Office of Environment, Health, Safety and Security
Operating Experience Level 3

OE-3: 2024-03 **September 2024**

Moving HVAC Parts Pose Amputation Risk - 2024

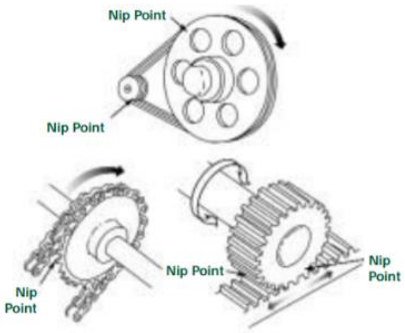
PURPOSE

This Operating Experience Level 3 (OE-3) document provides information related to hazards associated with maintaining equipment that utilizes fans, such as air handlers, exhaust fans, and other types of heating, ventilation, and air conditioning (HVAC) systems at Department of Energy (DOE) facilities. Maintenance personnel routinely work on these systems checking belt tension, inspecting bearings, cleaning filters and coils, and performing other preventative maintenance tasks.

BACKGROUND

In February 2017, an OE-3 was issued on this same topic (see OE-3: 2017-02). Since the issuance of that OE-3 there have been additional incidents reported with personal injuries. Although the incidents are relatively few, the injuries are severe. Therefore, EHSS is issuing this updated OE-3, along with the previous 2017 OE-3, to serve as operational awareness tools for personnel who perform work on HVAC equipment.

All mechanical motion is potentially hazardous. This OE-3 focuses on the serious hazards of in-running nip points ("pinch points") –which occur when two parts move together. "Pinch points" can cause injuries such as amputations, fractures and severe lacerations when workers are caught in moving equipment.



OPERATIONAL HISTORY

A review of the Computerized Accident Incident Reporting System (CAIRS) database was used to identify incidents involving work on HVAC equipment. If there was a corresponding Occurrence Reporting and Processing System (ORPS) report for an incident, it is listed under case demographics.

Below are brief descriptions/case demographics of 6 incidents that have occurred since 2020. Each incident occurred at a different DOE site.

Event (1/23/2020): A 56-year-old worker was performing corrective maintenance work on the supply fan motor and reached into the machine to stop the belt from moving to complete a continuity reading. This action resulted in the workers glove getting stuck in the pulley, resulting in a fracture of the left 4th finger.

Case demographics:

- Length of employment: Over 12 months
- Experience on this job/equipment: Over 12 months
- Emergency room treatment: No
- Hospitalized overnight: No
- Days away from work: 0
- Days of job transfer or restriction: 31
- Time employee began work: 7 am
- Time of event: 9 am
- ORPS report: NA--LASO-LANL-RADIOCHEM-2020-0001

Event (7/28/2020): A 46-year-old worker was performing maintenance work on a blower and attempted to slow the rotating pulley and belt with their left gloved hand so that the maintenance task could commence. The worker's leather glove became pinched in the rotating equipment and caused their left thumb to be entangled between the pulley and belt. The thumb went the full distance of the area that the belt rides in the

sheave and was released on the other side resulting in a complex fracture to the left thumb tip and loss of the thumbnail.

Case demographics:

- Length of employment: Over 12 months
- Experience on this job/equipment: Over 12 months
- Emergency room treatment: Yes
- Hospitalized overnight: No
- Days away from work: 15
- Days of job transfer or restriction: 88
- Time employee began work: 7 am
- Time of event: 8 am
- ORPS report: No

Event (8/23/2022): A 34-year-old worker was performing maintenance on an air conditioner/air handling unit that involved lubricating the motor bearing. The unit was locked out by another worker and this worker waited for approximately 2 minutes for the mechanical energy to dissipate before beginning work. The worker spun the pulley with their left hand, and the tip of their left gloved thumb was caught and pulled into the pinch point between the belt and pulley; the thumb was pulled around the pulley once resulting in a fracture.

