

## Yellow Alert- Rotating Fan Shaft Causes Near-Miss

**Lesson ID:** LL-3-LLNL-30 (Source: User Submitted)

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**Classifier:** **Reviewer:** James E. Wells

**Statement:** When two LLNL workers responded to a water leak in an equipment room, one worker's sweatshirt became entangled with the exposed rotating shaft of an operational fan unit.

The direct cause of this event was an equipment design problem. Ensure that all motion hazards are fully safeguarded.

**Discussion:** A near-miss incident occurred at LLNL when two workers responded to a water leak in an equipment room. The two employees repaired the HVAC unit and proceeded to clean up the excess water from the equipment room floor.

Working in a limited space, one employee's sweatshirt came into contact with the exposed rotating shaft with key way of an operational fan unit (see photo 1). The sweatshirt immediately became entangled and twisted forcefully, pulling the employee toward the fan. The employee braced his body against nearby piping and tore at his sweatshirt and shirt underneath until he was released from the entanglement (see photo 2). The employee was taken to LLNL Health Services, evaluated, and released that day. Although the initial injuries seemed minor, both lost and restricted days were attributed to this event.

In 1998, a similar incident occurred at another DOE facility when two employees were evaluating a smoke detector located inside an air-supply fan room. The employees turned off the fan at the control panel located outside the room, then entered the room before the fan had stopped rotating. As one employee walked past the rotating fan, his jacket became entangled in the exposed fan shaft that projected out almost 2 inches. The force of impact and torsion from the rotating 3-inch diameter shaft resulted in severe injuries to both arms from constriction of the clothing, and injuries to the face, head, neck, ribs, and lungs due to contact with the equipment. Prompt evacuation to a hospital via ambulance and helicopter saved the employee's life. This incident resulted in 549 lost workdays.

Following the near-miss at LLNL, a departmental safety stand-down was immediately conducted to brief workers (who perform similar duties) about the incident. The directorate formed a team to address the event and prepare an action plan. Using a Master Equipment List, the team identified all directorate-owned rotating equipment at LLNL. The team conducted a site-wide physical survey of similar equipment, and identified a small population of unguarded rotating equipment. This "focus list" of equipment requiring immediate machine guard evaluation was sent to the Safety Manager, who generated job orders for the immediate repair or installation of machine guarding.

**Analysis:** • The work activity was deficient because it did not include plans for mitigating hazards. Because the area is not normally an occupied space, it was not common knowledge that the rotating shaft hazard existed in this location. If the exposed rotating shaft had been identified as a hazard, a guard or procedure would have been utilized to control it.

- The safeguarding of HVAC equipment by an enclosed location does not prevent exposure to the

unguarded motion hazards found within the enclosure.

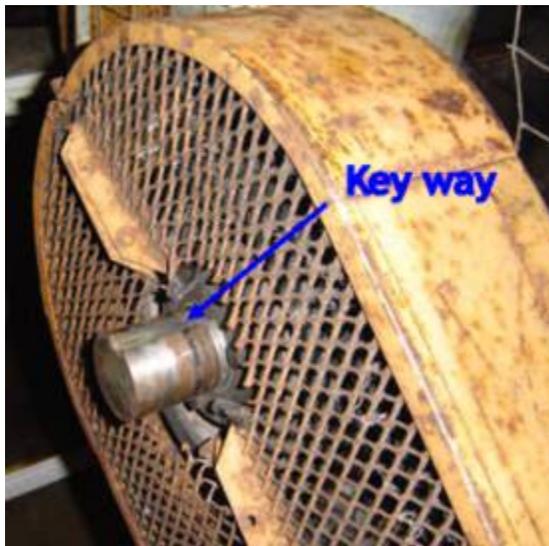
- The direct cause of this event was an equipment design problem. The lack of a guard on the exposed rotating shaft is an equipment flaw. This event may have been avoided if the shaft length did not protrude beyond the existing machine guard.
- The loose fitting sweatshirt increased the opportunity for the clothing to become entangled. This event may have been avoided if workers had been instructed NOT to wear loose fitting clothing around machinery.
- The incident occurred in an inadequate work environment. The workspace is limited, making the work area difficult to access and maneuver in. Movement of the exposed rotating shaft was difficult to see due to the poor lighting.

**Actions:** 1. Ensure that all motion hazards are fully safeguarded. In this case, machine guards were designed, fabricated, and installed to cover the exposed rotating fan shaft.

2. Ensure that workers DO NOT wear loose clothing, finger rings, or accessories (e.g. badge lanyards, neckwear, wrist bracelets, or watches and other jewelry) around machinery or rotating equipment in labs, offices, or building equipment rooms to avoid entanglement.

3. Ensure that long hair is properly secured around motion hazards to prevent entanglement.

4. Preventive Maintenance Programs should include the identification of any machine-guarding concerns and the evaluation of machine-guard installation or repair.



**Savings:**

**Keywords:** FAN SHAFT, ROTATING EQUIPMENT

**Hazard(s):** Personal Injury / Exposure - Mechanical Injury (Striking / Crushing)

**ISM Code(s):** Analyze Hazards

**Work Function(s):** Maintenance - HVAC

**References:**

**Priority Descriptor:** Yellow / Caution