

Worker Receives Electrical Shock from Damaged Plug

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.



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Lessons Learned

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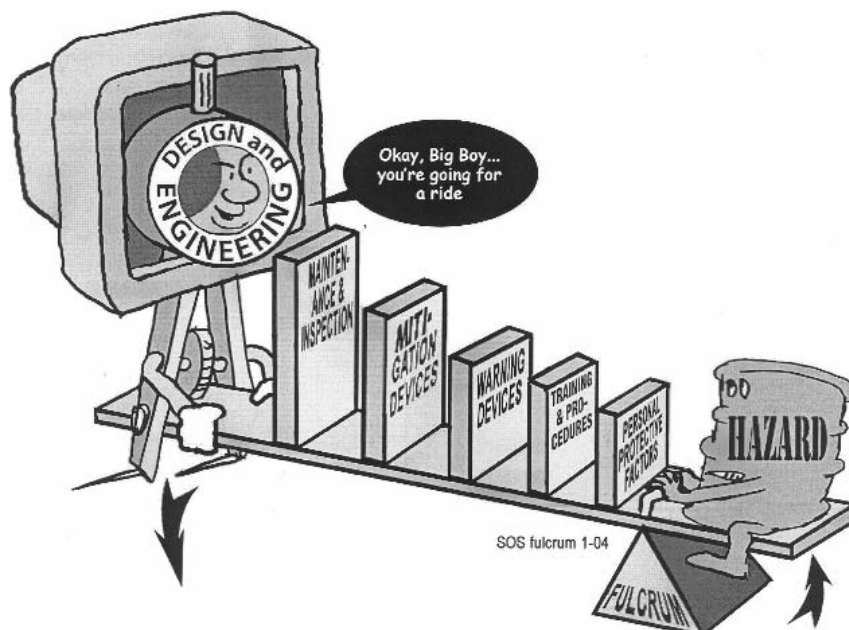
Background Information

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	Inspection and Testing Maintenance Quality Control	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
	Organizational (must address a root cause)	Management of Change (MOC)** Chemical Selection and Substitution Safe Siting Work Environment HF 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**	Turnarounds and Overhauls Mechanical Integrity			

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 subsystems 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 systems, not Design and Engineering.

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Lessons Learned Statement

Using hoist equipment that requires the manual installation of heavy power cords contributed to the electrical shock of a worker. *Systems of Safety* are utilized to prevent this type of incident.

The hazards presented by using hoist equipment that requires the manual installation of heavy cords and plugs would be eliminated with a **Design and Engineering System of Safety** approach. The installation of a permanent power supply, such as rechargeable battery power, would have prevented the electrical shock injury that occurred. Also, adhering to established electrical codes and standards would have removed the damaged cord from service. The **Design and Engineering** fix is the most effective way to eliminate the power cord hazard at the source.

Establishing and conducting routine inspections and repair of electrical equipment would eliminate the hazard through the **Maintenance and Inspection System of Safety** approach.

Using cord stress-relief devices would reduce the hazard of heavy power cords being pulled by the hoist operation. The protection provided by this **Mitigation Devices System of Safety** approach would reduce the strain on the cords and reduce the probability of damage to the plugs from stress on the cords.

The training of operators and managers in “Safe Electrical Work Practices,” as well as training qualified electricians to perform repair work, utilizes the **Training and Procedures System of Safety** approach.

