

This Guide provides information for plant manufacturers on manufacturing safe plant for the workplace. Plant includes machinery, equipment, appliances, containers, implements and tools and components or anything fitted or connected to those things. Some examples of plant include lifts, cranes, computers, machinery, scaffolding components, conveyors, forklifts, vehicles, power tools and amusement devices.

This Guide should be read with the Code of Practice: *Managing risks of plant in the workplace* which provides information on how to manage health and safety risks of plant from installation, commissioning and use through to its decommissioning and dismantling. It also includes information on plant hazards, risks and control measures.

This Guide is part of a series of guidance material for plant that includes information on the safe design, manufacture, import and supply of plant.

This Guide does not apply to structures unless the items of plant are designed as a structural component or are assembled to form a structure, for example scaffolding. A structure is anything constructed, whether fixed or moveable, temporary or permanent. Further information on the safe design of structures and safe design more generally is in the Code of Practice: *Safe design of structures*.



WHO IS A PLANT MANUFACTURER?

A plant manufacturer is the person conducting the business or undertaking that carries out that activity. If a manufacturer imports or supplies plant they will also take on the related duties. Similarly if they design the plant they will take on the designer's duties. For more information see the guides referred to above.

There are often a number of people involved with plant during its lifecycle. A person conducting a business or undertaking can have more than one duty and more than one person can have the same duty at the same time.



WHAT HEALTH AND SAFETY DUTIES DO PLANT MANUFACTURERS HAVE?

Manufacturers must ensure, so far as is reasonably practicable, that plant is manufactured without risks to the health and safety to people who:

- manufacture the plant
- assemble the plant
- use the plant
- store the plant
- decommission, dismantle or dispose of the plant, or
- are in or near a workplace and are exposed to the plant at that workplace.



Obtaining and providing information

Manufacturers have obligations to obtain and provide information about the plant they manufacture so other duty holders can fulfil their responsibility to manage health and safety risks. Information must be passed on from the designer through to the manufacturer, importer, supplier and the end user (see the *Guide for safe design of plant*).

Manufacturers must provide information on the intended purpose and safe use of the plant to any person to whom the plant is supplied.

Manufacturer instructions should be developed and trialled to check they can be understood, achieve the intended outcome and do not pose a risk to health and safety to plant users. Information may be provided in the form of written text or visual information like signs, symbols, diagrams, videos or a combination of these.

It is also helpful for manufacturers to provide information about relevant technical standards used in the plant's design and manufacture so the plant can be installed and used in accordance with those standards.



Using the design specifications

The manufacturer must use the design specifications provided by the designer. If the manufacturer identifies a new hazard in the design, the manufacturer must:

- not incorporate that hazard into the plant during manufacture
- give the designer written notice of the hazard as soon as possible, and
- take all reasonable steps to consult with the designer of the plant on altering the design to eliminate or minimise the hazard, so far as is reasonably practicable.

Where it is not possible for the manufacturer to tell the designer about the hazard, the manufacturer must ensure the risk is eliminated or minimised, so far as is reasonably practicable.



Modifying the design specifications

Every modification should be approved by the original designer or by a competent person. A competent person is a person who has acquired through training, qualification or experience the knowledge and skills to carry out the task. For example, the substitution of metals in a manufacturing process should be approved by the original designer or a person with relevant expertise before the substitute material is incorporated.

If a manufacturer modifies the design of plant without consulting the original designer then the manufacturer will have the work health and safety duties of a designer.



Plant design and item registration

Plant design registration involves registering a design from which a number of individual items can be manufactured to that same design. A manufacturer must not supply plant if the plant requires design registration and it is not yet registered.

If the designer has registered the design, the designer must provide the design registration number to the manufacturer. If the designer has not registered the plant design, then the manufacturer must register the plant design before it is supplied. The manufacturer must pass on the design registration number to the person being supplied with the plant.

If the manufacturing process has involved modifying an already registered plant design so that it requires new risk control measures, the altered design must be registered.

Some plant requires item registration by the person with management or control of that item of plant. This includes plant the manufacturer uses themselves.

A manufacturer who produces a number of the same items of plant may apply for the item registration for the plant. Once the item-registered plant is sold to someone else, the manufacturer must notify the regulator they no longer have the plant.

The WHS Regulations lists plant that requires design or item registration with the regulator. For more information see the [Code of Practice: Managing risks of plant in the workplace](#).

Marking registered items of plant

The plant item registration number must be marked on the item of plant where it can be easily seen. It will generally be a simple task to mark large items of plant by either etching the number in place or by fixing the number in a position that will not damage the plant or lead to the number being unreadable over time.

On some items, for example a tower crane that may comprise many parts and be assembled in a configuration to suit a particular workplace or task, it may not be feasible to mark each component. In these cases the item registration number should be marked on readily accessible major components, such as machine decks, and always be able to be seen when the crane is fully assembled.



MANUFACTURING PLANT

The manufacturer must ensure the plant is manufactured, inspected and if required tested in accordance with the information provided by the designer.

The manufacturer may choose to consider other published technical standards for information on the materials used for the plant and the method of manufacture or construction and testing to ensure the plant is safe.



Testing and examining plant

The manufacturer must arrange for any calculations, analysis, testing or examination that may be necessary to ensure, so far as is reasonably practicable, the plant is manufactured without risks to the health and safety of people.

