

SAFETY CIRCULAR ON LOCK-OUT PROCEDURES

OSD/GF/ SC001/ 2000



By Occupational Safety and Health Division
Ministry Of Manpower

INTRODUCTION

Section 24A of the Factories Act is about the establishment and implementation of lock-out procedures. It reads:

(1) Lock-out procedures shall be established and implemented for the inspection, cleaning, repair or maintenance of any plant, machinery or equipment that, if inadvertently activated or energised, is liable to cause bodily injury to any person.

(2) Every person carrying out any work described in subsection (1) shall be fully instructed on the lock-out procedures for that work before commencing that work.

(3) For the purposes of this section, "lock-out procedures" means a set of procedures

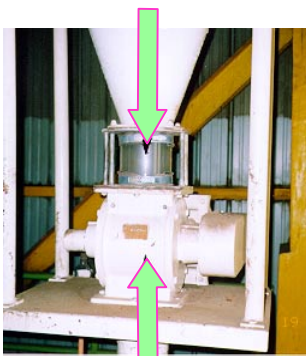
(a) to ensure that all energy sources to the relevant plant, machinery or equipment will be isolated, disconnected or discharged; and

(b) to prevent any part of the plant, machinery or equipment from being inadvertently activated or energised.

ACCIDENTS

Case 1

SIGHT GLASS



AIRLOCK

An employee was clearing a choke in the airlock of a cyclone. Within the airlock, there was a multi-vented rotating part. He did not switch off the electrical power supply to the motor that drove the multi-vented rotating part. After removing the sight glass that was above the airlock, he put his right hand into the airlock to clear the choke. Suddenly, his lower right arm was dragged into the airlock by the multi-vented rotating part. As a result, his lower right arm was amputated.

Case 2



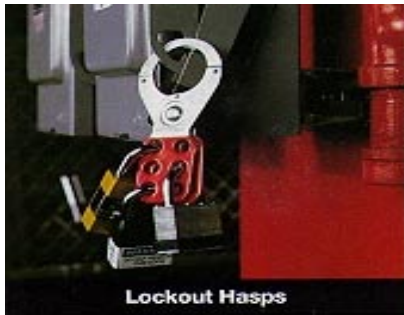
INSIDE OF THE MILL

A fitter was inside a special mill trying to mark out certain spots in the mill for the subsequent welding of a baffle plate. This mill was meant for cooling a product by mixing it with water and stirring the mix with two paddles rotating at a speed of about 180 revolutions per minute. At that time the mill was empty and not in operation. Suddenly, the mill was activated and the fitter suffered multiple injuries. The person who activated the mill had been working with the injured in the mill a short while before the accident on that day. After leaving the mill, he apparently did not realize that the injured who had come out of the mill had re-entered it to carry on with his work.

FIVE SIMPLE STEPS FOR LOCK-OUT

To prevent such accidents, the occupier of a factory must establish and implement a set of lock-out procedures for each of the plant, machinery, or equipment where inspection, cleaning, repair or maintenance work may have to be carried out and where accidental start-up is possible. The lock-out procedures spell out the steps to be taken by persons before they could engage in such work. All persons must be trained to recognize the danger that can arise from accidental activation or energization. Persons authorized to do such work must be trained in the lock-out procedures.

There are five simple steps for the effective lock-out of plant, machinery or equipment.



They are:

- **Announce the shutdown** - Inform the persons, who are working on the plant, machinery, or equipment that it has to be turned off or shut down for inspection, cleaning, repair or maintenance work that lock-out procedure would be implemented.
- **Shut down the machine** – Proceed to shut down the machine plant, machinery, or equipment by the normal shutdown procedure.
- **Disconnect all energy sources** – Disconnect all sources of energy (e.g. electrical, pneumatic or hydraulic energy) supply to the machine. Energy-isolating devices, such as manually operated circuit breakers or isolating switches are used for disconnecting the energy sources.

- **Apply lock-out** – Apply lock-out devices such as padlocks over the energy-isolating devices to ensure that energy would not be restored unexpectedly or accidentally while work was being carried out on the machine. [Also attach tags to indicate that persons are working on the machine. Tagging by itself is insufficient].
- **Verify the isolation and lock-out** - Never assume and always check that the isolation and lock-out have been achieved. Release any residual or stored energy such as the energy in capacitors. Operate the machine's controls to confirm that the machine has been isolated and cannot be re-energized. Return the controls to the neutral position. After this step, it would be safe to carry out the inspection, cleaning, repair or maintenance work on the machine.

