



HEALTH AND SAFETY
AUTHORITY

Guide to the Safety, Health and Welfare at Work (General Application) Regulations 2007



Chapter 2 of Part 2:
Use of Work Equipment

2010 Update

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**Guide to the
Safety, Health and Welfare at Work
(General Application)
Regulations 2007**

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Use of Work Equipment**

This Guidance has been updated in 2010.

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Guide to Chapter 2 of Part 2 of the General Application Regulations 2007

Chapter 2 of Part 2: USE OF WORK EQUIPMENT

Introduction

This Guide is aimed at safety and health practitioners, employers, managers, employees, safety representatives and others to give guidance on Chapter 2 of Part 2 and the related Schedule 1 to the Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007) as amended by the Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2007 (S.I. No. 732 of 2007) relating to the use of work equipment. The objective of the guide is to give general guidance aimed at the prevention of occupational accidents or ill health. *It is not intended as a legal interpretation of the legislation.* Neither is it a detailed technical document that covers all the implications of any given Regulation. What may be covered in a few lines in a Regulation may be the subject of a lengthy technical standard or code of practice.

From 1 November 2007, Chapter 2 of Part 2 of the Safety, Health and Welfare at Work (General Application) Regulations 2007 as amended, replaces the work equipment provisions of the Safety, Health and Welfare at Work (General Application) Regulations 1993 (S.I. No. 44 of 1993) as amended by the Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2001 (S.I. No.188 of 2001), which are revoked from that date.

In this Guide the text of the Regulations is shown in italics.

The General Application Regulations 2007 are made under the Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005) referred to elsewhere in this Guide as “the Act” or the “2005 Act”.

The Regulations retranspose Council Directive 89/655/EEC, as amended by Council Directive 95/63/EEC on the use of work equipment. The general requirements apply to work equipment in any location. They also consolidate the requirements for lifting equipment for all work sectors except offshore and mining where the existing Regulations remain unchanged.

The definition of work equipment, i.e. “*any machinery, appliance, apparatus, tool or installation for use at work*” in Regulation 2 is all inclusive. It ranges from complex machinery such as a printing machine to hand tools such as a hammer.

The provisions of the Regulations and Schedule 1 are only applicable to the extent that they are relevant to the work equipment in question.

There are some topics which are relevant not only to work equipment but also fall under a number of other Parts of the Regulations such as electricity (Part 3), work at height (Part 4), noise and vibration (Part 5) and explosive atmospheres (Part 8).

These Regulations apply to equipment in use; they do not cover the duties of those placing equipment on the market for the first time, including issues of CE marking and declarations of conformity.

Some of the Regulations overlap in scope, reflecting their different origins.

Chapter 2 of Part 2 of the General Application Regulations 2007 covers Regulations 27 to 61. However, in addition to the definition of work equipment, Regulation 2 also defines “lifting equipment” as “*work equipment for lifting, lowering loads or pile driving and includes anything used for anchoring, fixing or supporting such equipment*”.

The scope of potential workplaces covered by Chapter 2 of Part 2 is much broader than that addressed in Chapter 1 of Part 2 relating to the workplace.

Regulation 27: Interpretation for Chapter 2 *as amended by the Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2007 (S.I. No. 732 of 2007)*

27. *In this Chapter:*

“carrier” means the device by which persons or goods, or both, are supported in order to be lifted, lowered or moved;

“danger zone” means any zone within or around work equipment in which an employee is subject to a risk to his or her safety or health;

“EC declaration of conformity” refers to a declaration of conformity issued pursuant to Directive 98/37/EC or Directive 2006/42/EC of the European Parliament and of the Council on the approximation of the laws of the Member States relating to machinery;

“exposed employee” means any employee wholly or partially in a danger zone;

“fishing vessel” means a vessel to which the Safety, Health and Welfare at Work (Fishing Vessels) Regulations 1999 (S.I. No. 325 of 1999) apply;

“hoist or lift” means a lifting machine which has its direction of movement restricted by a guide or guides but, for the purpose of this Chapter, does not include—

- (a) a fork lift truck, order picker, self-propelled variable reach truck or similar type equipment,*
- (b) platform lifts for use by persons with impaired mobility,*
- (c) lifting equipment intended for lifting performers during artistic performances, or*
- (d) lifting equipment fitted in means of transport;*

(as amended by the Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2007)

“lifting accessories” include clamps and similar attachments, chain slings, rope slings, rings, hooks, shackles, swivels, spreader beams, spreader frames and any other item placed between lifting equipment and the load or on the load in order to attach it, but excluding features of the load used for its lifting;

“load” includes a person;

“non-integrated cage or basket” means one which is not equipped with controls that control its movement;

“selection, installation and use of work equipment” means any activity involving work equipment, including starting or stopping the equipment, its use, transport, repair, modification, maintenance and servicing and cleaning;

“thorough examination” includes testing if—

- (a) a competent person considers it to be necessary for the purpose of the examination, or*
- (b) testing is required pursuant to Regulation 52 and Schedule 1.*

Some of the implications of the definitions will be explored in the sections of this Guide dealing with particular Regulations.

Regulation 28: Duties of employer, use of work equipment

28. *An employer shall ensure that—*

- (a) any work equipment provided for use by employees at a place of work complies, as appropriate, with the provisions of any relevant enactment implementing any relevant Directive of the European Communities relating to work equipment with respect to safety and health,*

There are EU Directives that deal with the placing on the EU market, for the first time, of goods such as machinery, lifts, simple pressure vessels and pressure equipment, personal protective equipment and electrical equipment. These Directives also deal with the importing into the EU of second-hand equipment where the importer becomes responsible for compliance with the Directives. The Directives cover essential health and safety requirements, CE marking, declarations of conformity and the need for third-party conformity assessment.

Regulation 28(a) requires employers to ensure that any new equipment, or any second-hand equipment imported from outside the EU, which they are providing complies with the requirements of these Directives. Useful information can be found on the EU websites dedicated to the particular Directives.

The Regulation does not require employers to change their existing equipment to meet the same standards as new equipment, although these standards can be a source of guidance for dealing with particular problems.

- (b) in selecting the work equipment, account is taken of the specific working conditions, characteristics and hazards in the place of work having regard to the safety and health of the employees and any additional hazards posed by the use of such work equipment,*
- (c) the necessary measures are taken so that the work equipment is installed and located and is suitable for the work to be carried out, or is properly adapted for that purpose, and may be used by employees without risk to their safety and health,*

There are many situations, involving, for instance, wet, flammable, explosive, noisy, dusty or dirty atmospheres, where special care is needed in selecting and installing work equipment so as not to place employees at risk. Consideration should also be given to the physical demands of the work, the number of people involved, the nature of the workplace and the range of hazards it presents. In short, the equipment should be suitable for the purpose for which it is used.

The use of equipment with inadequate provisions cannot be justified on the basis that it was supplied in that way. It should be adapted to meet the legal requirements before being put into use, or not used until so adapted.

