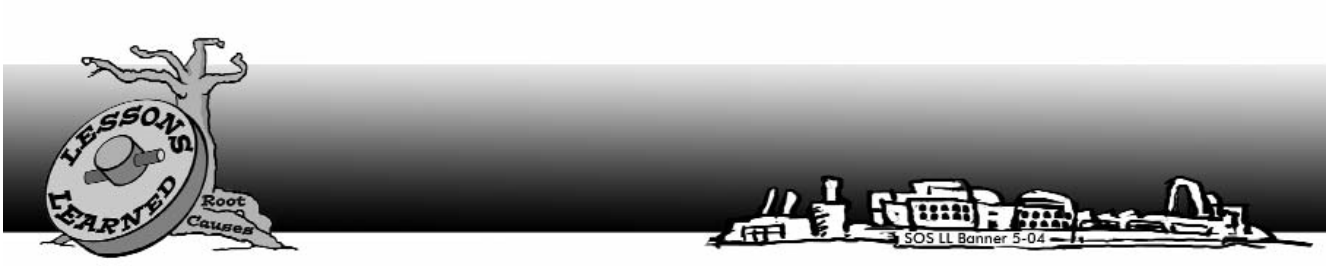

Firemen Injured When CO_2 Bottle Discharges

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

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Lessons Learned

Volume 08, Issue 10

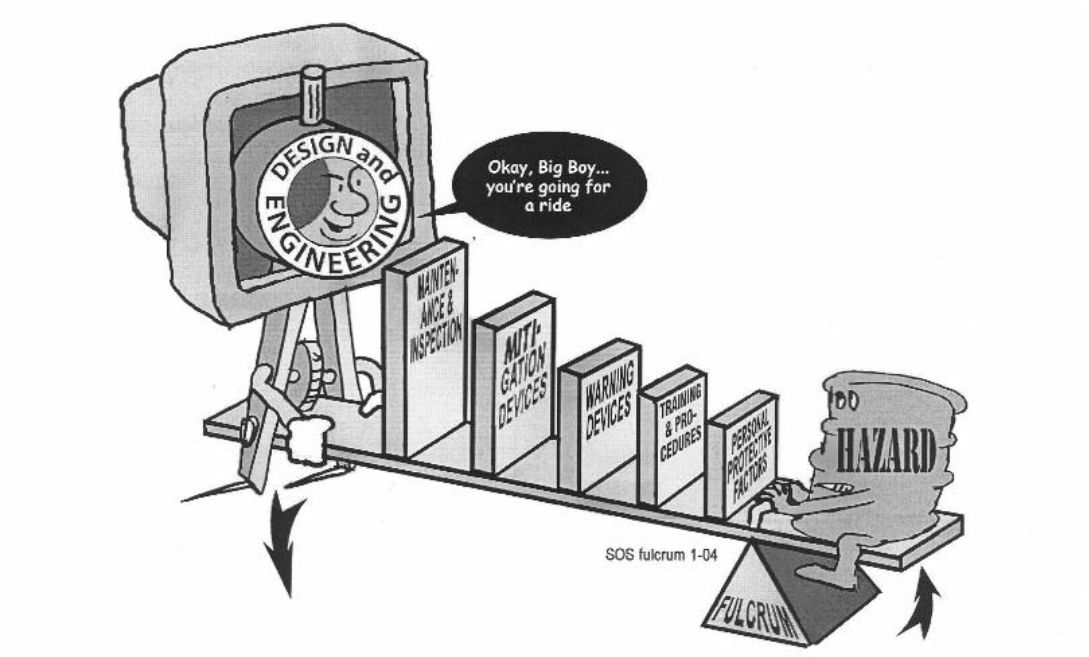
Background Information

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 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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Title: Firemen Injured When CO_2 Bottle Discharges

Identifier: Volume 08, Issue 10

Date Issued: April 15, 2008

Lessons Learned Statement:

Four firemen were injured when a CO_2 fire extinguisher suddenly discharged, causing the extinguisher to spin out of control and hit them. ***Systems of Safety*** are designed to provide prevention from this type of incident.

Replacing the older quick release valves with a more efficient design is working within the **Design and Engineering** ***Systems of Safety*** to ensure the most efficient and safest designed valve available.

Implementing an inspection program for valves before installation is taking action within the **Maintenance and Inspection** ***Systems of Safety*** that helps ensure the operational integrity of the valves.

Updating plant procedures to include leak testing bottles only while secure in a holder is a **Training and Procedures** ***Systems of Safety*** approach that helps provide a safe and healthy work environment.

Discussion:

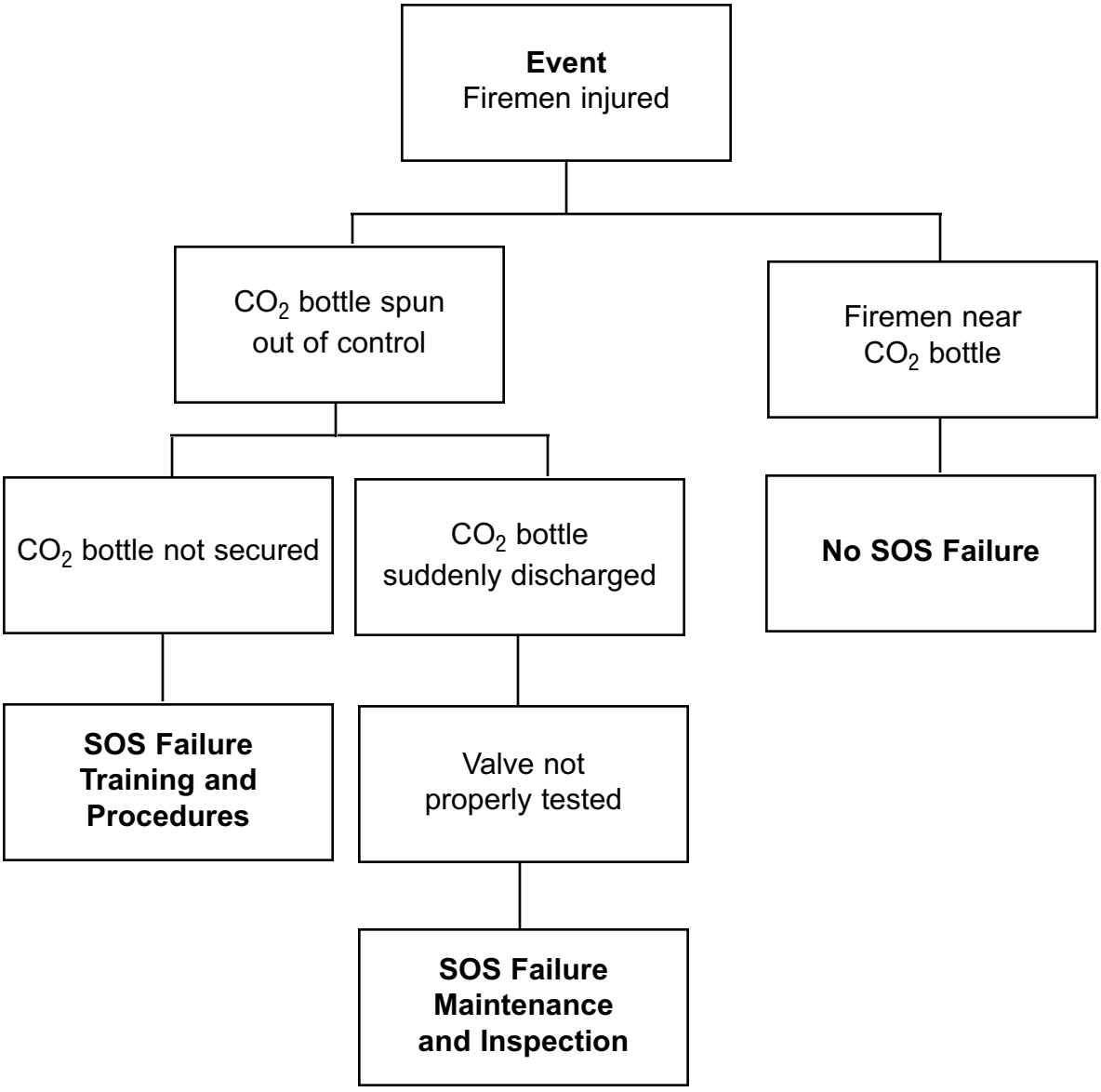
Firemen were in the routine process of filling 50-lb. CO_2 bottles in the CO_2 Filling Room at the Fire Station and changing the discharge valves. This particular valve (a Kidde quick discharge valve) had been removed from an Electrical Switchyard bottle that was due for its 12-year hydro recertification. The fireman removed the Kidde quick discharge valve from the bottle and reinstalled it in another bottle which had recently been returned to the plant following its hydro recertification by an offsite vendor. No maintenance or mechanical inspections were performed on the valve and no issues were identified with either the valve or bottle. The Kidde valve that had been installed into the bottle is thought to be part of the original fire suppression system installed in the Electrical Switchyard; therefore, this valve is possibly 30+ years old.

Following the CO_2 filling process, the bottle was removed from the filling station scale and the Kidde quick discharge valve was "pinned" in the closed position and sealed, then placed on a hand cart for movement within the CO_2 Filling Room. At the time, no issues were identified with the CO_2 filling process, bottle or valve. However, one of the firemen noticed a very small amount of CO_2 leakage from somewhere on the valve. The bottle and valve were then leak-tested and it was determined that the valve was not passing the leak test inspection due to some minor leakage at the valve's weep hole. Curious as to why the valve was leaking, four firemen were inspecting the leakage, when suddenly the CO_2 bottle inadvertently began discharging through the valve.

The force of the discharge caused the full 50-lb. CO_2 bottle to spin out of control and strike the four firemen before falling to the floor. Three of the firemen were knocked to the ground, while the fourth fireman fell onto the bottle in an attempt to secure the bottle. Once on the floor the bottle made approximately three to four revolutions before being secured. The approximate duration of discharge was three to five seconds before the bottle self-sealed and stopped discharging. Injuries to the four Fire Services employees consisted of soreness in their hips, legs, ribs and arms.

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. Review and identify other fire suppression systems at the Plant that may contain the Kidde quick discharge valve.

2. Evaluate the need of Kidde quick discharge valves in the Plant's fire suppression systems. Determine if there is a better designed valve for this application.

3. Evaluate applicable Fire Service procedures for the need to include steps of inspecting valves of bottles that are refilled at the Fire Station.

4. Leak test bottles and valves while secured in a holder.

5. Replace Kidde quick discharge valves on fire suppression bottles on needed systems.

6. Inform Fire Services personnel at sister plant of the CO_2 discharge caused by the Kidde quick discharge valve.

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: Firemen Injured When CO_2 Bottle Discharges

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:

If you are a TOP Site (excluding DOE TOP Sites)	**Send to: Steve Cable 2915 Gradient Drive St. Louis, MO 63125**
All other sites (including DOE TOP Sites)	**Send to: Doug Stephens United Steelworkers 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