

Machinery Safety

Policy

Introduction

The University is committed to ensuring the health and safety of its employees and students in the course of their work and studies. When machinery is used in work and studies, the risk of injury can be significant and should be reduced to a practical minimum by all reasonable means. Many machines are inherently dangerous. Serious and even fatal accidents have happened in workshops of universities both locally and overseas. This document is drawn up to provide general guidelines to departments and individuals on the safety considerations and measures they should take in using power machinery (including some battery-operated machines if they can present similar level of risk to the user as power machinery). As there is a large variety of machines in terms of types and designs, it is not practical to provide here detailed safety guidelines for individual machines. Generic principles and measures are given here so that those involved in the use of machinery can assess the risks and take safety measures according to the principles in a systematic manner. Specific safety advices on individual machines can be obtained from the Safety Office if necessary.

Potential Hazards and Relevant Legislation

The hazards associated with the use of machinery can be either mechanical or non-

mechanical. Mechanical hazards include entanglement, drawing in, abrasion and impacts etc. by the moving parts of the machinery. These mechanical hazards may result in various injuries from a minor cut of the finger to amputation of body parts, and may even cause death. Non-mechanical hazards of machinery include electrical hazard from damaged insulation, tripping hazard from trailing power cords, chemical hazard from associated raw materials and fire hazard from overheating. The safety guidelines here only cover the common mechanical hazards while non-mechanical hazards are dealt with separately in other University Guidelines.

The Occupational Safety & Health Ordinance and its Regulations (Cap. 509) state that the employer must ensure that the premises and the plants are, as far as reasonably practicable, safe and without risk. Machinery used in the University is under this general legislative mandate and therefore must be rendered safe by those responsible for it.

The Factories and Industrial Undertakings (F&IU) (Guarding and Operation of Machinery) Regulations under the F&IU Ordinance also stipulate that dangerous parts of machinery must be effectively guarded. More specifically, the use of abrasive wheels is regulated by the F&IU (Abrasive Wheels) Regulations.

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Responsibilities

The responsibilities for the safe use of machinery are no different from those for managing other hazards, and should be in line with the University's Safety Policy. More specifically, the duties are summarized below:

The Department Head has a duty to:

- Assign appropriate staff members to manage the safety of machinery in the department;
- Ensure that all machines are maintained in good working conditions at all time;
- Ensure that all users are suitably trained for the safe use of machinery;
- Ensure that in-house rules on access control, supervision and housekeeping, etc. are available and implemented.

The Supervisor/Person-in-charge of machinery should:

- Ensure that the machine to be acquired is either inherently safe or equipped with suitable guards on their dangerous moving parts;
- Ensure that safety information/procedure for the machine is readily available to all users;
- Ensure that all users have adequate training as specified by the department;

- Ensure that all users fully comply with safety rules;
- Arrange regular preventive inspection and maintenance on the machine and its guards to keep them in good working conditions at all time;
- Provide personal protective equipment if necessary (e.g. eye protection, hearing protection and respiratory protection against flying debris, noise and dust) to the users;
- Keep the surrounding area clean and tidy, and free from combustible materials;
- Arrange to have fire extinguishers available nearby if the machine generates heat in its operation;
- Arrange to provide adequate lighting for the operation of the machine.

Users of the machine should:

- Understand the potential hazards and follow established safety rules;
- Attend the required safety training before using the machine;
- Report any malfunctioning or loss of safety devices or accidents/incidents to supervisor or person-in-charge immediately;
- Use the personal protective equipment provided if required.

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Guidance

Safety Considerations for Acquiring Machinery

The safety of machinery is best dealt with at the planning and acquisition stages. The department and the person responsible for the acquisition should realize that the most effective way of preventing machinery-related accidents is to eliminate the hazard by design, that is, to have intrinsic safety built into the design of the machine. Wherever possible, design considerations such as eliminating dangerous parts, making them inaccessible, reducing the need to handle work pieces in dangerous zones, providing automatic feed devices and fully enclosing the moving parts should be specified as the preferred features in the acquisition process.