Case demographics:

- Length of employment: Over 12 months
- Experience on this job/equipment: Under 3 months
- Emergency room treatment: Yes
- Hospitalized overnight: No
- Days away from work: 96
- Days of job transfer or restriction: 0
- Time employee began work: 8 am
- Time of event: 10 am
- ORPS report: SC--ASO-ANLE-ANLEFMS-2022-0004

Event (12/1/2022): A 61-year-old worker was troubleshooting noise coming from a fan. While troubleshooting and while the belt was being pulled to check for noise coming from bearings, the worker's hand became pinched between the belt and pulley resulting in an amputation to the third and fourth fingertips of the right hand.

Case demographics:

- Length of employment: Over 12 months
- Experience on this job/equipment: Over 12 months
- Emergency room treatment: Yes
- Hospitalized overnight: No
- Days away from work: 0
- Days of job transfer or restriction: 108
- Time employee began work: 6 am
- Time of event: 9 am
- ORPS report: EM-SR--SRNS-HCAN-2022-0020

***In addition, this injury resulted in a Preliminary Notice of Violation (PNOV) of two Severity Level I violations with a total base civil penalty, before mitigation, of $236,000.** Refer to this link for further information: PNOV

Event (5/6/2024): A 53-year-old worker was conducting work on an air handling unit which included applying grease to the motor bearings and manually pulling on the belts. While performing this work, their glove was caught, and their right middle finger was pulled between the belt and pulley resulting in a fracture to that finger.

Case demographics:

- Length of employment: 3 to 12 months
- Experience on this job/equipment: 3 to 12 months
- Emergency room treatment: No
- Hospitalized overnight: No
- Days away from work: 0
- Days of job transfer or restriction: 33
- Time employee began work: 8 am
- Time of event: 10 am
- ORPS report: EE-GO--NREL-NREL-2024-0004

Event (5/28/2024): A 46-year-old worker was doing maintenance on an exhaust fan and used their hand to slow down the belt of the fan which, even though it had been electrically locked out, still had residual mechanical energy (winding down after shutdown). The worker's finger became caught in the belt and pinched between the belt and the pulley resulting in a fractured finger.

Case demographics:

- Length of employment: Over 12 months
- Experience on this job/equipment: Over 12 months
- Emergency room treatment: Yes
- Hospitalized overnight: No
- Days away from work: 7
- Days of job transfer or restriction: 68
- Time employee began work: 7 am
- Time of event: 11am
- ORPS report: NA--LFO-LLNL-LLNL-2024-0018

RECOMMENDATIONS

1. DOE contractors should utilize this OE-3 and the 2017 OE-3 as operational awareness tools for all personnel working on HVAC systems. They can be used to train new workers and as periodic refreshers as often as necessary to ensure that workers are adequately trained and informed.

2. Ensure all equipment is properly locked out consistent with the requirements of OSHA's performance-based standard "The Control of Hazardous Energy (lockout/tagout)" found in 29 CFR 1910.147 which is incorporated in DOE's Worker Safety and Health Program 10 CFR 851.23.

3. Before starting a task, management should ask the question, does the energy control procedure, provide sufficient detail and adequate guidance for an authorized worker to safely and effectively isolate all forms of energy for the HVAC system being serviced and/or maintained?

SUMMARY

HVAC systems require periodic maintenance along with emergency repairs due to equipment failures and are vital to the successful daily operation of facilities across the DOE complex.

Servicing and maintenance activities create the potential for worker exposure to hazards such as being caught in moving equipment. With proper work planning and control, these hazards can be eliminated or controlled. The continuing incidence of serious injuries during HVAC maintenance and repair indicates that this is an area of concern across the DOE complex. The recommendations contained within this OE-3 should be evaluated for inclusion in site Worker Safety and Health Programs.

Questions regarding this OE-3 document can be directed to Craig Schumann, CAIRS Program Manager at 630-252-9176 or craig.schumann@hq.doe.gov.

This OE-3 document requires no follow-up report or written response.

Michael J. Silverman
Director
Office of Environmental Protection and ES&H Reporting
Office of Environment, Health, Safety and Security

The pictures below are examples of air handling units with the guarding removed showing the exposed belt and pulley which can create an in-running nip point.