

Safety in the Use of Machinery

ACoP 10

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Health and Safety at Work Inspectorate
Social Security Department, P.O. Box 55, Philip Le Feuvre House La Motte Street, St Helier, Jersey, JE4 8PE
Tel: 01534 447300 Fax: 01534 873791
Email: hsi@gov.je Website: www.gov.je/hsi

Safety in the Use of Machinery

Approved Code of Practice

Notice of Approval

By virtue of Article 10 of the Health and Safety at Work (Jersey) Law, 1989, (“the HSW Law”), this Code of Practice, entitled “Safety in the Use of Machinery”, has been approved by the States of Jersey Minister for Social Security.

The Code provides practical guidance for all persons who have duties under Part 2 of the Law and are involved in the design, manufacture, supply and use of machinery at work.

ACoP 10

This Code of Practice shall come into force on <Date>.

Senator F Le Gresley
Minister for Social Security

<Date>

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FOREWORD

This Code of Practice on managing health and safety risks from the use of machinery in the workplace has been approved by the Minister for Social Security as an Approved code of practice under Article 10 of the Health and Safety at Work (Jersey) Law, 1989 (the HSW Law).

An ACoP provides practical guidance on how to comply with the standards required under the HSW Law.

An ACoP applies to anyone who has duties under the HSW Law and Regulations. In most cases, following the guidance set out in the ACoP will result in you complying with the duty placed on you under the Law and Regulations. This ACoP deals with particular issues and is not intended to cover all hazards or risks that may arise. The health and safety duties placed on duty holders require that all risks associated with work be considered, not only those for which Regulations and ACoPs exist.

ACoPs have a special legal status and are admissible in legal proceedings under the HSW Law and Regulations. The Court may regard an ACoP as evidence of what is known about a hazard, risk or control and rely on the ACoP in determining whether the requirements of the HSW Law and Regulations have been met in the circumstances to which the ACoP relates.

Compliance with the HSW Law may be achieved by following an alternative method, such as a technical or industry standard, if it provides an equivalent or higher standard of health and safety than the ACoP.

In seeking to enforce the HSW Law and Regulations, an Inspector may refer to an ACoP when issuing an improvement or prohibition notice.

Scope and Application

Machinery safety must be assured at all stages of its life cycle, from the design, manufacturing and supply stage right through to its installation, use, maintenance, cleaning, and modification and decommissioning.

Designers, manufacturers and suppliers should use this ACoP to ensure that machinery is constructed and designed to be used safely and that it is fit for its intended purpose.

Employers should use this ACoP to ensure that they make all necessary considerations when selecting equipment to make certain that machinery is appropriate for its intended use and is suitable for the working environment in which it will be installed and used.

Employees should use this publication to ensure that they are also aware of their responsibilities when using machinery, in line with health and safety law.

INTRODUCTION

Machinery is used extensively in the workplace for a wide variety of purposes. Machinery can, however, result in serious and life changing injuries due to the hazards arising from its use.

The need to consider health and safety risks from the use of machinery is therefore critical for ensuring the safety of persons, not only when machinery is used but at all stages of its lifetime, i.e. during its manufacture, commissioning and installation in the workplace, and during maintenance and cleaning operations. Even the decommissioning and disposal of machinery can lead to injury and therefore consideration should be given, at all stages during the life of a machine, to the identification of hazards and the control measures required to reduce risk.

This Approved Code of Practice (ACoP) provides practical guidance and advice on the safe use of machinery in the workplace, with the exception of woodworking machinery which is covered in ACoP 9 (The Safe Use of Woodworking Machinery).

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The Law

Health and Safety at Work (Jersey) Law, 1989

Law Health and Safety at Work (Jersey) Law, 1989, Article 3 – 8.

- 1 Part 2 of the HSW Law sets out general duties on all those involved with work activities. These general duties, contained in Articles 3 to 8, apply to the safety of machinery.

- 2 **Article 3** places a duty on employers to ensure, so far as is reasonably practicable, the health, safety and welfare of all of their employees. More specifically, Article 3(2) sets out the general duties of employers to their employees. Those duties include:
 - (a) The identification and assessment of risks to health and safety which the employer's employees are exposed to at work.
 - (b) The provision and maintenance of plant and systems of work that are, so far as is reasonably practicable, safe and without risks to health.
 - (c) Arrangements for ensuring, so far as is reasonably practicable, safety and absence of risks to health in connection with the use, handling, storage and transport of articles and substances.
 - (d) The provision of such information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the health and safety at work of the employer's employees.
 - (e) So far as is reasonably practicable as regards any place of work under the employer's control, the maintenance of it in such a condition that is safe and without risks to health and the provision and maintenance of access to and egress from it that are safe and without such risks.
 - (f) The provision and maintenance of a working environment for the employer's employees that is, so far as is reasonably practicable, safe, without risks to health, and adequate as regards facilities and arrangement for their welfare at work.

- 3 **Article 3(3)** sets out further duties of employers employing 5 persons or more –
 - (a) To prepare and, as often as is appropriate, revise a written statement of –
 - (i) the employer's general policy with respect to the health and safety of the employer's employees;
 - (ii) the organisation of responsibilities with respect to that policy;
 - (iii) the arrangements in force and measures taken by the employer to implement that policy;
 - (iv) the significant risks identified by the employer and the

employer's assessment of them; and,

- (v) any arrangements in force and any measures taken by the employer to eliminate or reduce the significant risks to health and safety identified.