- (d) where it is not possible fully to ensure that work equipment can be used by employees without risk to their safety or health, appropriate measures are taken to minimise any such risk,*

There are many circumstances in which it is not possible to eliminate entirely at source the hazards arising from the use of work equipment, for instance in the case of moving machinery, high-speed cutting equipment or vibrating machinery. In order to minimise the risks, it is necessary to consider guarding of dangerous parts, detection of dangerous situations, design of controls, provision of safe systems of work, use of protective equipment and any other necessary measures.

- (e) sufficient space to reduce such risks is provided between moving parts of work equipment and fixed or moving parts in its environment,*

Machinery layout should take account of the risk of impact and crush injuries from moving parts of machines. Guidance on minimum clearance distances to avoid crush injuries is given in EN 349:1993+A1:2008, Safety of Machinery – Minimum gaps to avoid crushing of parts of the human body.

- (f) where the use of work equipment is likely to involve a specific risk to the safety or health of employees—*
 - (i) the use of such work equipment is restricted to those employees required to use it, and*
 - (ii) in cases of work involving repairs, modifications, maintenance or servicing of such work equipment, the employees concerned are competent to carry out such work,*

Two themes are covered by Regulation 28(f): dangerous equipment is only to be used by those who are assigned to use it and those who service such equipment must be competent to do so. There are certain types of equipment which in their use give rise to hazards, such that specific training is necessary for their safe operation, e.g. forklift trucks and chainsaws. In such cases, the employer must confine the use of the equipment to those employees properly trained to operate it and must put in place control measures to ensure this.

See also Section 10 of the 2005 Act in relation to the instruction and training of employees.

Where necessary, provision should be made to ensure that sufficient people are trained to provide cover for illness and annual leave, as otherwise there will be an increased risk of equipment being used by untrained employees.

In many cases, the servicing and repair of equipment may be contracted out to companies particularly competent in these areas.

(g) the working posture and position of employees while using work equipment, and any ergonomic requirements, are taken into account having regard to the safety and health of the employees,

While Regulation 18(c) deals with the provision of seating for jobs where this is possible, thought also has to be given to those situations where employees are required to bend or twist their bodies or adopt awkward positions in order to do their work. Operators should not be expected to exert undue force or to stretch or reach beyond their normal strength or physical reach limitations to carry out tasks. This is particularly important for highly repetitive work, e.g. working on supermarket checkouts or high-speed “pick and place” operations.

Where the working posture is uncomfortable, measures should be taken to reduce the strain by:

- Machine or job redesign
- Provision of better means of access
- Use of lifting aids or equipment positioning devices.

There are a range of harmonised EN standards which address different ergonomic aspects of machinery.

(h) areas and points for working on, or maintenance of, work equipment are suitably lit having regard to the operation to be carried out,

Regulation 28(h) requires employers to consider the conditions under which maintenance is going to be carried out and the degree of lighting necessary for the task. Some equipment may carry its own lighting whereas, in many cases, there will be reliance on area and portable lighting. The lighting level has to be sufficient so that the maintenance personnel can see and be seen and the means of lighting should not itself pose a hazard, e.g. do not use an ordinary lamp in an explosive atmosphere.

- (i) work equipment parts at high or very low temperature are, where appropriate, protected to avoid the risk of employees coming into contact or coming too close,*

If a hot or very cold piece of equipment is readily accessible to those passing by, then protective measures must be taken, either by the provision of insulation or a physical barrier. The advantage of insulation is that protection is maintained if people must work close to the hazard.

If the parts are only accessible at certain times, e.g. when a guard is opened or a panel is removed, then an assessment must be made as to whether the type of work to be done requires protection of the hot/cold parts.

- (j) work equipment bears warnings and markings essential to ensure the safety and health of employees,*

This general provision is aimed at warning employees about hazards that may not be obvious and giving information to enable safe use of equipment. While other provisions of the General Application Regulations 2007, such as those dealing with electricity or lifting equipment, specify particular details that must be provided, Regulation 28(j) requires consideration of “warnings” and “markings” for any equipment. The level of detail required is determined by the context in which the equipment is used and the experience and training of the operators.

- (k) employees have safe means of access to, and egress from, and are able to remain safely in, all the areas necessary for production, adjustment and maintenance operations,*

Regulation 28(k) covers two key issues: namely that employees must have a safe means of access to a work area and, having got there, must be safe in that location. Safety is to be secured irrespective of the time required for the task.

The means of access must be of sound design and construction, properly maintained and securely fixed, or be stable if it is temporary. Where frequent or prolonged access is required, or where the work may involve awkward manipulation, permanent access and platforms should be provided.

When using safety harnesses and fall arrest devices, secure anchorage points must be provided, safety lines should be short enough to prevent injury from falls and steps must be taken to ensure that such safety equipment is used. See also the provisions of Part 4 of the General Application Regulations 2007 relating to work at height.

- (l) work equipment is used only for operations and under conditions for which it is appropriate,*

“Conditions” may relate to operating limits, the degree of supervision, weather, ground stability, flammable atmospheres, nature of material being worked on etc. The equipment manufacturer’s guidance should be consulted in determining appropriate conditions of use. If in doubt, direct contact should be made with the manufacturer or agent where possible.

- (m) all work equipment is appropriate for protecting employees against the risk of the work equipment catching fire or overheating, or of discharges of gas, dust, liquid, vapour or other substances produced, used or stored in the work equipment,*

Under Regulation 28(m), issues for consideration may include:

- Correct sizing of equipment
- Provision of cooling air for motors
- Overload protection
- High temperature alarms and trip switches
- Lubrication
- Materials of construction suitable for products handled
- Ignition of process materials
- Design, provision and location of vents and overflows
- Provision of fume and dust extraction.

See also Regulation 33(b).

(n) all work equipment is appropriate for preventing the risk of explosion of the work equipment or of substances produced, used or stored in the work equipment,

There are several mechanisms that can lead to explosions such as:

- The overheating of a liquid/vapour in a confined space
- A runaway chemical reaction
- Ignition of a flammable dust cloud
- Discharge from high pressure plant to unprotected low pressure plant.

Explosions have been reported in steam boilers, hot-water boilers, chemical reactors and storage tanks, flour silos, dust (combustible) collectors, mills for grinding powders and drying plant in the food industry.

The primary focus should be the prevention of explosions by means of proper selection of materials and good control systems. However, recognising that explosions can happen, the fitting of explosion relief/suppression systems may be required so that overpressures do not lead to the catastrophic destruction of plant.

The issue of “explosive atmospheres at places of work” is addressed in greater detail in Part 8 of the General Application Regulations 2007.

