



## Boom Truck Mounting Bolt Failure

### Purpose

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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**

**Volume 07, Issue 49**

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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
<b>EXAMPLES OF SAFETY SUB-SYSTEMS**</b>	<b>Technical</b>	Inspection and Testing	Enclosures, Barriers Dikes and Containment	Monitors	Operating Manuals and Procedures	Personal Decision-making and Actions HF
	Design and Engineering of Equipment, Processes and Software	Maintenance	Relief and Check Valves	Process Alarms	Process Safety Information	Personal Protective Equipment and Devices HF
	Management of Change (MOC)**	Quality Control	Shutdown and Isolation Devices	Facility Alarms	Process, Job and Other Types of Hazard Assessment and Analysis	Stop Work Authority
	Chemical Selection and Substitution	Turnarounds and Overhauls	Fire and Chemical Suppression Devices	Community Alarms	Permit Programs	
	Safe Siting	Mechanical Integrity	Machine Guarding	Emergency Notification Systems	Emergency Preparedness and Response Training	
	Work Environment HF				Refresher Training	
	<b>Organizational (must address a root cause)</b>				Information Resources	
	Staffing HF				Communications	
	Skills and Qualifications HF				Investigations and Lessons Learned	
	Management of Personnel Change (MOPC)				Maintenance Procedures	
	Work Organization and Scheduling HF				Pre-Startup Safety Review	
	Work Load					
	Allocation of Resources					
	Buddy System					
	Codes, Standards, and Policies**					

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:**

The proper use of *Systems of Safety* when inspecting and maintaining boom trucks would have prevented this serious incident. *Systems of Safety* are utilized to provide prevention from this type of incident.

The practice of replacing mounting bolts when they are found to be loose provides a well-defined **Maintenance and Inspection System of Safety** approach.

Utilizing the **Maintenance and Inspection System of Safety** to inspect and replace stressed mounting bolts would have prevented this incident.

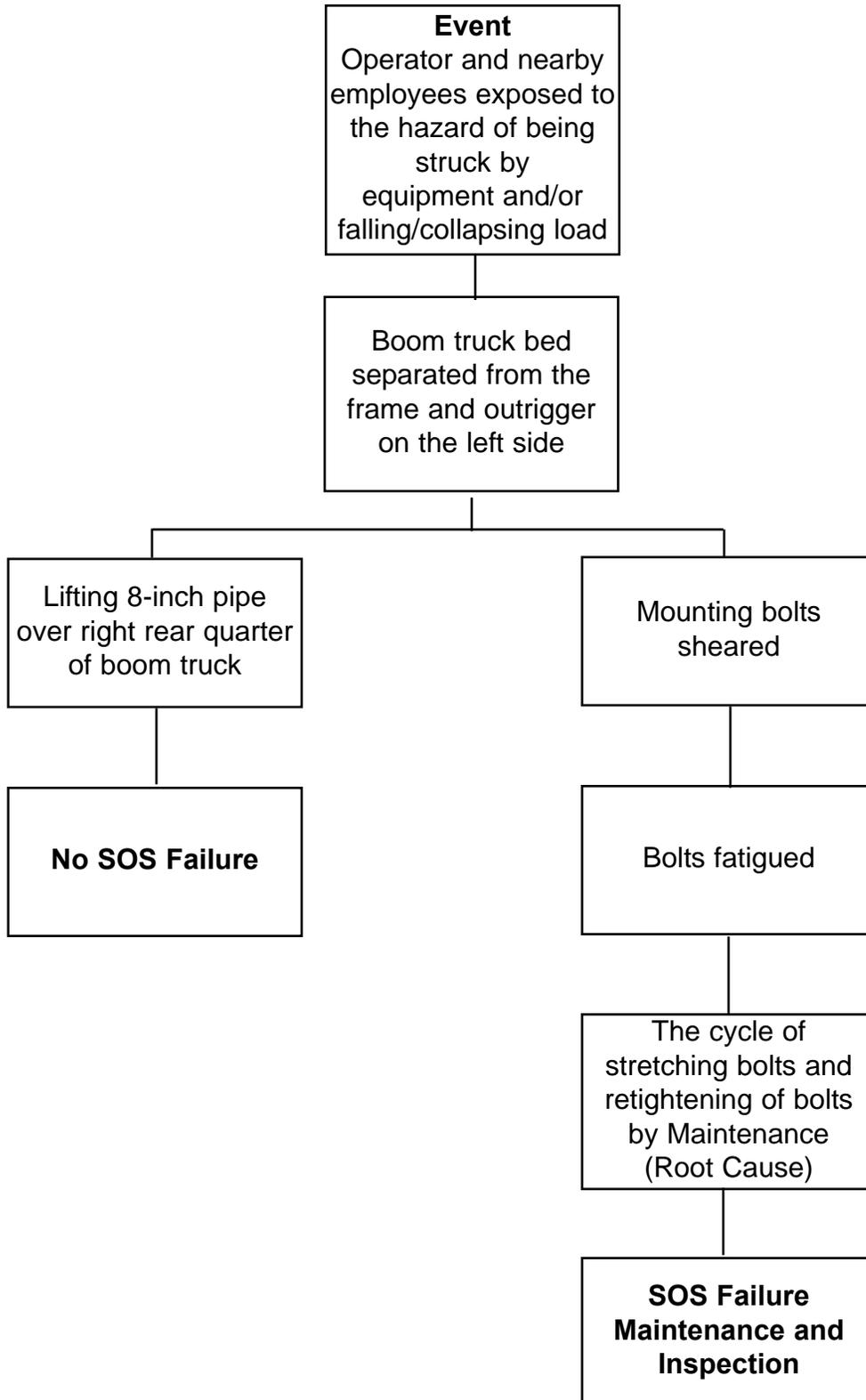
**Discussion:**

A contractor boom truck was in the process of lifting a section of 8-inch piping approximately 60 feet long to reposition it for installation. The lift was estimated at 3,800 lbs. According to the boom truck loading chart, the boom truck could lift 5,000 lbs. at the current configuration. As the crane was booming down over the right rear of the bed, a popping noise was heard. The left rear of the bed of the boom truck began to lift. The operator quickly lowered the lift to prevent tipping of the equipment.

Upon inspection of the truck, it was determined that the bolts mounting the bed to the frame and the outrigger had sheared causing the bed to separate from the frame and the outrigger. It was also determined after the incident that the actual weight of the pipe was 4,600 lbs. This weight was taken from the second boom truck's load calculation computer. The load calculation computer on the second boom truck was verified by conducting a lift of a known weight. The lift was within the limit of the boom truck that had failed. It was also reported that there was previous damage to the outrigger assembly. During maintenance on the boom, truck loose bolts were tightened instead of inspected and replaced.

**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. Conduct an inspection of all boom trucks in the facility to ensure the integrity of the rear outrigger mounting bolts.
2. The maintenance contractor and the contract crane company shall conduct an investigation of this incident and submit a copy of their report.
3. The boom truck involved in the incident shall be recertified by the manufacturer before use.
4. Review findings of this investigation with the maintenance contractor and the contract crane company.
5. The contract crane company shall initiate a third party analysis on the bolt fragments. The report shall be sent to the employer and the local union health and safety representative.
6. The contract crane company shall develop a maintenance best practice that requires the replacement of loose bolts.
7. Employee training in all areas where problems were identified or changes were made.

### 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.

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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).

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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: Boom Truck Mounting Bolt Failure

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?

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**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  
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3340 Perimeter Hill Drive  
Nashville TN 37211

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