4 **Article 4** sets out the general duties of employees at work. All employees are required to take reasonable care for their health and safety and any other persons who may be affected by what they do or do not do. In addition, employees must cooperate with their employer or other person who is legally responsible for health and safety. This includes, for example, the use of safe systems of work and correct use of personal protective equipment such as high visibility clothing, hard hats and respirators.

5 **Article 5** requires employers and self-employed persons to consider individuals other than their employees who could be affected by their work activities, including members of the public and other groups of workers.

6 **Article 6** requires persons in control of premises, which are used as a place of work by other individuals (other than their employees) to ensure that areas under their control do not pose risk to persons using them.

7 **Article 7** requires designers, manufacturers, importers and suppliers to ensure that products intended for use at a place of work can be used safely and without a risk of harm to health. This consideration must be made for the entire life of products, right through from design stage to decommissioning and disposal and information relating to, or affecting safety, must be supplied to the end user.

8 **Article 8** requires that no person shall intentionally or recklessly interfere with or misuse anything provided in the interests of health, safety or welfare as required by law.

Regulations

9 The safe use of machinery is also subject to specific requirements set out under Regulations made under the HSW Law. These Regulations include the following:

- Construction (Safety Provisions)(Jersey) Regulations, 1970
- Cranes and Lifting Appliances (Jersey) Regulations, 1978
- Electricity at Work (Jersey) Regulations, 1983
- Explosives (Safety Provisions)(Jersey) Regulations, 1972
- Lifts (Jersey) Regulations, 1990

This list is not intended to be exhaustive. Reference should be made to the Health and Safety Inspectorate website for a list of current Regulations, www.gov.je/hsi

Duties placed on persons under Part 2 of the Health and Safety at Work (Jersey) Law, 1989

Scope and Application

Law Health and Safety at Work (Jersey) Law, 1989, Article 3 – 8.

- 10 This Approved Code of Practice applies to the safe design, manufacture, supply, use, maintenance, modification and decommissioning of machinery in any undertaking involving a work, trade or business activity. This code is intended to apply generally to machinery and does not take into account specifics of particular categories of machinery such as pressure vessels, medical devices, vehicles and trailers for the transport of passengers or domestic household appliances.
- 11 Machinery is responsible for a number of accidents and incidents occurring each year in the workplace due to the hazards associated with its design, manufacture, supply, use and disposal. Machinery, when not designed and manufactured correctly can lead to serious, life changing and sometimes fatal injuries being sustained by individuals through the inadvertent failure or malfunction of machinery or inappropriate safeguards against machinery hazards. In addition, individuals choosing to remove safety features such as guards or interlocking safety systems, or disregarding safe systems of work when using machinery, are highly likely to sustain injury or harm.
- 12 The aims and objectives of this ACoP are to prevent accidents, incidents and ill-health arising from working with or working on machinery throughout all stages of its lifetime. This requires all persons with responsibility for machinery to follow the recommendations made in this ACoP or to use any equally effective alternative means to comply with duties set out in the law.
- 13 All designers, manufacturers and suppliers of machinery are required to ensure that all hazards arising from the use of work equipment are suitably controlled to prevent harm or injury.
- 14 Employers and self-employed persons also have a duty for assuring the safety of themselves, their employees and any other persons that could be affected by the use of machinery whilst at work. They should ensure that the right equipment is selected for tasks being carried out, making certain that people using equipment are appropriately trained and that work equipment is regularly inspected and maintained to confirm that it works correctly.
- 15 Employees have a duty to assure their own safety and the safety of those around them by following safe systems of work and adopting all necessary safeguards as instructed by their employer.
- 16 The most effective way of controlling work related risk is by elimination of risk from work tasks, wherever possible. It is necessary to consider whether particular work

processes have to be carried out or whether there is any other way that they can be completed (for example by having parts manufactured externally by other companies where the machinery available is not suitable to make that part).

- 17 It is not, however, always possible to eliminate risk in this way and there may be some risk remaining when the use of machinery is essential for carrying out tasks. As such it is necessary to reduce risk as much as possible at all stages to assure the safety of individuals, from design, manufacturing and supply stage right through to the use of, decommissioning and disposal of machinery. This is carried out by applying appropriate risk management techniques, identifying where risk exists, installing controls to reduce risk and ensuring that safe systems of work are adopted to prevent harm or ill-health.
- 18 It is possible to substitute parts of a process with less hazardous operations or by putting controls in place to reduce risk to acceptable levels that prevent harm, injury or disease. Only after all such controls have been installed, and residual risk remains, should the use of personal protective equipment (PPE) be considered, as it only protects the wearer when it is being worn and used correctly. It should, therefore, be considered as a last line of defence.
- 19 Machinery being considered within the scope of this ACoP does not just include new machinery, it also includes machinery that has been altered or modified in any way together with second-hand machinery or items that have been moved, reinstalled or reconfigured.