Discussion

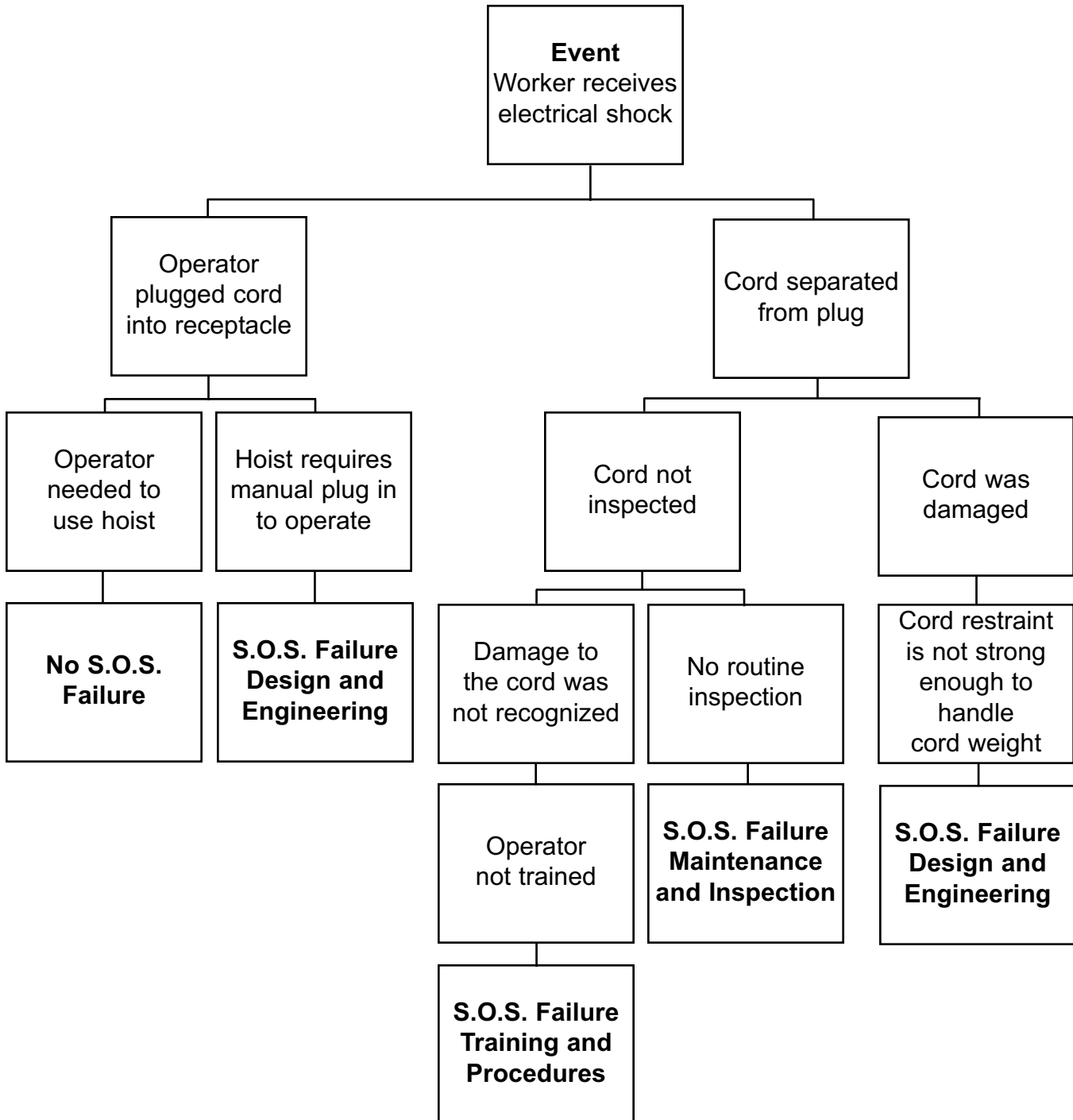
Debris removal requiring the use of a hoist with a long reach, was being performed by an operator. The only hoist available for the job had a power cord that had a surgeon's glove taped over the cord's plug. The worker was instructed by the Shift Operations Manager to remove the glove and inspect the cord. The operator inspected the cord and determined the cord was usable. The operator then plugged the cord into a receptacle that was labeled "CAMS ONLY." The moment the plug was being inserted into the receptacle, a spark was observed and the cord separated from the plug. The plug remained in the receptacle. The worker received a shock.

Stress placed on the cord/plug interface during normal hoist operation caused the cord to pull out from the plug. Power cords are commonly stretched to full extension while used on the hoist. These are standard plugs and the cord restraint clamping mechanism is not robust enough to handle the size and weight of the 30-foot long by 5/8-inch diameter hoist power cord. The above conditions, combined with the failure to routinely perform periodic 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 hold the plugs into the receptacles. The use of these devices is not a mandatory requirement. Operators were permitted to hold plugs into the receptacles in lieu of using the stress-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

1. Install a different power supply for hoist (rechargeable battery).
2. Establish inspection and repair program for electrical devices.
3. Train Operators and Shift Operation Managers on safe electrical work practices.

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 more 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 actions or recommendations participants discussed pursuing at their workplace(s).

Thank you for completing this form.

EVALUATION

Lessons Learned: Worker Receives Electrical Shock from Damaged Plug

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
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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:

<p>If you are a TOP Site (excluding DOE TOP Sites)</p>	<p>Send to: Steve Cable 2915 Gradient Drive St. Louis, MO 63125</p>
<p>All other sites (including DOE TOP Sites)</p>	<p>Send to: Doug Stephens United Steelworkers 3340 Perimeter Hill Drive Nashville, TN 37211</p>

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



SIGN-IN SHEET *(Please print clearly.)*

Class Title: _____ **Class Completion Date:** _____

Location (City, State)/Facility: _____

Grant Program: _____ **Dist. & LU #:** _____

Instructors: 1) _____ 2) _____

3) _____ 4) _____ 5) _____

Name (print first and last)

Check one:

		Hourly	Management
1			
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