(o) work equipment is erected or dismantled under safe conditions in particular observing any instructions which may have been provided by the manufacturer,

The work must be planned and any hazards identified before the job begins. Subjects to consider include:

- Stability during erection/dismantling
- Safe means of access to parts
- Adequate clearance distances to facilitate manoeuvring
- Safe provision/disconnection of services
- Hazards from stored energy in spring/hydraulic systems
- Presence of dangerous substances.

See also Regulation 30 concerning inspection of work equipment after installation.

(p) work equipment which may be struck by lightning while being used is protected by devices or appropriate means against the effects of lightning, and

I.S. EN 62305-1:2006 presents the general principles to be followed for protection of structures against lightning, including the protection of persons and services connected to the structure. Part 2 of the standard deals with risk management; Part 3 with physical damage to structures and life hazards and Part 4 with electrical and electronic systems within structures.

(q) all forms of energy, substances and articles used or produced with work equipment are supplied or removed in a safe manner.

The Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 (S.I. No. 619 of 2001) place a duty on every employer to determine whether any hazardous chemical agents are present at the workplace and to assess any risk to the safety and health of employees arising from the presence of those chemical agents, taking the following into consideration:

- Their hazardous properties
- Information provided by the supplier of the hazardous chemical agent, including information contained in the relevant safety data sheet and any additional information as may reasonably be required to complete the assessment
- The level, type and duration of exposure
- The circumstances of work involving such agents and the quantities stored and in use in the workplace
- Any occupational exposure limit value or biological limit value contained in an approved code of practice
- The effect of preventive measures taken
- Where available, the conclusions from health surveillance already undertaken
- Any activity, including maintenance and accidental release, in respect of which it is foreseeable that there is a potential for significant exposures.

See also the HSA's guides and Code of Practice to the Chemical Agents Regulations.

The supply or removal of articles can involve both ergonomic issues and prevention of contact with dangerous machinery parts. In the case of some machines, particular attention to guard design is required to enable the safe clearance of blockages.

Regulation 29: Information and instruction

29. *An employer shall ensure that—*
- (a) *the necessary measures are taken so that employees have at their disposal adequate information and, where appropriate, written instructions on the work equipment containing at least adequate safety and health information concerning—*
 - (i) *the conditions of use of work equipment,*
 - (ii) *foreseeable abnormal situations, and*
 - (iii) *the conclusions to be drawn from experience, where appropriate, in using such work equipment, and*
 - (b) *employees are made aware of safety and health risks relevant to them associated with work equipment located at or near their workstation or to any changes relating to that work equipment, even if they do not use the equipment.*

These requirements build on the general duty in the 2005 Act to provide employees with information and instruction relative to health and safety.

Employees should, where necessary for the conduct of their work, have access to any manuals or instructions produced by the manufacturer and, where issued, updates should be incorporated into the available documentation. Translation of documents may be necessary to ensure that equipment users are adequately informed.

The content of any information or instruction should address, as necessary, normal conditions of use and action to identify and control foreseeable abnormal situations. These situations may arise due to, for example, an abnormal change in temperature or pressure or component or service failure. The content should also reflect any lessons learnt from experience, previous accidents or near misses. Information may also be available from other users or inspection bodies.

On occasion, employees may be at risk from equipment which they themselves do not use but which is located in their vicinity, e.g. equipment capable of exploding or leaking hazardous substances. It is important that such people are aware of the hazards and any associated alarm or warning systems. Furthermore, changes in the workplace which affect the safe use of work equipment must be both communicated to employees and addressed in revised risk assessments.

Regulation 30: Inspection of work equipment

30. *An employer shall ensure that—*

- (a) where the safety of work equipment depends on the installation conditions—*
 - (i) an initial inspection is carried out after installation is completed and before it is first put into service, and*
 - (ii) an inspection is carried out after assembly at any new site or in any new location, and that the work equipment is installed correctly and is operating properly,*
- (b) in the case of work equipment which is exposed to conditions causing deterioration liable to result in a danger to safety or health—*
 - (i) periodic inspections and, where appropriate, testing is carried out,*
 - (ii) special inspections are carried out when exceptional circumstances arise which are liable to make the work equipment unsafe, including modification work, accidents, natural phenomena or prolonged inactivity, and*
 - (iii) deterioration is detected and remedied in good time,*
- (c) inspections carried out under paragraphs (a) and (b) are carried out by a competent person and are appropriate to the nature, location and use of the work equipment,*
- (d) the results of inspections carried out under paragraphs (a) and (b) are recorded and kept available for 5 years from the date of inspection, for inspection by an inspector, and access to these records is made available to users of the work equipment upon request, and*
- (e) when work equipment is used in another place of work, it is accompanied by evidence of the last inspection carried out under paragraphs (a) and (b).*

Regulation 30 is far reaching in its scope and is not limited to any particular piece of equipment. It covers the requirements for inspection and the availability of inspection records.

It relates to both work equipment which is permanently installed at a location and to that which is moved from place to place requiring assembly each time. In either case equipment should not go into use until it has been inspected by a competent person to ensure that it has been properly installed and is safe for operation. Evidence of such inspections must be recorded and kept available for Health and Safety Authority inspection.

All work equipment is subject to varying levels of deterioration. Deterioration could be due to a range of factors, including corrosion, chemical attack, erosion, friction, fatigue, impact damage etc., which in turn can lead to erratic machine behaviour, structural failure, loss of containment of dangerous substances, failure to maintain adequate protection around dangerous parts and so on. Reference to equipment includes any associated monitoring and alarm systems.

Employers are required to set up programmes to maintain the integrity of work equipment by a system of ongoing monitoring which will detect deterioration in sufficient time to allow remedial measures to be taken. The inspection frequency should be based on how quickly the work equipment, or its parts, are likely to deteriorate and therefore give rise to unacceptable risk. In some cases, such as steam boilers in factories, there are statutory duties which determine the minimum level of inspection and

testing. On occasion, testing will be required; this may be called for in the manufacturer's instructions, specified in a Regulation or guidance document or required by the competent person.

Inspection results should be stored in a secure manner and be readily retrievable when required. While Regulation 30 does not prescribe the details to be examined or the format of the inspection results, these details may be prescribed under other Regulations for certain types of plant. Advice may also be found in relevant standards or codes of practice.

The scheme of inspections must take into account the known failure mechanisms of the work equipment.

In general, records should contain information on the:

- Type and model of equipment
- Means of identification
- Location
- Date of inspection
- Personnel who carried out the inspection
- Extent of inspection or test
- Faults found
- Remedial measures required, including deadlines for action
- Details of remedial action that has been taken.

The employees who use the equipment are entitled to see the inspection reports.

Evidence of the last inspection may take the form of a copy of the report for large items of plant and some form of labelling or tagging for smaller items.

See also Regulation 52 which is specific to the examination and testing of lifting equipment.