General Duties of Designers and Manufacturers

Law Health and Safety at Work (Jersey) Law, 1989, Article 7

- 20 Designers and manufacturers of machines have a responsibility for ensuring that users of machinery that they design or manufacture, and any other persons who could be affected, cannot come to adverse harm to their health and safety.
- 21 Specific consideration therefore needs to be made at the design stage to determine the likely and foreseeable risks that exist for each piece of machinery, ensuring that risks are 'designed out' prior to manufacture and that machinery is constructed to be fit for the purpose for which it is intended to be used. Where risks cannot be designed out, appropriate risk reduction measures and controls must be installed to address each risk factor and ensure that risk is reduced to acceptable levels.
- 22 Responsibilities of designers and manufacturers include a requirement to risk assess machinery throughout the entirety of its life. This includes the design, construction, installation, use, maintenance, disabling, dismantling, de-commissioning and scrapping of machinery
- 23 Risk assessment is a major factor in controlling hazards associated with the use of machinery; it requires a systematic process of identifying all likely and foreseeable hazards that could exist at all stages of its life and levels of control that must be

achieved to prevent harm or ill-health. Findings of risk assessments may determine that not enough is being done to control hazards and it may be necessary to install further risk reduction measures.

- 24 In addition to risk assessment, it is essential that designers and manufacturers of machines install all necessary technical measures to assure health and safety whilst, as much as possible, taking the most up to date technology into account.

Risk assessment

Law Health and Safety at Work (Jersey) Law, 1989, Article 7

- 25 Risk assessment should be carried out during the design process in order to consider the foreseeable risks associated with all possible uses to which the machinery may be put, from the start to the very end of its life cycle. This includes its construction, installation, operation, adjustment, maintenance, cleaning, movement, upgrade, modification, decommissioning and disposal.
- 26 In addition to the above, it is necessary for designers and manufacturers to consider the potential abuse of machinery in the workplace and the hazards associated with such misuse. This could include the potential overriding or removal of safety devices by users; and failure to use safe working practices as instructed by manufacturers and suppliers of machinery. It is therefore necessary to 'design out' risk as much as possible so that machinery cannot be misused.
- 27 It will be necessary to consider the types of hazard posed by machinery, combined with the severity of any injury or damage likely to be sustained by individuals and the possibility of such events occurring. It may be decided that there is no alternative but to ensure that machinery operators wear personal protective equipment (PPE) as a control measure. It should, however, be remembered that PPE can also inhibit movement, feeling, dexterity and sensory perception and as such, the installation of this control can also introduce further hazards.
- 28 Designers and manufacturers need to devise measures to eliminate hazards wherever possible. Where hazards cannot be eliminated, risks posed must be reduced, as far as is reasonably practicable, to prevent harm, by installing protective measures. Any controls installed should be checked and reviewed to ensure that they are appropriate in reducing risk to acceptable levels and to determine whether further controls are also necessary to assure safety.

Equipment and accessories

Law Health and Safety at Work (Jersey) Law, 1989, Article 7

- 29 Designers and manufacturers of machinery should include all equipment and accessories necessary for assuring safety.
- 30 In particular instances, machinery will require special tools, accessories, equipment

and safety devices made specifically for use with the machine, for example. to make adjustments to machine settings, to change tooling or to inhibit the use of machinery in particular situations (interlocks and guards). Manufacturers should therefore ensure that all such equipment is supplied with machinery so that it can be operated correctly and safely, with the right equipment for the job.

Warning signs

Law Health and Safety at Work (Jersey) Law, 1989, Article 7

- 31 Machinery designers and manufacturers should place appropriate safety markings, signage and certifications on machinery in line with recognised standards.
- 32 All machinery should be marked with highly visible and indelible labels to provide warnings and raise awareness relating to the safe use of equipment. Pictograms are often used to represent particular hazards via symbols and pictures.

Instructions and information

Law Health and Safety at Work (Jersey) Law, 1989, Article 7

- 33 Designers and manufacturers should provide all instructions necessary for the safe installation and use of machinery. Information should include all safety precautions and safe systems of work to be employed to prevent harm.
- 34 Manufacturers' instructions usually come in the form of written instruction manuals or directions for use and should include the following information:
- the full name and address of the manufacturer with contact details
 - the make and model numbers of machinery
 - details of what machinery is specifically designed to do and what it should be used for
 - any diagrams, drawings, descriptions and explanations required for the safe use, maintenance, cleaning and repair of machinery
 - specific instructions and warnings on any actions that must or must not be carried out in the interests of safety, for example, guards and interlocks must not be removed
 - the specific checks, cleaning and maintenance instructions required to be carried out to ensure its continued correct functioning and operation
 - any additional supplementary information relating to machinery safety
 - how to safely dismantle and dispose of machinery at the end of its life cycle.

- 35 Machinery manufacturers should regularly review information, reports and evidence that relate to adverse product safety, including accident information, ill health, near misses and machinery failure. This information should be used to:
- prevent further occurrences compromising safety
 - re-engineer controls to assure safety
 - supply all information relating to product safety (including defects) to all persons who may be affected
 - withdraw products from use and recall machinery to safeguard end users and any other persons who could be affected.

