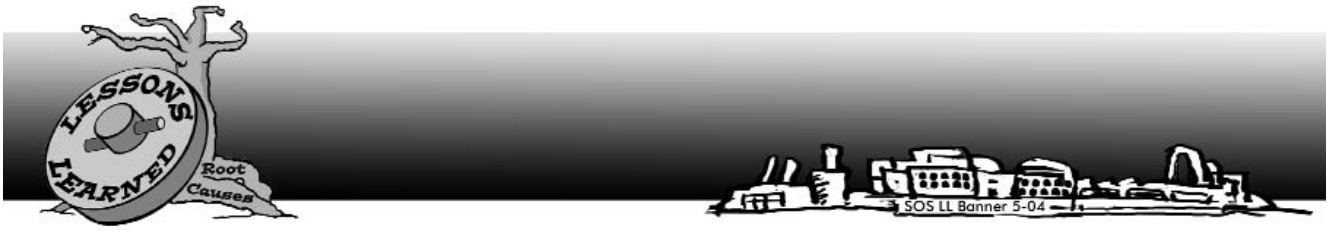

Instrument Mechanic Suffers Electrical Flash Burn

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

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Lessons Learned

Volume 06 Issue 17

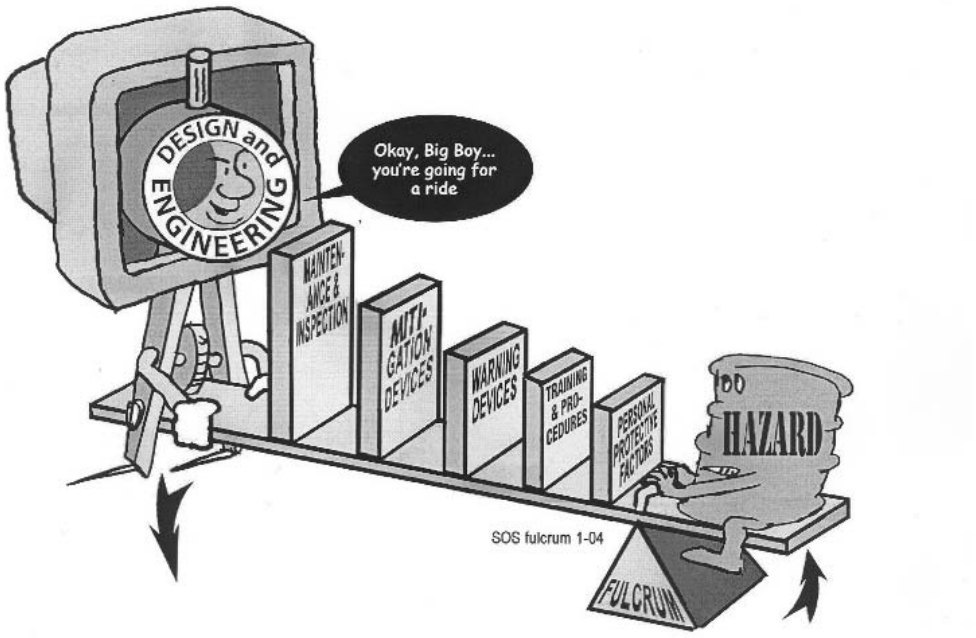
Background Information

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 sub-system 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 sybsystem 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 sub-systems 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: Instrument Mechanic Suffers Electrical Flash Burn

Identifier: Volume 06 Issue 17

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Lessons Learned Statement

The lack of knowledge of the presence of 480 volt equipment in a 110 volt electrical cabinet; the fact that the live 480 volt equipment had no barrier to prevent contact; and a training module not updated with the appropriate protective measures, combined to allow an instrument mechanic to suffer an arc flash burn to his hand and could have caused an electrocution. Having the required barrier in place to prevent contact with the live equipment is a great example of how the properly applied *Technical* **Design and Engineering *System of Safety*** would have prevented this worker's injury.

Having an updated training module, an example of the **Training and Procedures *System of Safety***, will provide employees with the correct information regarding the appropriate electrical protective gloves required to protect the instrument mechanic from the electrical arc.

Correct drawings indicating the presence of the 480 volt equipment in the cabinet, an example of the *Organizational* **Design and Engineering *System of Safety***, allows for safe job planning and execution.

Discussion

An instrument mechanic suffered a first degree burn to his left hand from an electrical arc flash while installing a test jumper. The jumper contacted an exposed, energized 480 volt terminal. The mechanic did not know that there was a 480 volt source in this cabinet. Instrument mechanics do not work on 480 volt equipment. Electrical drawings for this equipment did not show the 480 volt equipment in this cabinet. The mechanic was not wearing electrical protection gloves at the time. The work permit issued for this work, did not identify electrical hazards. The electrical training module was referenced in writing the permit. The module requires the use of electrical protective gloves when working on equipment greater than 300 volts. No justification for energized work was required by the module.

During the investigation it was discovered that the new electrical safety procedure states that electrical protective gloves are required when working on equipment over 50 volts. The training module was never updated with this information. There was also evidence of previous arcing in and around the 480 volt terminal block which was never reported.