Regulation 31: Maintenance

31. *An employer shall ensure that—*

- (a) *throughout its working life work equipment is kept, by means of adequate maintenance, at a level such that it complies with the provisions of this Chapter;*

- (b) where possible, maintenance operations are carried out when work equipment is shut down, and where this is not possible, appropriate protection measures are taken for the carrying out of such operations or such operations are carried out outside the area of danger;*
- (c) work equipment is maintained in such a way as to reduce the risks to users of the work equipment and to other persons at work, and*
- (d) a maintenance log for any machine is kept up to date.*

Maintenance operations often present a greater risk than normal operations as operators need to approach or access dangerous parts of equipment in the course of maintenance work and the normal safeguards may be inoperative.

Regulation 31 sets out a hierarchy of considerations. Maintenance operations that can be done with the equipment shut down, should only be done with the equipment stopped and any necessary power or process isolations in place.

If the nature of the process or the required maintenance action requires the work to be carried out on running equipment, appropriate protection measures are required. Depending on the circumstances, these might entail use, among other controls, of:

- Hold-to-run controls
- Jogging or inching controls
- Reduced speed or other process variables
- Permit to work systems
- Personal protective equipment
- Additional monitoring staff or protective devices, e.g. gas detectors
- Controls on exposure periods
- Built-in lubrication systems.

Adequate maintenance requires consideration of adherence to manufacturers' recommendations, likely failure mechanisms, detection of deterioration, performance of repairs and appropriate record keeping.

Although Regulation 31(d) requires that a maintenance log be kept up to date, it does not, of itself, require a log to be kept. However, it will be a necessary requirement for many items of equipment, such as lifting equipment, pressure equipment and machines with interlocked guarding, in order to show that adequate maintenance procedures are in place.

Regulation 32: Control devices

32. *(1) An employer shall ensure that—*

- (a) work equipment control devices which affect safety and health are clearly visible and identifiable and appropriately marked where necessary,*

- (b) *control devices are located outside danger zones except where necessary,*
 - (c) *the operation of control devices cannot cause additional hazard,*
 - (d) *the operation of control devices cannot give rise to any hazard as a result of any unintentional operation,*
 - (e) *the absence of persons in the danger zones is verifiable from the main control position if necessary,*
 - (f) *where it is impracticable to comply with paragraph (e), a safe system such as an audible or visible warning signal, or such a signal that is both audible and visible, is given automatically whenever the machinery is about to start,*
 - (g) *an exposed employee has the time, the means, or both, quickly to avoid hazards caused by the starting or stopping, or both, of the work equipment,*
 - (h) *control systems are safe, and are chosen making appropriate allowances for the failures, faults and constraints to be expected in the planned circumstances of use,*
 - (i) *it is possible to start work equipment only by deliberate action on a control provided for the purpose,*
 - (j) *a control is included in work equipment to—*
 - (i) *restart it after a stoppage for whatever reason, and*
 - (ii) *to control a significant change in the operating conditions**unless such a restart or change does not subject exposed employees to any hazard,*
 - (k) *all work equipment is fitted with a control to stop it completely and safely,*
 - (l) *each workstation is fitted with a control to stop some or all of the work equipment, depending on the type of hazard, so that the equipment is in a safe state,*
 - (m) *the equipment's stop control has priority over the start controls and, when the work equipment or the dangerous parts of it have stopped, the energy supply of the actuators concerned is switched off, and*
 - (n) *where appropriate, and depending on the hazards the equipment presents and its normal stopping time, work equipment is fitted with an emergency stop device.*
- (2) *Paragraph (1)(j) does not apply to restarting or a change in operating conditions as a result of a normal operating cycle of an automatic device.*

Regulation 32 deals with various aspects of control devices, the use of which have

safety implications. Such devices may be used to start or stop machines, control positioning, increase speed or pressure etc.

The suitability of the controls should be determined in the context of the working environment in which they are located. The function of the control device should be obvious to the operator but, if necessary, measures may need to be taken to minimise the risk of operators mistaking its purpose. This may be achieved by adhering to standards on the shape and colour of controls, combined with clear and robust identification and marking of the controls as necessary.

The operation of a control device should not require the operator to place him/herself in danger, although the use of controls in a danger zone may be required for some machines, such as the use of jogging buttons during set-up or maintenance.

Ideally, controls should be positioned so that equipment operators are able to see from the control position that nobody is at risk of injury when the equipment is set in motion and that they have a view of any part of the workplace affected by their equipment. A direct view is best, but supplementing by mirrors or more sophisticated visual or sensing facilities may be necessary (e.g. TV monitors or pressure-sensitive mats). In addition, it may be necessary to provide audible and/or visible warnings that the machine is about to start. The length of such warnings should be determined by the amount of time required by a person who might be in the danger zone to get to a safe location.

There should be no possibility that the control device could operate of its own accord, e.g. operating due to gravity, vibration or failure of a spring mechanism.

The design of the control system should take account of other factors, including the manner of its use, e.g. frequent or occasional, presence of background lighting, risk from stray currents, clean or dirty environment etc.

In order to avoid operators being surprised by the sudden start-up of equipment, the Regulations require that machinery can only be set in motion by a deliberate activation of a control device. Unless the equipment is designed to run under some form of automatic control, operator intervention is required to control any change in operating conditions or to restart the unit if it has been stopped for any reason if such operations have any hazard implications. In general, the closing of a guard or exit from a photoelectric detection beam should not, of itself, initiate a machine start-up.

All equipment must have a stop control which brings moving parts to a complete rest. The stopping action need not necessarily be instantaneous but the control of access to dangerous parts must take account of the time for equipment to come to rest. Once at rest, the equipment must be such that movement cannot be initiated by accident such as an uncovenanted stroke of a ram caused by tipping against a limit switch.

In bringing a machine to rest, the control system must also cut off the energy supply (electrical, pneumatic, hydraulic) to any actuators so that they cannot be energised once the machine is switched off.

The activation of the stop control must override any start controls.

In addition to the general requirement for a main stop control for work equipment, there may be a need for local stop controls at individual work stations if safe work practices require the stopping of machinery at that location, e.g. clearing jams on packaging lines.

Finally, in some instances machinery may also require an emergency stopping device, e.g. where people must pass close to machinery at points away from the control unit such as with conveyor units or where they must work close to dangerous tools such as those in an engineering workshop.

There are a number of harmonised European standards that deal with the design of control systems, either in a general way or specifically related to particular types of machines.

Regulation 33: Guards and protection devices

33. *An employer shall ensure that—*

- (a) *work equipment presenting risk due to falling objects or projections is fitted with appropriate safety devices corresponding to the risk,*

Where there is a risk of objects falling onto people, such as loose materials from a scaffold or a raised machine platform, product mishaps on overhead conveyors or lifting operations, relevant technical measures must be taken to control the risk. Where parts of equipment projecting into walkways cannot be avoided, they should be clearly marked, and cushioned if necessary. If a projection presents the risk of eye injury it must be suitably capped.