FIVE STEPS FOR RESTORING THE MACHINE FOR OPERATION

After the work has been completed on the machine and it is ready for return to normal operation, the following five steps must be taken to ensure the safety of personnel:

- Check to ensure that all tools have been removed from the machine and safety guards, if previously removed, have been replaced on the machine.
- Verify that all personnel are safely clear of the machine.
- Announce that the machine would be turned on.
- Remove the lock-out devices and re-energize the machine.
- Inform the personnel assigned to operate such machine that it is now ready for operation.

DEFINITIONS FOR ENERGY SOURCES, ENERGY-ISOLATING DEVICES, AND LOCK-OUT DEVICES

- **Energy Sources**

Energy sources include electricity, pneumatic energy, hydraulic energy (for example oil, water, other fluids in piping), thermal energy, chemical energy and gravitational energy.

Stored energy must be released or safely blocked off before a person could commence work. Stored energy includes stored pressure, springs under compression or tension, and electric charge in capacitors.

- **Energy-Isolating Devices**

An energy-isolating device is a mechanical device that physically prevents transmission or release of energy. Examples are: a manually-operated circuit breaker, an isolating switch, a line valve, and a block.

Supplementary hardware needed for isolating, securing or blocking of machines includes chains, and self-locking fasteners.



VALVE LOCK-OUT

- **Lock-out Devices**

A lock-out device is a device that utilizes a positive means such as a lock, to hold an energy-isolating device in the safe position so as to prevent the energizing of a plant, machinery or equipment.

Lock-out devices should be standardized within the factory in at least its colour, shape, and size. Lock-out devices should be durable and

strong enough to prevent accidental removal. Any lock-out device should be accompanied by a durable and sufficiently strong tag to indicate the identity of the person who affixes it. Lock-out devices should not be used for any other purpose.

OTHER CONSIDERATIONS TO ENSURE EFFECTIVE COMPLIANCE WITH THE REQUIREMENT ON LOCK-OUT PROCEDURES

- **Group Lock-out**

Whenever a group or groups of people perform such work, the lock-out procedures adopted should provide the same level of protection as if only one person is performing the work. A lock-out hasp could be used to allow each person to affix a lock-out device to the energy-isolating device.

If two or more groups are involved, a coordinator shall be appointed to coordinate the work. A group lock box may be used. Once all energy sources have been isolated, residual energy released and locked out; all keys are placed in the group lock box and the coordinator would apply his lock on the group lock box.

- **Handing Over, Transfer of Lock-out**

Specific procedures shall be developed to ensure continuing protection of people during changes of personnel (replacement or addition). The changes in personnel may take place in the same shift or during shift changes. The incoming persons and outgoing persons should be present together to apply the lock-out device and remove the lock-out device respectively. The outgoing personnel should not remove the lock-out device before the incoming personnel had applied the lock-out device. However, the transfer of lock-out device could take the form of a transfer of the key of the lock.

- **Outside Contractors**

Whenever personnel of an outside contractor (i.e. persons not employed directly by the occupier) are involved in the work, the occupier shall ensure that these persons have been trained in the lock-out procedures and comply with the lock-out procedures.

- **Training and Disciplinary Measures**

The factory occupier should provide training to the following two categories of personnel (including contract personnel) in the factory:

- ✓ *Persons who have to carry out the inspection, cleaning, repair, or maintenance of plant, machinery, or equipment*

Training must cover the skills to identify the energy sources and safely isolate them; to correctly apply lock-out devices; and to verify the shutdown. Re-training should be carried out to keep the worker updated on any new hazards or change in the lock-out procedures. Records of the names of the persons trained or re-trained, and the contents of the training and re-training should be kept after such training or re-training.

- ✓ *Persons who are not involved in inspection, cleaning, repair, or maintenance of plant, machinery, or equipment.*

Training to understand the purpose of the lock-out procedures and the prohibition to restart or re-energize any plant, machinery, or equipment that is locked out. Records of this training should be kept following the end of the training.

Disciplinary measures to be taken for violation of the lock-out procedures should be made known to the personnel, and should be acknowledged



by them.

- **Auditing**

The occupier should carry out audits of each of the lock-out procedures at least once in every 12 months to ascertain whether the lock-out procedures have been complied with. Any inadequacies or deviations uncovered through the audits should be corrected. The occupier should certify that these audits have been carried out -- the certification must identify the plant, machinery, or equipment on which the lock-out procedures were applicable, the dates of the audits, and the names of the persons who conducted the audits. Proper documentation of the audits should be kept.

Issued by
COMMISSIONER FOR WORKPLACE SAFETY AND HEALTH
MINISTRY OF MANPOWER