General Responsibilities of Suppliers

Law Health and Safety at Work (Jersey) Law, 1989, Article 7

- 36 Suppliers of machinery should ensure that they are aware of the safety requirements under the Law and that the machinery complies with those requirements, prior to supply.
- 37 Suppliers who erect or assemble machinery prior to it being supplied to customers, will need to ensure that all safety devices and features are in place to assure safety. This will include assurance that all guards, barriers, interlocks and warning devices are fitted and operational in line with the original design of the machine.
- 38 All information regarding the safe use of equipment should be passed on to customers wherever possible. In some cases, particularly for older equipment, manufacturer's instructions may be missing or no longer available; however, the supplier should do as much as possible to retrieve this information and provide it to customers. This information will include manufacturer's safe assembly instructions and how to safely use, maintain, clean, dismantle and dispose of equipment at the end of its life.
- 39 Suppliers of second hand machinery should ensure that it is safe and meets the requirements of the Law.
- 40 Suppliers have a duty to assure the safety of new and second hand machinery even if they have not been responsible for its design and manufacture. In some cases, suppliers may have dismantled, or assembled machinery prior to supply to customers. It is essential that if this is the case, suppliers follow all safety instructions, installing all guards and protective devices as necessary. Where such guards or devices are missing, particularly for second hand machinery, it is the suppliers' responsibility to ensure that they are replaced prior to supply to customers.

- 41 In addition, if second hand machinery is being supplied, it will be necessary to demonstrate that the machinery meets all technical requirements and specifications to assure safety possibly via thorough examination by a person who is competent to do so. Signed certificates of conformity by a competent person will provide documentary evidence that machinery is fit for purpose, a copy of which should be supplied to the customer. Once testing has been carried out, machinery should not be further altered or adjusted, as this could affect its safe use and operation and it may need to be re-inspected and re-certificated by a competent person.

General Responsibilities of Employers

Arrangements and selection of machinery

Law Health and Safety at Work (Jersey) Law, 1989, Article 3

- 42 Employers should ensure that they provide sufficient resources to enable machinery to be used and operated safely. This may include financial resources to comply with all statutory requirements, regularly assuring the safety of machinery via thorough examinations and ensuring that employees required to carry out works on machinery are trained and competent. Failure to make suitable arrangements for assuring safety due to associated costs are no defence in the event of accidents, injuries and near misses.
- 43 Employers should give careful consideration to the type of machinery that is to be used for working practices and operations, to ensure it is appropriate for the tasks to be performed. This may involve research into the most suitable machinery to be used, via liaison with designers and manufacturers of equipment, to ensure that machinery specification is the most appropriate for work tasks to be performed and in line with the type of environment in which it would be installed. Selecting the wrong equipment for the job in the first instance could lead to safety implications and accidents, and prove to be costly.

Risk assessment

Law Health and Safety at Work (Jersey) Law, 1989, Article 3

- 44 Employers should ensure that they have a health and safety management system in place to assess and control the risks posed by work on or with machinery. This includes all work practices including machinery installation, use, cleaning, maintenance, decommissioning, removal and disposal.
- 45 Employers are required to carry out risk assessments for all significant hazards that exist in relation to the use of machinery. Risk assessments are carried out to ensure that machinery is safe and to develop safe systems of work for employees to follow. The significant findings of risk assessments which would affect the safety of employees should be communicated to ensure that they are aware of the risks present when using machinery and of the control measures to be used to prevent harm, injury or ill-health.

- 46 Where employers employ 5 or more persons, risk assessments should be documented with significant risks identified as part of their health and safety policy. It should be noted, however, that employers with less than 5 employees still need to carry out the risk assessment process and communicate findings to employees to assure they still adopt all appropriate controls to prevent harm or ill-health.
- 47 It will be necessary to consider the types of hazard posed by machinery combined with the severity of any injury or damage likely to be sustained by individuals, and the possibility of such events occurring. It may be decided that there is no alternative but to ensure that machinery operators wear personal protective equipment (PPE) as a control measure. It should, however, be remembered that PPE can also inhibit movement, feeling, dexterity and sensory perception and as such, the installation of this control can also introduce further hazards.
- 48 Employers need to devise measures to eliminate hazards wherever possible. Where hazards cannot be eliminated, risks posed must be reduced, as far as is reasonably practicable, to prevent harm by installing protective measures. Any controls installed should be checked and reviewed to ensure that they are appropriate in reducing risk to acceptable levels and to determine whether further controls are also necessary to assure safety.
- 49 Information on the Hierarchy of Risk Control is provided in the Risk Management Section of this ACoP. This Hierarchy of Risk Control describes how the elimination of risk should be considered in the first instance. Where this is not possible, the next step is to install the most effective methods possible in reducing risk. Further information on risk assessment is also provided in the Health and Safety Inspectorate publication, *Guidance on Risk Assessment, reference RA02 2009*.
- 50 It is necessary for employers to communicate the findings of risk assessment to employees to ensure that they are aware of the risks that exist in relation to the use of machinery, and the safeguards that need to be adopted to prevent injury or ill-health. Employees need to understand the information provided to them. Written records showing that information has been communicated and understood by the employees should be prepared and retained.

Use of machinery

Law Health and Safety at Work (Jersey) Law, 1989, Article 3

- 51 Employers should ensure that the way in which machinery is installed complies with the safety instructions set out in the design and manufacturing information supplied with machinery. Failure to appropriately install equipment can lead to instability and could lead to accidents and failures. Consideration of the work environment should be made to take into account where machinery will be installed to ensure that it can be safely used and does not present hazards.
- 52 All safety devices should be installed, before machinery is taken into use in line, with the manufacturer's specification and instructions.