- (b) *work equipment presenting hazards due to emissions of gas, vapour, liquid or dust is fitted with appropriate containment devices, extraction devices, or both, near the sources of the hazard,*

Emissions of gas, vapour, liquid or dust which are likely to injure employees must be prevented from entering the air of a workroom. Such emissions may arise for a number of reasons, including poor sealing, inadequate level control, poor location of vent outlets and lack of fume control. Extraction devices should be fitted as near as possible to the source of the hazard. Examples of such devices include fume-cupboards in laboratories and extraction units in dry-cleaning premises, in wood-working shops or in welding booths.

Special precautions to avoid or mitigate explosions apply to the control of combustible powders or flammable vapours.

- (c) *work equipment and parts of such equipment are, where necessary for the safety and health of employees, stabilised by clamping or some other means,*

For some equipment, stabilisation is a question of ensuring that it is properly secured to a floor or a wall by adequately sized fasteners. For other equipment, particularly mobile equipment, stabilisers are necessary.

- (d) *where there is a risk of rupture or disintegration of parts of work equipment, likely to pose significant danger to the safety and health of employees, appropriate protection measures are taken,*

Examples of this risk include the disintegration of abrasive wheels, bursting of pressure vessels, collapse or bursting of tanks under atmospheric pressure and centrifuge failure. The nature of the risk will determine the necessary protection measures. The protective measures will need to be supplemented by a suitable programme of inspection and maintenance. Tripping devices may be necessary on high-speed equipment at risk from “out of balance” forces. Overpressure protection on pressure vessels can take several forms depending on the application of the vessel (boiler, storage vessel, chemical reactor etc.).

The Safety in Industry (Abrasive Wheels) Regulations 1982 (S.I. No. 30 of 1982) are applicable to factory premises, as defined, but they also contain principles that can be applied to workshops associated with other sectors in order to reduce the risk of the disintegration of abrasive wheels.

- (e) where there is a risk of physical contact with moving parts of work equipment which could lead to accidents, those parts are provided with guards or protection devices to prevent access to danger zones or to halt movement of dangerous parts before the danger zones are reached,*

IS EN ISO 13857:2008 on the safety of machinery provides guidance on the safety distance required to prevent danger zones being reached by the upper and lower limbs of persons.

B.S. PD 5304:2005 (originally BS 5304 until withdrawn upon publication of harmonised European Standards) published by the British Standards Institution provides a good introduction to the different types of machine guarding.

- (f) guards and protection devices where required under subparagraph (e)—*
 - (i) are of robust construction,*
 - (ii) do not give rise to any additional hazard,*
 - (iii) are not easily removed or rendered inoperative,*
 - (iv) are situated at sufficient distance from the danger zone,*
 - (v) do not restrict more than necessary the view of the operating cycle of the equipment,*
 - (vi) allow operations necessary to fit or replace parts, and*
 - (vii) restrict access for maintenance work only to the area where the work is to be carried out, if possible, without removal of the guard or protection device,*
- (g) warning devices on work equipment are unambiguous and easily perceived and understood, and*
- (h) any part of a stock-bar which projects beyond the headstock of a lathe is securely fenced unless it is in such a position as to be safe to employees as it would be if securely fenced.*

Guarding must be suitable for the type of risk being confronted, otherwise poor design will increase the chances that it will be discarded, broken or bypassed.

Where access is rarely required, e.g. v-belt and gear power transmission drives, fixed guarding is usually appropriate. Where employees frequently must approach the danger areas, e.g. packaging machinery, some form of interlocked guarding is required so that the guard can readily be opened while at the same time stopping movement.

For some applications, there are also non-contact systems using light, laser or camera systems that detect the presence of employees and stop machinery before they are at risk. Sometimes delay mechanisms must be built into guarding systems so that high-speed rotating components have sufficient time to stop before access is permitted.

The protection system should protect not only those working directly with the equipment but also those in the vicinity who are at risk if they should slip or fall or inadvertently place their hand on the machine.

Regulation 33(f) sets out the general requirements for guarding and protective systems. Guards and protection devices must be of good construction, sound material and adequate strength.

Guards and protection devices must not themselves give rise to any increased risk to health and safety. When power-operated guards are used, e.g. interlock guards on large plastic injection moulding machines, it may be necessary to fit a trip bar to prevent a trapping danger between the leading edge of the guard and a fixed part of the machine. Sharp edges should be avoided to prevent cuts when handling guards.

Foreseeable abuse and normal wear and tear must be taken into account. If it is easy to bypass a guard, then it does not comply with Regulation 33.

Fixed guards should be held firmly in position and it should require a deliberate action, such as the use of a tool to remove fastenings, to allow opening or removal of the guards. The distance a guard or protective device is fitted away from dangerous parts of equipment will depend, in the case of fixed guards, on the extent of access permitted by the guard, and for other protective devices, on the characteristics of the work equipment, i.e. speed and time to stop.

Guards and protection devices must not unduly restrict the view of the operating cycle of the work equipment where this is necessary. In particular situations, viewing windows may need to be incorporated in the guarding.

Guarding should be designed, where possible, to enable maintenance to be carried out and parts to be replaced or fitted without removing the guarding or by removing the guarding only in the immediate area where the work is being carried on. Greasing systems should, in most cases, permit greasing to be done from outside the guard.

Examples of warning systems in the context of this Regulation include detection of start-up by sirens/flashing lamps or the use of lights to indicate if a protective device is active.

Regulation 33(h) is a particular provision for lathe work in engineering workshops, which was previously provided for in the Factories Act 1955.

Regulation 34: Connection to energy sources

34. *An employer shall ensure that—*
- (a) *all work equipment is fitted with clearly identifiable means to isolate it from all its energy sources, and*
 - (b) *the reconnecting of the work equipment to its energy sources poses no risk to the employees concerned.*

The most common energy for equipment is electricity, but energy may also be supplied by hydraulics, compressed air, steam or mechanically through a clutch system.

Isolation from the energy supply will be required from time to time to make adjustments, carry out repairs or move the equipment. The means of isolation must be obvious to the equipment user. Particular care is required if there are several energy supplies to the equipment or if an internal residual energy reserve is stored in a capacitor or hydraulic circuit.

When restarting equipment is likely to place employees at risk, e.g. after repair or maintenance, only authorised persons should have control over the restarting of the equipment and the release of any devices, such as padlocks or multilocked systems, which ensure that the energy sources remain isolated during the stoppage.

In the case of an electricity outage, some machines will not start-up upon return of the supply, but in other cases movement can occur without the intervention of the operator and, depending on the circumstances, this can be dangerous.

Particular care is required with equipment where the ON switch has a lock-on facility, as is the case with some designs of angle grinders. The appropriateness of such a facility should be checked by reference to the relevant harmonised EU standard and, even if permitted, consideration should be given to the use of machines that do not pose this hazard.

