserted into the receptacle, a spark was observed and the cord separated from the plug with the plug remaining in the receptacle.

As the power cords are commonly stretched to full extension, stress placed on the cord/plug interface during normal hoist operation likely caused the cord to pull out from the plug. The plugs are shop stock standard and the cord restraint clamping mechanism is smooth and not robust enough to handle the size/weight of the 30 foot long by 5/8 inch diameter hoist power cord. The above conditions, combined with the failure to routinely perform electrical inspections of these power cords, plugs and cord grips, contributed to the failure of the plug.

Cord strain relief devices had previously been provided to relieve the strain of the cords on the plugs and to hold the plugs into the receptacles. However, use of the devices was not a mandatory requirement. Operators were permitted to hold plugs into receptacles in lieu of using the strain relief devices.

Analysis

The Logic Tree is a pictorial representation of a logical process that maps an incident from its occurrence, "the event," to facts of the incident and the incident's root causes.



Recommended Actions

Recommended Actions

1. Immediately train all Shift Operations Managers and Operators on:
    - Safe electrical work practices;
    - The practice of permitting operators to hold plugs into receptacles in lieu of strain relief devices.
    - Training to inform operators that only qualified electricians can perform inspections or repairs on electrical equipment such as cords and plugs; and
    - Training to include mandatory use of cord grip devices where necessary.
2. Establish and communicate management expectations to ensure defective equipment or problems are reported, logged and tagged in a timely manner and that event scenes are secured and evidence preserved until the investigation has been completed
3. Establish inspection program to include hoist power cords, cord plug interfaces, strain relief devices and plugs:
    - Cord plugs should be inspected to determine if they are robust enough for the cord weight.
    - Inspections and repairs are to be performed by qualified electricians only.
    - Program to include the immediate removal of defective electrical cords, plugs, etc. and proper electrical lockout/ tagout procedures.
4. Redesign hoist power supplies that can eliminate the use of power cords such as hardwire electrical supply to hoists.

Education Exercise

Working in your groups and using the Lessons Learned Statement, Discussion, Analysis and Recommended Actions, answer the two questions below. Your facilitator will give each group an opportunity to share answers with the large group.

1. Give examples of ways to apply the Lessons Learned Statement at your workplace.

_____

_____

_____

_____

_____

_____

2. Of the examples you generated from Question 1, which will you pursue in your workplace? (**Note:** When we say something you may pursue, we mean a joint labor-management activity or a union activity rather than an activity carried out by you as an individual.)

Trainer's Lessons Learned Success Inventory

Following a Lessons Learned (LL) session, **the trainer who led the LL** should complete this form. This information will: 1) Help you reflect on the successes and challenges of the session; 2) Help USW with new curriculum development; and 3) Help USW as a whole better understand how the LL Program is supporting their workers.

By reviewing LL from different sites or from other areas of their workplaces, workers are able to analyze the information and apply these lessons to their own workplaces in order to make their workplaces healthier and safer.

1. Site name (if there are participants from ore than one site, please list all).

_____

2. Date of LL training _____
3. LL number used in today's Training_____
4. Your name_____
5. **Summary of Education Question 1:** Please summarize participants' examples of ways to apply this LL Statement to their workplace.

Please continue on reverse side.

6. **Summary of Education Question 2:** Please summarize which actions or recommendations participants discussed pursuing at their workplace(s).

Thank you for completing this form.

EVALUATION

Lessons Learned: Electrical Shock

Please answer the two questions below:

1. **How important is this lessons learned to you and your workplace? (Circle one.) Rate on a scale of 1 to 5, with 5 being the most important.**

1	2	3	4	5

2. **What suggestions would you make to improve this Lessons Learned?**

End of Training Trainer's Instructions

Please complete the information below.

Trainer's Name _____
(Please Print)

Date of training: _____

No. of Participants: Total _____ Hourly _____ Management _____

Location of Training: _____

USW Local # _____

Send:

1. This page;
2. The Education Exercise (page 8);
3. The Trainer's LL Success Inventory form (pages 9 and 10);
4. The evaluation for each participant (page 11); and
5. The Sign-in sheet (page 13) to:

Doug Stephens
United Steelworkers International Union
3340 Perimeter Hill Drive
Nashville TN 37211

Thank you for facilitating the sharing of this
Lesson Learned with your coworkers.

Sign-in Sheet

Name of Class_____ Date of Class_____

Instructors: _____

Please Check One* H	M	Print Name	Signature

***H = Hourly Worker**
M = Management or Salaried Worker