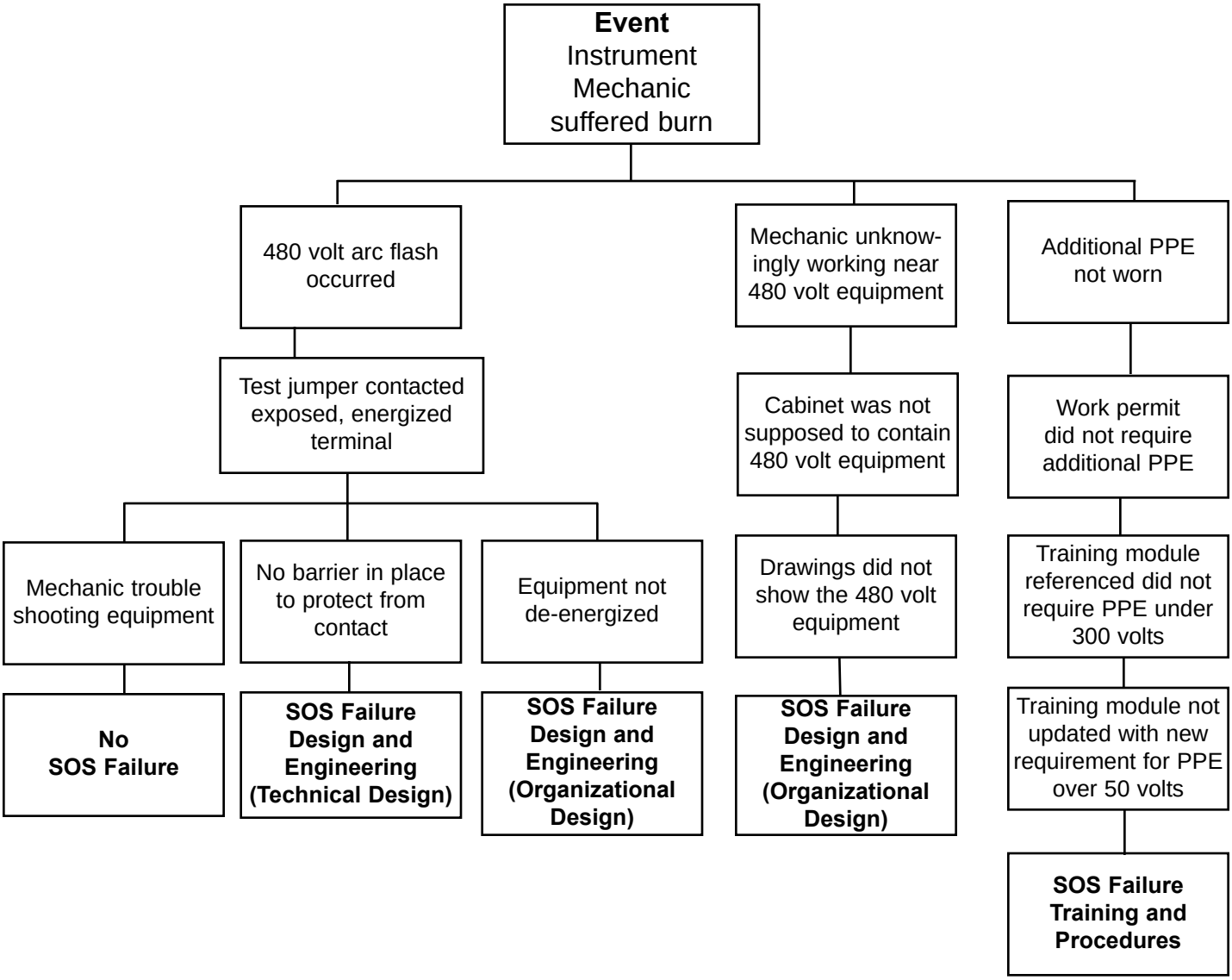
Although not identified as a root cause of the incident investigated, it was found that large sized piping is run on the floor of the room forcing workers to walk on the piping in order to work in the room. This could result in a slip or fall resulting in a significant worker injury and the potential for an electrocution.

Recommended Actions

1. Energy source isolation must be the first consideration when evaluating work to be performed.
2. Work permits must include justification for working on or around energized equipment.
3. When energized work has been justified, a formal JHA must be conducted before beginning work.
4. Before beginning any energized work a pre-job meeting must be held with all involved in the work to review the JHA and to identify and mitigate all potential hazards.
5. Update electrical training module with the latest information from the new electrical procedure.
6. Retrain all affected employees with the newly updated module.
7. Install work platform over piping in the electric room.

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.



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. Complete the chart below by:

   - Putting an "X" beside the recommended actions you think your employer would implement at your workplace.
   - Putting an "X" beside the recommended actions you think should be implemented at your workplace.
   - Prepare to share with the group the reasons for your answers.

Employer	Recommended Actions	You
	1. Energy source isolation must be the first consideration when evaluating work to be performed.	
	2. Work permits must include justification for working on or around energized equipment.	
	3. When energized work has been justified, a formal JHA must be conducted before beginning work.	
	4. Before beginning any energized work a pre-job meeting must be held with all involved in the work to review the JHA and to identify and mitigate all potential hazards.	
	5. Update electrical training module with the latest information from the new electrical procedure.	
	6. Retrain all affected employees with the newly updated module.	
	7. Install work platform over piping in the electric room.	

EVALUATION

Lessons Learned: Instrument Mechanic Suffers Electrical Burn

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 this page **plus the Education Exercise and Evaluation for each participant** 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