Regulation 35: Contact with wheels or tracks of Mobile Work Equipment

35. *An employer shall ensure that work equipment with ride-on employees is fitted out in such a way as to reduce the risks for employees during the journey, including risk of contact with or trapping by wheels or tracks.*

The range of work equipment with ride-on employees extends from ride-on lawn-mowers to large excavators and covers equipment where the operator is standing while travelling.

The risks to employees (drivers, operators and passengers) carried by mobile work equipment when it is travelling must be appropriately dealt with. These include risks associated with people falling from the equipment or from unexpected movement while it is in motion or stopping. Issues to be addressed in respect of such equipment include:

- Suitability for carrying people
- Seating

- Design of cabs, operators' stations and work platforms
- Roll-over protection
- Falling object protection
- Restraining systems
- Speed control
- Access to moving parts.

It is also necessary to ensure that the risks from wheels and tracks when the equipment is travelling are controlled by the design of the machine. See also Regulations 38, 39 and 40.

Regulation 36: Drive systems of mobile work equipment

36. *An employer shall ensure that—*

- (a) *where an inadvertent seizure of the drive unit between an item of mobile work equipment and its accessories or anything towed, or both, creates a specific risk, the work equipment is equipped or adapted to prevent blockages of the drive units and where such seizure cannot be avoided, every possible measure is taken to avoid any adverse effects on employees, and*
- (b) *where drive shafts for the transmission of energy between mobile items of work equipment can become soiled or damaged by trailing on the ground, facilities are available for fixing them.*

The main focus should be on the prevention of damage to the drive shaft and its guard when the equipment is not in use. The drive shaft should be supported on a cradle wherever one is provided. If there is no cradle, it should be supported by other means to give equivalent protection against damage. Drive shafts should not be rested on draw bars, nor dropped on the ground, as this could lead to damage.

In the event of seizure, slip clutches and shear bolts can protect drive shafts from damage and reduce the risk of equipment overturning.

Regulation 37: Combustion engines of mobile work equipment

37. *An employer shall ensure that mobile work equipment with a combustion engine is not used in working areas unless –*

- (a) *specific provision is made for conducting the exhaust gases from the engine into the open air, or*

- (b) *the working area is adequately ventilated so as to prevent danger to health from the exhaust gases.*

Exhaust gases from mobile work equipment with a combustion engine may contribute significantly to airborne pollution in workplaces, e.g. indoor use of diesel generators and air compressors, buildings where forklift trucks are used and construction equipment in tunnels. In such circumstances, a high standard of ventilation and/or extraction may be necessary to allow the combustion process to take place and to dilute toxic combustion products (such as carbon monoxide, carbon dioxide and oxides of nitrogen) to an acceptable level.

In some instances it may be possible to provide specific exhaust systems for the fumes where the equipment is stationary. Otherwise, good ventilation, including general extraction, is necessary.

Fuel type and quality of engine maintenance will also influence the air quality.

Regulation 38: Roll-over of mobile work equipment

38. (1) *An employer shall ensure that mobile work equipment with ride-on employees is designed to restrict, under actual conditions of use, the risks arising from roll over of work equipment either by—*

- (a) *a protection structure to ensure that the equipment does not tilt by more than a quarter turn,*
- (b) *a structure giving sufficient clearance around the ride-on employees if the tilting movement can continue beyond a quarter turn, or*
- (c) *by some other device of equivalent effect.*
- (2) *The protection structures referred to in paragraph (1) may be an integral part of the work equipment but are not required when the work equipment is stabilised during operation or where the design makes roll over impossible.*
- (3) *An employer shall ensure that where there is a risk of a ride-on employee being crushed between parts of the work equipment and the ground should the equipment roll over a restraining system for the ride-on employees is installed.*

Regulation 38 outlines the measures necessary to protect employees carried on mobile work equipment where there are risks from roll-over while it is travelling. UK data indicates that the machines that are most at risk of roll-over are: compact dumpers, agricultural tractors and variable reach, rough terrain trucks (telehandlers). (HSE Information Sheet MISC175)

In assessing the likelihood and potential consequences of roll-over, it is necessary to take into account the nature of the mobile work equipment and any attachments or accessories fitted to it, the effects of any work being carried out on or by the mobile work equipment and the conditions in which it is used. This information will determine the safety measures needed.

When mobile work equipment is travelling, roll-over may be caused by uneven surfaces, variable or slippery ground conditions, excessive gradients, inappropriate speeds, incorrect tyre pressures and sudden changes in direction. It may also occur due to the inertia transmitted to the mobile work

equipment by attachments used with it, particularly if those attachments are not securely restrained from movement.

Driver training is not a substitute for hardware measures to prevent roll-over such as counterbalance weights or roll-over protective structures (ROPS).

ROPS may be structures, frames or cabs which, in the event of roll-over, prevent the work equipment from crushing the people carried by it. In order to ensure that a ROPS is capable of withstanding the forces that it is likely to sustain in the event of roll-over, employers should check that it complies with a recognised standard, e.g. for earth moving machinery – EN ISO 3471:2008: Earth moving machinery- Roll-over protective structures- Laboratory tests and performance requirements or for earlier machines EN 13510:2000.

Seat belts must be worn with ROPS protection, otherwise there is a risk that the driver may be crushed by the ROPS bar as he or she is thrown from the vehicle.

In the case of those sit-astride ATVs (all terrain vehicles, e.g. quad bikes) where the driver has to sometimes stand to maintain control (“active riding”), roll bars are not required as they would increase the overall risk. Research has shown that they are more likely to increase injuries by obstructing the rider, either when thrown off or when jumping off, during an overturn. This causes the rider to fall to the ground alongside the ATV and increases the likelihood of injury. Lap straps are not required as they prevent “active riding” and could lead to lethal consequences in the event of an overturn.

Regulation 39: Fork-lift trucks

- 39.** *An employer shall ensure that a fork-lift truck carrying one or more employees is equipped or adapted to limit the risk of it overturning—*
- (a) by the installation of an enclosure for the driver,*
 - (b) by a structure preventing the fork-lift truck from overturning,*
 - (c) by a structure ensuring that, if the fork-lift truck overturns, sufficient clearance remains between the ground and appropriate parts of the fork-lift truck for the employees carried, or*
 - (d) by a structure restraining the employees on the driving seat so as to prevent them from being crushed by parts of the fork-lift truck which overturns.*

If it is foreseeable that a forklift truck (FLT) with a seated ride-on operator can roll over in use and there is a risk of the operator being thrown from the operating position and being crushed between the FLT and the ground, a restraining system, such as a seat belt, will be required. Restraining systems are also required on any FLT which is fitted with a ROPS, e.g. on a variable reach truck to protect operators from the risks of injury from 180 degrees or more roll-over. To be effective, the

restraining system should prevent operators or others carried from falling out or being trapped by the FLT or its protective structure in the event of roll-over.