Training and supervision

Law Health and Safety at Work (Jersey) Law, 1989, Article 3

- 53 Employers should ensure that all employees are trained and competent in the use of machinery.
- 54 No one should be permitted to use machinery unless they have been trained and assessed as being competent. Training can take a number of forms including external, in-house, a combination of both and refresher training. In all cases a training assessment of an individual's specific needs must be carried out to ensure that the training is appropriate. It is advisable to keep a record of all training and assessments, signed by a responsible person such as a partner, director or senior member of management.
- 55 Employers should ensure that appropriate levels of supervision are provided in the workplace for work activities being performed to assure adherence to work procedures and safe systems of work.
- 56 Effective supervision is key to the training of employees' understanding and awareness in the safe use of machinery. The degree of supervision will depend on the progress of the trainee and will vary until it has been determined that the individual is considered to be competent. A record of the assessment of competence should be made and signed by a responsible person such as a partner, director or senior member of management.

Inspection and maintenance

Law Health and Safety at Work (Jersey) Law, 1989, Article 3

- 57 Machinery can be prone to overuse, wear and tear, breakdown or problems that can affect its safe use and operation and the safety of persons using it. As such, it is necessary to ensure that regular machinery checks are carried out to make sure that machinery remains in good working order.
- 58 Machinery requires regular inspection by persons who have the competence to judge whether equipment is in safe working order, so that any risks to health and safety may be detected to prevent injury. Such inspections should be well planned and carried out by competent persons including external engineers with the appropriate knowledge, qualifications and experience to assess machinery and detect any problems or concerns affecting safety.
- 59 Any such problems will be reported to the employer who has responsibility for taking remedial action to render machinery safe for use. This again will require engineers with the appropriate knowledge, qualifications and experience to repair machinery and certify that it is safe for use.
- 60 Frequencies of machinery inspections will vary, dependent upon machinery types, the risks posed and the environmental conditions to which machinery is exposed. The usual inspection period for machinery is 12 months, however it may be

necessary to carry out more regular inspections in accordance with the manufacturers guidance.

- 61 Machinery will also need to be inspected if there are any concerns over machinery safety between planned inspection periods. Where defective machinery has been identified it will be necessary for machinery to be taken out of use, until safety checks have been made by a competent person, and assurance has been provided to confirm that it can be used safely and is fit for purpose.

General Responsibilities of Employees

Law Health and Safety at Work (Jersey) Law, 1989, Article 4

- 62 Employees should follow all safe working procedures provided by their employer for the safe operation of machinery.
- 63 Employees should follow all safe working procedures, safe systems of work or method statements provided by their employer. All such instructions are provided to ensure that safe work methods are adopted to prevent injury or ill-health and it is important that employees follow them.

Co-operation

Law Health and Safety at Work (Jersey) Law, 1989, Article 4

- 64 Employees should ensure that they carry out any activity or comply with safe systems of work as required by the employer. This would include following safe working practices or procedures, attending training sessions and wearing PPE where required.

Misuse or tampering with safety devices

Law Health and Safety at Work (Jersey) Law, 1989, Article 8

- 65 Any item of equipment provided for the safety of employees should not be altered or misused that may lead to its subsequent failure. This includes the removal of safety devices on machinery including guards or barriers, modification or altering of PPE or horseplay in which machinery is used incorrectly.

Reporting faults and accidents

Law Health and Safety at Work (Jersey) Law, 1989, Article 4

- 66 Employees should immediately report any fault or dangerous situation arising from the use of machinery to their employer, to ensure that any fault on machinery can be rectified, as this may affect machinery safety. Employers can only remedy faults that they are aware of and therefore it is important that any concerns are quickly reported to prevent machinery failure leading to injury or ill-health.

- 67 Employees should immediately report all accidents, incidents and dangerous occurrences, no matter how small or seemingly inconsequential, as soon as it is possible to do so. Employers can then take remedial action to prevent such incidents from reoccurring.

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The Risk Management Process

Risk assessment

68 Risk assessment is a fundamental part of good health and safety management; it is a systematic process that is carried out to identify hazardous situations, to determine the risk or likelihood of such situations actually occurring and the control measures necessary to eliminate or reduce risk to acceptable levels.

69 Risk assessments should be carried out by competent persons with all of the necessary information, knowledge and experience of the situation being assessed. More specifically in the case of machinery:

- Designers should have sufficient knowledge and competence in the safe design of machinery.
- Manufacturers should have sufficient knowledge and competence to safely manufacture and assemble machinery components in conjunction with designs.
- Suppliers should ensure that they are competent to assess the safety of machinery and ensure that all safety aspects are complied with including the provision of all necessary safety and user information to their customers.
- Employers are required to have sufficient competence and experience with regard to risk assessing the use of machinery and they must pass the details of such assessments on to their employees.

Risk assessment process

70 Stage 1. Identify the hazards

Consider all of the significant foreseeable hazards associated with the assessment being carried out, gathering as much information as possible for each hazard identified. The most common hazards that should be considered with regard to machinery include crushing, shearing, puncturing, cutting, abrasion, burns, electric shock, fire and explosion, noise induced hearing loss and exposure to harmful substances.