Details including results of the testing and examination carried out should be documented and must be provided to each person the manufacturer provides the plant to. Typical testing nominated by the designer may include:

- electrical testing e.g. input current, safety contactor current, leakage current, protective earth continuity, dielectric strength test and insulation resistance
- safety function testing e.g. safety circuit operation times, relevant installation distances, use of correct components and reliability design
- temperature rise tests e.g. for exposed temperature hazards and to confirm components are used within their specification
- pressure, stability, mechanical or structural testing
- abnormal condition tests e.g. foreseeable component failures, unexpected start up, hazards following interruption and restoring power sources like electricity and air
- developing a prototype to
 - simulate the normal range of operational capabilities
 - test design features to ensure 'fail safe' operation
 - measure imposed stresses on critical components to ensure maximum design stresses are not exceeded
 - test critical safety features like over-speed and over-pressure devices under both normal and adverse operational conditions, and
 - develop overload testing procedures to ensure plant safety when plant is misused.

Tests and examinations should include:

- all critical components
- the suitability of selected components
- mechanical devices
- pneumatic devices
- hydraulic devices
- sources of emissions e.g. lasers, noise
- guarding and interlocking arrangements
- structural integrity
- material types and properties, and
- a review of safety circuits to ensure the requirements of the category, performance level or safety integrity level have been met.

Techniques for checking the integrity of plant manufacture include visual and non-visual. For example, checking welded joints may require non-visual, non-destructive testing (NDT) techniques. For high risk plant where welding is used as a joining technique, NDT techniques like ultrasonic and x-ray procedures should be used to ensure the welds are defect free and fit for the intended purpose.

Manufacturers should consider, where appropriate, the use of strain gauging or photo-elastic techniques to accurately assess operational stresses. Stresses should be measured dynamically under a range of operational conditions.



Compatibility of components

Some plant may be assembled from components from a variety of sources. The assembly of these by a manufacturer could present a risk to health and safety. A manufacturer using components from external sources should confirm the suitability of the components and provide suppliers an assurance of compatibility of the components used, for example by listing the specifications required in relevant technical standards.



SPECIFIC HAZARDS AND CONTROL MEASURES

Manufacturers have a duty to eliminate or minimise risks, so far as is reasonably practicable, for a number of specific plant hazards.



Confined spaces

Where a confined space is necessary, designers and manufactures must minimise the risk. Manufacturers must ensure that if it is not reasonably practicable to eliminate the need to enter the space or the risk of a person inadvertently entering the space:

- the need or risk is minimised, so far as is reasonably practicable
- the space is designed with a safe means of entry and exit, and
- the risk to the health and safety of any person who enters the space is eliminated or minimised, so far as is reasonably practicable.

Features that should be incorporated in the manufacturing phase are:

- Use of lining materials that are durable, require minimal cleaning and do not react with materials contained in the confined space.
- Design of mechanical parts to provide for safe and easy maintenance to reduce the need for people to enter.
- Access points including those within the confined space—through divisions, partitions or obstructions—should be large enough to allow people wearing the necessary protective clothing and equipment to pass through and to permit the rescue of people who may enter the confined space.



For more information on confined spaces see the [Code of Practice: Confined spaces](#).



Guarding

The manufacturer must ensure that any guarding used as a control measure:

- is of solid construction and securely mounted to resist impact or shock, and
- can be removed to allow maintenance and cleaning when the plant is not in normal operation and the plant cannot be restarted unless the guarding is replaced.

When selecting material for constructing guards manufacturers should consider:

- strength and durability e.g. use of non-metallic materials in corrosive environments
- the effects on machine reliability e.g. a solid guard may cause the machine to overheat while a mesh guard may allow dust into the working environment

- visibility e.g. there may be operational and safety reasons for needing a clear view of the danger area, and
- the control of other hazards e.g. the use of a material that will not permit the ejection of molten metal.



Information on the various types of guards and design requirements is in the Code of Practice: *Managing risks of plant in the workplace*.



Manual tasks

Manufacturers must:

- ensure the plant is designed to eliminate or minimise, so far as is reasonably practicable, the need for any hazardous manual task to be carried out in connection with the plant, and
- take reasonable steps to get information on hazardous manual tasks to be carried out in connection with the plant and provide it to the people that have been supplied with the plant. This information may be in user manuals and manufacturer's instructions. It should be in plain English and include pictures or drawings where possible while also maintaining the accuracy and quality of the technical information.

Manufacturers should consider:

- Characteristics e.g. the weight, size, shape, surface characteristics and stability of plant or its various component parts.
- Vertical and horizontal reach distances of people who may use or manually handle the plant.
- Conditions in which the plant will be used, serviced, maintained and repaired. For example, in some situations it may not be possible to make use of mechanical lifting devices so items of plant or their components should be designed to eliminate risk to the user.

Manufacturers may consider the following methods to minimise risks associated with manual tasks:

- Modular components designed to be dismantled so they can easily be carried or repaired.
- Attachments like handles or designated lifting points to make lifting easier, or wheels to make moving easier.
- Using lightweight materials.



For more information see the Code of Practice: *Hazardous manual tasks*.



Noise

Manufacturers must ensure plant is manufactured so that its noise emission is as low as is reasonably practicable. To eliminate or minimise the risks associated with noise emission the manufacturer should consider:

- preventing or reducing the impact between machine parts
- replacing metal parts with quieter plastic parts
- combining machine guards with acoustic treatment
- enclosing particularly noisy machine parts
- selecting power transmission which permits the quietest speed regulation e.g. rotation/speed-controlled electric motors
- isolating vibration-related noise sources within machines
- using effective seals for machine doors
- using effective cooling flanges which reduce the need for air jet cooling

- quieter types of fans or placing mufflers in the ducts of ventilation systems
- quiet electric motors and transmissions
- pipelines for low flow speeds - maximum 5 metres per second, and
- ventilation ducts with fan inlet mufflers and other mufflers to prevent noise transfer in the duct between noisy and quiet rooms.



For more information see the [Code of Practice: Managing noise and preventing hearing loss at work](#).



Further information

Codes of practice, guidance material and other resources are available on the [Safe Work Australia website \(www.swa.gov.au\)](#).