The person responsible for the acquisition should require the vendor to supply all available safety information on the machine as a condition of purchase. Upon delivery of the machine, briefing or training on its safe use should be provided by the vendor or other competent personnel to the concerned supervisor(s) and person(s)-in-charge. The supervisor(s) or person(s)-in-charge should in turn arrange similar safety training for all potential users. The safety information such as that in operation manuals must be properly kept and made easily accessible to supervisors and users for reference.

Machine Guarding

If the hazardous moving parts of a machine cannot be eliminated or totally enclosed, effective guarding must be provided. The Factories and Industrial Undertakings (Guarding and Operation of Machinery) Regulations and

the associated “Handbook on Guarding and Operation of Machinery” issued by the Labour Department provide useful information on those dangerous moving parts (see Appendix I) that should be guarded and the different types of guarding.

There are several common ways of guarding a machine that offer effective protection to the user from direct contact with the dangerous parts:

(a) Fixed Guard

The fixed guard is mainly to prevent the access to dangerous moving parts where manual feeding or withdrawal of materials is not necessary.

(b) Interlocking Guard

The interlocking guard is useful for guarding the point of operation where feeding and withdrawal of materials is required. It works on the principle that the machine is made immediately un-operational through some electrical-mechanical interlocking mechanism if the guard is opened. The equipment should be designed to “fail to safety”, i.e. any failure in the interlocking mechanism will render the machine un-operational.

(c) Automatic Guard

The automatic guard is designed to move the user’s hands or body parts away from the danger zone during operation. It is not recommended for guarding fast moving parts as the associated high speed of the automatic guard may become a potential danger in itself to the user.

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(d) Trip Guard

Trip Guard is suitable for machines with continuously moving parts in a danger zone where hands or body parts may come in. A mechanical or photoelectric sensor is used to detect the incoming body parts and immediately stop the moving parts. This type of guarding relies on both the sensitive detection mechanism and the efficient braking mechanism.

(e) Two-hand Control Device

The device allows the machine to operate only when both hands of the user engage the controls simultaneously, thus preventing any of the hands from entering the point of operation. The machine stops immediately if one or both hands are taken off the controls.

More details on the types of machine guarding described above are available in the “Handbook on Guarding and Operation of Machinery” issued by the Labour Department, which is freely accessible on the Labour Department's homepage.

In general, a machine guard should be made of solid incombustible material. All types of machines and their guards require regular testing, inspection and maintenance by a competent person to ensure that they are in good working conditions. Inspection and maintenance records should be kept by the department. Only fully trained personnel should be permitted to service and repair machines. Machines should always be shut down and electrically isolated before the maintenance.

Administrative Measures and Housekeeping

Despite the large variety of machinery, some general safety rules are applicable in all machine workshops. They include:

- An access-control and authorization system should be developed and implemented to control the use of machinery by various groups according risk levels and competency;
- In-house rules should be developed and implemented to restrict personnel working alone with high-risk machinery;
- Loose clothing should be avoided in machine workshops;
- Long hair must be properly tied back;
- Wearing of gloves that can be caught in the moving parts should not be allowed;
- Appropriate personal protective equipment (such as eye protection and face shield) should be used to protect the user from impacts by objects projected from the machines;
- Good housekeeping should be enforced to reduce the chance of accidents;
- Floors and aisles should be kept clean and tidy, and free from unevenness, debris, spills and other tripping hazards. If cutting fluids are used which may make the floor exceedingly slippery, anti-slip safety shoes should be worn in the workshop;
- Sufficient lighting should be provided for machinery work.

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Appendix I:

Dangerous Parts of Machinery or Plant

1. Revolving shafts, couplings, spindles, mandrels, bars and flywheels
2. In-running nips between pairs of rotating parts
3. In-running nips of the belt and pulley type
4. Projections on revolving parts
5. Discontinuous rotating parts
6. Revolving beater, spiked cylinders, and revolving drums
7. Revolving mixer arms in casings fitted with openings
8. Revolving worms and spirals in casings fitted with openings
9. Revolving high-speed cages in casings fitted with openings
10. Revolving cutting tools
11. Reciprocating cutting tools
12. Reciprocating press tools and dies
13. Reciprocating needles
14. Closing nips between platen motions
15. Projecting belt fasteners and fast running belts
16. Nips between connecting rods or links, and rotating wheel cranks or discs
17. Traps arising from the traversing carriages of self-acting machines

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