71 Stage 2. Who can be harmed and how?

Think about the people who are likely to be harmed, how many people this could be and how they could be harmed. It is important to consider the severity of any harm, injury or ill-health sustained as this will also affect the levels of control that are necessary to reduce risk. Persons likely to sustain injury at all stages of the machinery life cycle include persons manufacturing and assembling components, and

operatives coming into contact with moving parts when clearing blockages, or being drawn into machinery.

72 **Stage 3. What is the likelihood of the hazard occurring and what controls are already in place to reduce this risk?**

How likely is it that the hazardous event will take place for each scenario? Is it very likely and what controls are already in place to reduce the chances of it occurring?

73 **Stage 4. Can risk be reduced any further?**

Is there anything more that can be done to reduce risk? If so, this should be prioritised and put into place as soon as possible, in line with the levels of risk. Individuals should be made responsible for installing such controls within appropriate timescales. For example, if hazardous situations are highly likely to occur with severe consequences and little control is in place, additional controls must be installed as a matter of urgency to prevent injury, harm or ill-health, or the task stopped until appropriate control has been implemented.

74 **Stage 5. Record your findings and regularly review.**

Persons with 5 or more employees have a legal duty to record the findings of any risk assessment and to communicate the findings of risk assessment to their employees. Risk assessments also must be regularly reviewed by competent persons to ensure that they remain up to date or should work processes change, whichever is sooner.

75 Further guidance on the 5 stage risk assessment process is available in the publication '*Guidance on Risk Assessment, reference RA02 2009*' which is available on the Health and Safety Inspectorate website, www.gov.je/hsi

Identifying machinery hazards

76 There are a wide range of hazards associated with machinery throughout all stages of its life which should be eliminated or reduced so far as is reasonably practicable to prevent harm or ill-health. It is important to be aware of the likely hazards that cause harm, injury or ill health and the consequences of such hazards occurring. The most common hazards likely to cause harm, injury or ill health, with regard to machinery, are briefly summarised in this section.

Mechanical hazards

77 **Abrasion and friction**

Injuries related to friction or abrasion occur when contact is made between body parts and machinery parts moving at high speed. Machinery parts can range from being relatively smooth surfaces (for example, conveyor belts and drums) to rough surfaces (for example, abrasive grinding wheels, pulleys and ropes). When moving at high

speed, sufficient friction between the machinery surface and human body parts can cause serious burn injuries, or 'skinning', being sustained to the top layers of the skin, even when contact time is brief.

78 **Crushing**

Crushing injuries are sustained in a variety of ways when parts of the body are caught in between machinery parts and/or fixed structures. This can include:

- crushing between 2 moving parts of machinery (e.g. the arms of a scissor lift)
- crushing between a moving and fixed/immobile part of machinery (e.g. punch press)
- crushing between a moving part of machinery and a fixed structure (e.g. counterweight and wall or floor).

Injuries are caused through compression of body parts and can range from bruising, breaks and fractures to suffocation.

79 **Cutting**

Cutting hazards exist on machinery which involves rotating, cutting, drilling and planning operations. Such machinery includes rotating saws, planers, pillar drills, mills and high pressure water jet cutting machines.

Cutting injuries include lacerations and amputations when parts of the body are exposed to the operating position of the machine (for example, rotating drill bit), however, injuries can also occur when materials or tools are ejected at high speed from machinery, most often resulting in injuries to the face, head and eyes.

80 **Entanglement**

Entanglement occurs when loose materials or items are caught in machinery leading to parts of the body also being drawn in to the machine resulting in injury. This can include the drawing in of items of loose clothing, (for example, gloves, sleeves, ties, scarves and jewellery), long hair, cleaning cloths and rags, at high speed into machinery.

Injuries most often sustained due to entanglement include fractures, breaks, crushing and amputation, which can be fatal.

Machinery in which entanglement occurs includes rotating equipment or surfaces such as drills, chucks, spindles, mandrels and augers however entanglement can also occur inside gaps in machinery or via projections on machinery catching on loose items and drawing them into the equipment.

81 **Impact**

Impact injuries arise when the body is struck by objects that do not physically

puncture or penetrate the skin, but which can cause bruising, breaks, fractures, unconsciousness and severe internal injuries that can be fatal.

Machinery causing impact injuries may be the same or similar to that causing crushing injuries including vehicles, robotic arms or counterbalances.

82 ***Puncture and stabbing***

Injuries are sustained when the skin is punctured or stabbed by moving machinery or flying objects such as loose tooling, items being machined or debris, resulting in a flesh wound. Injuries sustained can include loss of blood, loss of sight, exposure to harmful substances and infectious materials. Machinery with rapidly moving parts and responsible for such injuries include drills and machine dies.

83 ***Shearing***

Shearing occurs when power is applied to slice, trim or shear items between two opposing machine parts. Examples of such machinery include guillotines, power presses and metal planing machines in which shearing occurs at point where machine parts meet.

Injuries are most often sustained by individuals coming into contact with shear points at which items are machined, leading to cuts, breaks, fractures and amputations.