As there is a history of accidents on counterbalanced, centre-control, high-lift trucks that have a sit-down operator, restraining systems will normally be required on these trucks to protect operators from the risks of roll-over.

Regulation 40: Safety of self-propelled work equipment

40. *An employer shall ensure that—*

(a) self-propelled work equipment is operated only by competent persons who have been appropriately trained, and

There is a general requirement that people using self-propelled machinery are specifically trained in its use. The Safety, Health and Welfare at Work (Construction) Regulations 2006 (S.I. No. 504 of 2006) have particular provisions in this regard by way of the construction skills certification scheme (CSCS) for the types of equipment listed in Schedule 4 to those Regulations.

(b) self-propelled work equipment, which when in motion may create risks for persons—

(i) has facilities for preventing unauthorised start-up;

Self-propelled work equipment may be prevented from unauthorised start-up if it has a starter key or device which is issued or made accessible only to authorised people. This means that access to starter keys and starting devices, such as removable dumper starting handles, should be controlled.

(ii) has appropriate facilities for minimising the consequences of a collision where there is more than one item of track-mounted work equipment in motion at the same time;

If more than one item of rail-mounted work equipment may travel on the same rails at the same time and collision may be foreseen, safety precautions such as buffers or automatic means of preventing contact should be provided.

(iii) has a device for braking and stopping equipment;

(iv) in the event of failure of the main facility for braking and stopping equipment, where safety constraints so require, has available emergency facilities operated by readily accessible controls or automatic systems for braking and stopping the equipment;

Self-propelled mobile work equipment must have adequate brakes to enable it to slow down and stop in a safe distance and park safely. The braking capability must be such as to enable it to be operated safely on the gradients on which it will be used and its parking brakes should be capable of holding it stationary (where appropriate, fully loaded) on the steepest incline that the mobile work equipment may be parked in use.

Where there are significant risks associated with a failure of the main braking device, a secondary braking system is required. The secondary braking system may operate automatically through spring-applied brakes or through a dual circuit system on the service brakes. It may also be operated through the parking brake system or other controls which are easily accessible to the driver. Self-propelled

mobile work equipment which will not stop in a safe distance, e.g. through transmission drag, are normally fitted with secondary braking systems in case service brake failure or faults occur.

- (v) *has adequate auxiliary devices installed to improve visibility where the driver's direct field of vision is inadequate;*

If direct vision is impaired, mirrors or more sophisticated visual or sensing facilities may be necessary. Such facilities may include mirrors (plane, angled or curved), Fresnel lenses, closed-circuit television (CCTV) or radar. The Safety, Health and Welfare at Work (Construction) Regulations 2006 (Regulation 87 and Schedule 6) have specific provisions in this regard.

- (vi) *is equipped with lighting appropriate to the work to be carried out and ensures sufficient safety for employees where designed for use at night or in dark places;*

The level of lighting required will depend on the type of equipment being operated, the job that it is doing and the area in which it is operating. Factors requiring consideration are the presence of other people and/or obstacles in the vicinity of the equipment and ground conditions.

- (vii) *is equipped with appropriate fire-fighting appliances where such appliances are not available sufficiently nearby at the place of use, where such work equipment constitutes a fire hazard, either on its own or in respect of whatever it is towing or carrying, or both, and is liable to endanger employees;*

Fires can occur on self-propelled equipment due to electrical faults, leaking hydraulic hoses, fuel leaks, tyre fires etc. The decision as to whether they must be equipped with extinguishing systems depends on the level of fire-fighting resources at the site and whether employees are at risk in the event of fire breaking out. Offsite fire-fighting capability is not usually relevant to considerations under this Regulation. In assessing onsite capability, one has to assess whether there are procedures, personnel and equipment readily available to deliver a rapid response.

The other consideration is whether, in the event of fire, affected employees are likely to make it to safety while allowing a fire to continue, or whether this approach would lead to a greater risk of injury from smoke inhalation or explosion.

- (viii) *if remote-controlled, stops automatically once it leaves the control range;*

The control range should be known and if going beyond range is a possibility, checks should be carried out under controlled conditions to verify this safety feature.

- (ix) *if it*
(I) *is remote-controlled, and*

- (II) *creates, in normal conditions a crushing or impact hazard, has facilities to guard against that hazard, unless other appropriate devices are present to control the hazard.*

This requires the consideration of risks, due to the movement of the equipment, to the person controlling it and also anyone else who may be in the vicinity.

Where possible, people should be excluded from the area of operation with strict control over any access.

Consideration may need to be given to alarms or flashing lights so that other employees in the area are aware of its movement and to presence-sensing or contact devices which will protect people from the risks associated with the equipment if they come close to or make contact with it.

Regulation 41: Traffic rules for mobile work equipment

41. *An employer shall ensure that—*

- (a) *if work equipment is moving around in a work area, appropriate traffic rules are drawn up and followed,*

This provision mirrors similar requirements in Chapter 1 of Part 2 of the General Application Regulations 2007 relating to the workplace.

Traffic control rules may include issues such as speed, right-of-way, direction of movement, the use of headlights to assure appropriate visibility and properly placed signs or signals that warn of hazardous situations.

- (b) *organisational measures are taken to prevent employees on foot coming within the area of operation of self-propelled work equipment and, if work can be done properly only if employees on foot are present, appropriate measures are taken to prevent them from being injured by the equipment, and*

Traffic routes for vehicular traffic or pedestrians (or both) should be clearly marked where possible. In some locations the provision of footpaths is appropriate.

Where the speed and/or volume of traffic creates a risk to the safety of persons, the traffic route should be wide enough to enable any vehicle likely to use that route to pass the pedestrians safely. Account should be taken of the maximum number of employees and vehicles likely to use the traffic route at any one time during the working period.

If employees are required to be close to the equipment the following topics may be relevant:

- Communication with equipment operator
- Visibility aids on equipment
- High-visibility clothing, and head and foot protection
- Speed of equipment operation.

In the construction sector the use of zero “tail-swing” excavators reduces the risk to nearby workers and pedestrians.

- (c) *the transport of employees on mechanically driven mobile work equipment is only permitted where safe facilities are provided to this effect and if work is carried out during the journey, speeds are adjusted as necessary.*

The transport of employees on mobile work equipment raises issues about the ability of drivers to concentrate on their task and the safety of passengers in respect of contact with moving parts and falling off or falling over. In general, passengers should not be carried unless the equipment is specifically designed for that purpose.

Regulation 42: Work equipment for lifting loads

42. *An employer shall ensure that—*

- (a) *all lifting operations are properly planned, appropriately supervised and carried out to protect the safety of employees,*

The person planning the operations should have adequate practical and theoretical knowledge and experience of planning lifting operations.

The plan must be based on a proper risk assessment, preparation of method statements, identification of the resources and skills required, instituting procedures and assigning responsibilities so that any lifting operation is carried out safely.

