

# Lessons Learned

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## *Fall from Fixed Ladder with Grab Bars Results in Injury and Fine*

### **What Happened?**

A campus employee was holding onto the grab bars at the top of a fixed vertical ladder and was beginning to descend when one of the grab bars broke off, causing the employee to fall about 13 feet. The employee sustained significant injuries to several toes. The incident occurred on a roof mounted cooling tower.



*Photo 1 - The Sheared Metal Ladder*

### **What went right?**

- Two employees were working together and a third was nearby and able to help, Emergency medical providers and UCPD were called and responded immediately.

### **What should have been done differently?**

- The ladder system should have been built to withstand greater load forces.

- The connection hardware should have included a solid insert and backing plates on both sides to distribute load forces over a wider area.
- The connection method should have been designed to minimize galvanic (bimetallic) corrosion between differing metals.
- The ladder, grab bars and connection hardware should have been treated with a sealer protectant or paint to slow the effects of corrosion.
- The ladder system should have been inspected at least twice a year and documented.
- Corroded, excessively rusty, or suspect parts should have been replaced.

### **What was the cause of the ladder failure?**

It is strongly believed that metal fatigue and galvanic (bimetallic) corrosion weakened the aluminum ladder and contributed to the side rail failure at the connection to the grab bars—2 bolts with nuts and washers. The metal fatigue may have been caused by repeated low frequency compression and tension loading in the area near the bolted connection points. The combination of these effects—metal fatigue, corrosion, and intermittent load forces—during a span of 30 years, is the suspected failure cause.

### **What corrective actions have been taken?**

- Affected staff informed of the incident by email and this Lessons Learned document.
- Staff instructed to inspect ladders and ladder parts during each use, and during formal periodic inspections (see next point).
- Instituted a semiannual inspection program for all fixed ladders. Also, performed a campuswide survey of all fixed ladders.
- Replaced the ladder with a caged ladder system.
- A Job Safety Analysis for cooling tower maintenance was created. Also, the job plans document was revised to include more specific safety procedures.
- Instituted a new round of ladder safety refresher training to include instruction on fixed ladders.

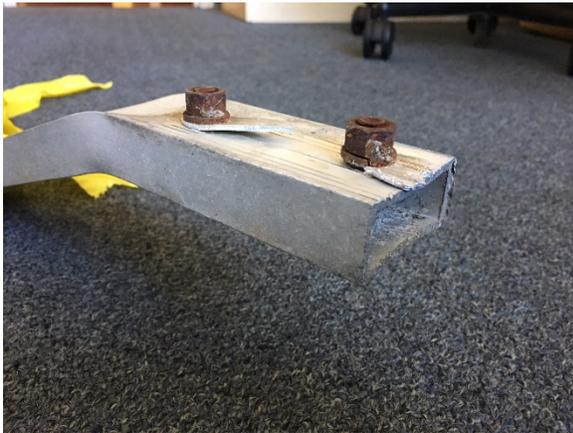
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In addition to the lessons described in the What Should Have Been Done Differently section, major takeaways are to guard against complacency and to always consider the [Integrated Safety Management \(ISM\)](#) process, even for routine tasks.

For additional assistance, contact EH&S at [ehs@berkeley.edu](mailto:ehs@berkeley.edu) or (510) 642-3073, Lessons Learned date: October, 2018.

Additional Photos



*Photo 2 - Grab Bar at the Connection Point*



*Photo 3 - Broken Ladder*



*Photo 4 - Ladder Replacement*