84 ***Trapping***

Trapping or 'drawing in' hazards exist at points where parts of the body can be caught between two counter rotating parts also known as 'running nip points'. Such machinery includes pulleys, gears, spindles and transmission belts and such hazards most often occur when machinery is running too fast and fails to run smoothly; for example, when there are erratic changes in operating speed, frequent breakdowns or problems with feeding materials into machinery.

Injuries from trapping include crushing, breaks, fractures and amputations. In severe instances injuries can be fatal.

Non-mechanical hazards

85 ***Electricity***

Electrical hazards include electric shock, electric burns as a result of persons contacting live conductors or parts of machinery which have become electrical live due to faulty conditions. Fires and explosions can also occur as a result of faulty electrical equipment.

Static electricity build up can present a risk of electric shock and fire through the ignition of materials.

86 **Temperatures**

Machinery can be subject to changes in temperature due to hot or cold working processes and activities. This can lead to individuals being exposed to surfaces or parts of machinery at which contact with extremes of temperature (both hot and cold) can cause severe burn injuries. In some cases such injuries can lead to infection and amputation.

87 **Noise and vibration**

Noise and vibration are inherent factors associated with the use of work machinery and are the cause of a significant level of industrial illness in workers.

Exposure to high levels of noise (in excess of 80 decibels (dB(A))) is the cause of such conditions as deafness, tinnitus and noise induced hearing loss which is irreversible.

Severe pain and discomfort is caused by circulatory disorders such as vibration white finger and carpal tunnel syndrome which occur when the body is exposed to excessive vibration through contact with work machinery.

88 **Radiation**

Exposure to either non-ionising or ionising radiation can result in immediate injury through burns and can also give rise to long term effects.

Types of non-ionising radiation include electromagnetic radiation and light including infra-red, visible, ultra violet and laser light radiation.

Ionising radiation includes alpha, beta and gamma rays, X-rays, electron or ion beams and neutrons.

89 **Emissions and explosions**

Dangerous emissions can be generated from the use of machinery such as exhaust gases from combustion, vapours from the use of chemical processes or dusts which can be inhaled, ingested, and absorbed by persons in contact with such substances.

Machinery explosions can occur when there is a build-up of gases, liquids, dusts and vapours that are produced in machinery or in the work environment. When particular concentrations of such substances occur together with a good supply of oxygen and the presence of an ignition source, explosion can occur with catastrophic consequences.

The hierarchy of control measures

90 The ways of controlling risks associated with machinery are ranked from the highest level of protection and reliability to the lowest. This ranking is known as the hierarchy of risk control. The Law requires the duty holder to work through this hierarchy to choose the control that most effectively eliminates or, where that is not reasonably practicable, minimises the risk in the circumstances:

1. ***Elimination*** – The most effective control measure is to remove the hazard or hazardous working practice associated with the use of a machine.
2. ***Substitution*** – Substitute the machine or process with a machine or process that is safer.
3. ***Isolation*** – Separate the hazardous machine from persons by barriers.
4. ***Engineering controls*** – Provide guards to prevent contact with moving parts of the machine.
5. ***Administrative controls*** – If risk remains, it must be minimised by implementing administrative controls, so far as is reasonably practicable, for example, introducing a permit system to ensure that operators are aware that the machine is isolated from its power source and must not be operated while maintenance or cleaning work is being done.
6. ***Personal protective equipment (PPE)*** – Any remaining risk must be minimised with suitable PPE, such as providing persons with respirators or protective eye wear.

Combining control measures

91 In many cases, a combination of control measures will provide the best solution. For example, protecting persons from flying debris when using a concrete cutting saw may involve guarding the blade, isolating the work area and using PPE such as a face shield and hearing protection.

Maintaining and reviewing risk control measures

92 The control measures that are implemented must be reviewed and, if necessary, revised to make sure they work as planned and no new hazards have been introduced by the control measures.

93 Operators and other workers should be consulted to obtain feedback on the effectiveness of the control measures that are provided.

94 The control measures should also be reviewed following any incident or accident.

95 A regular review of control measures should also be carried out. The time interval between reviews will be dependent on the level of risk and the type of machine involved. There may also be particular stages in the life of the machine when more frequent reviews are required.

Specific Control Measures

- 96 This section provides guidance on specific control measures that can be used to address the hazards arising from use of machinery. It is not intended to be exhaustive as all machinery and workplaces differ widely in their applications

Guarding

97 **Fixed guards**

Fixed guards are permanently fixed barriers that are welded or incorporated into the body of machinery to prevent access by persons to hazardous areas whilst under normal operating conditions or during cleaning and maintenance. Fixed guards or barriers are usually constructed of wire mesh, sheet metal or are in the form of screens and bars made of materials able to withstand impact or usage, likely to occur on such machinery. Such guards should not be easily removable without the use of an appropriate tool. Fixing devices that are operated with the fingers, for example, wing nuts, should not be used.

98 **Interlocking guards**

Interlocking or 'moveable' guards are physical barriers controlling access to hazard zones that are interconnected with the power or control system of the machine. Therefore, when interlocking guards are moved or opened, the machinery should come to a complete stop before access is possible. Where the stopping of machinery is not immediate, it will be necessary to ensure that an interlock delay device prevents opening of the guard until it comes to a complete stop.

