



## FACT SHEET

SAFEWORK NSW

# MACHINE SAFETY – GUIDE FOR DESIGNERS

Every year thousands of workers in NSW who use machinery suffer horrific and life-changing injuries.

Lack of controlling risks in the design, lack of maintenance, lack of training and improper use of machinery are frequent causes of fatalities, amputations, manual handling injuries, crush injuries, burns and fractures to the fingers, hands and arms.

But all these injuries are preventable!

If you design machinery, this guide will help you design safe machines. Design of a machine includes providing drawing or sketches, specifying material sizes, material condition, material finishes functional specifications and method of manufacture. Persons that modify machines including adding attachments become 'designers' for these tasks and must consider the impact of these tasks on the rest of the machine and its operation.

## WHAT ARE THE HAZARDS?

The hazards of machines used in manufacturing include:

- Mechanical hazards such as; shearing, crushing, entangling, stabbing and drawing-in, abrasion and high-pressure fluid injection
- Electrical hazards
- Noise and vibration hazards
- Manual handling hazards
- Thermal hazards; high or low temperature surfaces, liquids or flames

## WHAT YOU NEED TO DO

Designers have a duty to ensure, so far as is reasonably practicable, that machines are without risks to the health and safety throughout their life cycle. Hazards can be eliminated or managed by designing-in control measures before the plant is introduced into the workplace. This is best achieved by incorporating health and safety risk management in the design process.

## DESIGN CONSIDERATIONS

A designer should consider:

- ✓ Rate of output and level of quality of products
- ✓ Safety at all stages of the life cycle, manufacture, transport, assembly, installation, commissioning, inspection, maintenance and disposal
- ✓ Safe access for inspection, maintenance, operation and rescue

- ✓ Selection and location of controls to minimise injuries from operating controls, for example switches, levers, or push buttons.
- ✓ Providing means to prevent injuries from manual tasks, such as, loading materials, unloading finished products, and installing or removing machine components
- ✓ Foreseeable misuse – defeating interlocks to clear blockage, mis-feeds or need to rotate parts for cleaning
- ✓ Managing safety using controls that do not depend on human behaviour, training and procedures

## WHAT DESIGNERS CAN DO

Where elimination is not practicable, designers must ensure that risks are minimized. The most common types of safeguarding measures of machines are:

- Physical guards which can prevent people accessing the hazard or, guards to prevent broken or ejected parts from striking people
- Tunnel guards which allow the material to flow through but are long and narrow enough to prevent accessing the hazardous area

- If frequent access to the hazardous area is required, use interlocked guards that stops the machine as soon as the guard is opened. Interlocked presence sensing controls are more suitable for certain situations
- If moving parts take a while to stop after interlock is activated, use a combination of locks and interlocks that prevents opening the guard until moving parts have come to a standstill
- Where it is necessary to move hazardous parts, to clear a blockage, clean or setting up, inching or pulse type controls may be installed to run the machine slowly for short distances at a time.
- Operating the machine during cleaning could be avoided if the parts to be cleaned can be removed easily for cleaning.
- Two hand controls may be used if more effective controls are not practicable. They need to be designed to operate the machine only if both controls are activated simultaneously, within a fraction of a second.
- Control risks from unexpected starting of a machine or integrated system of machines
- Use control measures with appropriate level of reliability to suit the severity of possible consequences from the failure of the safety function – safety integrity level or performance levels of the safety critical systems.
- Where possible:
  - extend the lubrication points outside the danger areas
  - use transparent guards for easy inspection without removing guards
- Controls should be easily accessible, could not be activated inadvertently and labelled showing the function and direction.
- Emergency stops do not control risks but they could minimise the harm from an unexpected situation. Emergency stops should not be used as on/off switches.

## RESIDUAL RISKS

The information regarding the risks that cannot be controlled at the design stage must be given to the manufacturer to be passed on to other duty holders in the life cycle. The information, should be provided in the form of operation and repair manuals, should include;

- Limitations of the machine warning against foreseeable misuses
- Rated capacities
- How to operate the machine safely
- Inspection, maintenance and setting up requirements
- Preparations for maintenance (isolating energy sources and releasing stored energy) and fault tracing
- Precautions when undertaking cleaning, repairs and testing

Refer to the following for more guidance:

- *Code of practice – Managing the risks of plant in the workplace* (catalogue No. SW08839), SafeWork NSW
- [www.safework.nsw.gov.au](http://www.safework.nsw.gov.au)
- call 13 10 50.

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Information on the latest laws can be checked by visiting the NSW legislation website [www.legislation.nsw.gov.au](http://www.legislation.nsw.gov.au)

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SafeWork NSW, 92-100 Donnison Street,  
Gosford, NSW 2250  
Locked Bag 2906, Lisarow, NSW 2252  
Customer Experience 13 10 50  
Website [www.safework.nsw.gov.au](http://www.safework.nsw.gov.au)  
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