Connections with interlocking guards are usually electrical, mechanical, hydraulic or pneumatic and in the event of power failure, interlocking guards should 'fail to safe' to ensure that danger zones remain inaccessible until the power is restored and the guard is placed in 'safe mode'.

99 **Adjustable guards**

Adjustable guards are physical barriers that can be altered to suit the size or depth of material being machined. Adjustable guards offer varying degrees of protection. Manually adjustable guards rely on the physical movement of guards to suit the material being machined and thus can be prone to misuse.

Self-adjusting guards are guards which alter to the material being machined and once materials are removed from the hazard zone, the guard returns to its original position to prevent access to the danger area.

100 **Distance barriers**

Distance barriers, such as perimeter fences securely fixed in position, prevent access to dangerous areas. Any access points, for example gates and doors should be secured with a lock and key or interlocking system.

Isolation procedures may be necessary where there is a danger of machines activating whilst a person is inside the barrier, for example when an interlocked gate is closed the machine should not automatically restart.

101 ***Presence sensing systems***

If physical guards are not reasonably practicable, then a presence sensing system can be used to control the risk. These systems detect when a person (or part of a person's body) enters the danger zone and stops the machine. Photoelectric light beams, laser scanners and foot pressure mats are examples of these type of guards. They rely on sensitive trip mechanisms and the machine being able to stop quickly, which may be assisted by a brake.

Effective presence sensing safeguard systems require the selection of a trip device appropriate for the work being done, and the correct location of beams and light activated devices, taking into account speed of entry and machine stopping time.

102 ***Colour coding***

It is good practice for all guards to be painted the same colour. For example:

- use high visibility yellow, provided it is different from the machine's colour, so that it can be clearly seen when a guard has been removed or when it is not in its proper place.
- paint the surfaces behind the guard a contrasting colour or bright colour so that when the guard is removed, the exposed colour is clearly visible and it is easy to identify that the guard has been removed, alerting operators to the possible danger.

103 ***Removal of guarding***

If any type of guard is removed for the purpose of maintenance or cleaning, it must be replaced before the machine is taken back into use. The machine should not be able to restart unless the guarding is in place. When removing guarding, isolate the energy source by disconnecting the power supply or locking out motive power sources.

Operator controls

104 ***Control devices***

Control devices are used and installed to ensure that hazardous situations do not arise and present a risk of harm, injury or ill-health whilst using machinery. Where hazardous situations do however arise, control devices should be in place on machinery to ensure that danger can be overcome to assure safety. Such controls include starting and stopping mechanisms including interlocked systems, emergency stops and warning devices.

Machinery control devices should be designed to ensure that access to hazardous zones on machinery is prevented whilst the machine is operating or to alert the machine operative of any unsafe situation arising.

This includes controls to prevent moving parts being activated whilst the operator is within hazard zones and methods for ensuring that should operators try to access hazard zones during machinery operation, machinery comes to an immediate and complete stop before access is permitted.

105 **Starting devices**

Starting devices should be designed and manufactured to ensure that they cannot be inadvertently or accidentally activated which could lead to danger.

Two handed devices are sometimes used to ensure that machinery can only be operated when two hands are positioned on the machine controls. This ensures that the operatives' hands are out of the hazard zone when the machine is operated; however, such devices only offer protection for the operative using the machine and not other persons who may be in the hazard zone. As such, this method of protection should be used in combination with other guarding methods.

106 **Stopping devices**

All machinery should be fitted with stopping devices that allow machinery to come to a complete and full stop rendering equipment safe before access can be gained.

107 **Emergency stops**

Although emergency stop devices are an important feature on machinery, they should not be used as the only method of controlling hazards but should be an additional control to those already in place, to prevent or reduce the potential for harm, injury or ill-health.

Emergency stop or braking devices should be installed on machinery to ensure that it can be stopped immediately in the event of a dangerous occurrence or accident.

Risk assessments should, however, be carried out on machinery to determine:

- whether other risks are introduced by the stopping of machinery in an emergency
- whether additional safety devices will also be necessary to supplement the safe isolation of machinery in an emergency
- whether other parts of machinery will need to continue to operate to assure safety.

Emergency stops should be:

- placed in a prominent position relative to the way in which machinery is used by operators
- placed close enough to the machining area for quick activation
- activated by a single human action
- placed away from additional danger zones
- immediately accessible
- clearly marked and labelled
- coloured red
- ergonomically designed and shaped to allow easy activation from any angle (for example, mushroom head buttons, handles, bars)
- manually reset after activation
- tested regularly.

It will be necessary to consider the working environment to ensure that it does not adversely affect the use of emergency stops such as the build-up of materials or dusts, exposure to chemicals, extremes of temperature or other factors affecting safe operation.

Further Information

- 108 Further information on the application of this ACoP, or advice on the guidance set out in this publication, may be obtained by contacting the States of Jersey Health and Safety at Work Inspectorate, Social Security Department, PO Box 55, Philip Le Feuvre House, La Motte Street, St Helier, Jersey JE4 8PE. Telephone: 01534 447300 Fax: 01534 873791 Email: hsi@gov.je

The ACoP may be viewed at www.gov.je/hsi

Further copies of this publication can be obtained from the Health and Safety at Work Inspectorate or downloaded from the website.

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