The plan should ensure that the lifting equipment remains safe for the range of lifting operations for which the equipment might be used.

- (b) *when work equipment for lifting loads is installed permanently, its strength and stability during use is assured, having regard to the loads to be lifted and the stress induced at the mounting or fixing points of the structure,*

It is necessary to ensure that the lifting equipment has sufficient strength with particular attention given to the mounting or fixing points so that the combination of structure and equipment is adequate for any likely task. Engineering calculations are necessary before cranes or associated runway beams are attached to structures.

Part 6 of EN 1993: provides principles and application rules for the structural design of crane runway beams and other crane-supporting structures, including columns and other members made of steel. The provisions of Part 6 supplement, modify or supersede the equivalent provisions in EN 1993-1-1, to which reference should also be made. It covers overhead crane runways inside buildings and outdoor overhead crane runways. Crane runways for stacker cranes in high-bay warehouses are not covered in this document, even though some of its provisions might be adopted for such runways. It covers crane runway beams for: overhead travelling cranes, either supported on top of the runway beams or underslung below

the runway beams, and for monorail hoist blocks. Ancillary items, including crane rails, structural end stops, support brackets, surge connectors and surge girders, are also covered. However, crane rails not mounted on steel structures and rails for other purposes are excluded.

- (c) lifting equipment designed for low frequency use is not installed where its anticipated use will render the equipment unsuitable,*

The specification of the lifting equipment should be checked in terms of the frequency which the manufacturer has assigned for the safe use of the equipment. Lifts designed for occasional use should not be used as the main lift in busy workplaces where there is a high demand for lift use.

- (d) machinery for lifting loads is clearly marked to indicate its safe working load, and where appropriate the safe working load for each configuration of the machinery,*

For simple gantry cranes which have a single safe working load, this information can be marked in large letters on the side of the gantry. For other machines, where the safe working load depends on the configuration or working position of the machine, a diagram showing the relationship between positions and safe working loads must be provided. See also Regulation 43 for cranes, Regulation 46 for lifts and hoists and Regulation 55 for excavators.

- (e) work equipment which is not designed for lifting persons is appropriately and clearly marked to this effect,*

Equipment designed for lifting persons has a set of controls which may not be necessary if it is designed for lifting goods only. Where the machine is intended for goods only, there must be clear signage to this effect. One example of this topic is the distinction between goods and passenger lifts.

- (f) every drum or pulley round which the chain or wire rope of any lifting equipment is carried is of suitable diameter and construction for the chain or rope used,*

Damage will occur if there is a mismatch between the lifting chain or ropes and the equipment onto which it is being wound. Replacement of drums or pulleys should be in accordance with the manufacturer's instructions.

- (g) every chain or rope which terminates at the winding drum of any lifting equipment is properly secured thereto and at least two turns of such chains or rope remain on such drum in every operating position of the equipment,*

This simple provision is to ensure that the chain or rope will always be properly secured and cannot be totally unwound.

- (h) permanently installed work equipment is installed in such a way as to reduce the risk of the load—*
 - (i) striking employees,*
 - (ii) drifting dangerously or falling freely, and*
 - (iii) being released unintentionally,*

Lifting equipment should be installed so as to minimise the need to lift loads over people and should also be positioned and installed to prevent crushing when it is in its extreme positions. The measures

that must be taken to control the risks will depend on the type of equipment and where and how it is used.

Breaking systems on hoists and powered trolleys must be maintained in good working order.

Runway beams supporting lifting equipment should be level and of sufficient stiffness to prevent equipment drifting or running away.

It is necessary to ensure that loads are under control at all times to minimise risks to persons in the vicinity of the lifting operation. The aim is to prevent uncontrolled free fall. It is not, however, intended to prohibit operations which involve a controlled free fall, e.g. piling where risks to people from such operations can be almost eliminated.

Hooks and other similar devices provided for lifting should be of a type that reduces the risk of the load becoming displaced from the hook or other devices. Wherever possible, hooks that have safety catches fitted or are shaped to prevent the accidental displacement of the sling etc. should be used. Where this is not possible, an alternative acceptable method is to secure the throat of the hook by “mousing”, i.e. placing a binding or metal shackle across the mouth of the hook around the point and shank to prevent an eye or sling from slipping off. If vertical plate clamps are used, it is important that they do not open if the load strikes a surface.

Vacuum and magnetic lift systems should incorporate features to minimise risk in the event of loss of power or loss of vacuum.

If for some reason the lifting equipment will not be able to maintain its hold on the load in the event of power failure, appropriate measures must be in place to prevent persons being exposed to any consequential risks.

- (i) *work equipment which is mobile or can be dismantled and which is designed for lifting loads is used in such a way as to ensure the stability of the work equipment during use under all foreseeable conditions, taking into account the nature of the ground,*

Examples of mobile lifting equipment include mobile cranes, forklift trucks and forwarders and cable cranes in forestry. Examples of lifting equipment which can be dismantled and reassembled include tower cranes, construction site hoists and mast-climbing work platforms.

In fixed workplaces it is important to ensure that the slope and strength of the floor surface is suitable for any lifting equipment operating there. Where equipment goes from site to site, the suitability of the ground conditions has to be ascertained and the use of stabilisers ensured where necessary.

Where equipment is dismantled, particular care is required with the fasteners (nuts and bolts) to ensure that they are not damaged or excessively worn and that they

are properly torqued in the assembly operation. Only fasteners specified by the manufacturer should be used.

Any modifications to lifting equipment, such as fitting Christmas decorations and messages or advertising hoardings etc. to a tower crane, should only be carried out after careful consideration of the risks that may arise due to changes in the wind loading and of the potential effect on the stability of the lifting equipment. (*Note:* Part 4 of the regulations dealing with work at height are also relevant).

It is important to ensure that the lifting equipment has adequate stability for its proposed use. Account must be taken of any combination of destabilising forces that may adversely affect the stability of the lifting equipment, which may include:

- Strength of the ground or surface on which the lifting equipment is positioned or located, e.g. spreader plates may be needed so that they can safely support the weight of the equipment and the maximum load to be fitted
- Stability of the surface under load conditions, e.g. if the lifting equipment is too close to an excavation, the ground may slowly subside or suddenly collapse
- Whether the surface on which the lifting equipment operates is on a slope and the angle of any slope – this imposes horizontal as well as vertical forces
- Size and nature of the load, e.g. whether the load itself is unstable
- How the load is intended to be lifted
- Maximum wind loading that may occur.

Methods to improve the stability of lifting equipment include designing a suitable base on which to position the lifting equipment, using an anchorage system, using counterbalancing weights and using ballast, outriggers or stabilisers.

- (j) *lifting equipment is not used beyond its safe working load except when being tested under the direction of a competent person,*

Equipment operators should know the safe working loads for the different configurations of their machines and the weight of any objects to be lifted. Good planning should ensure that no machine is loaded beyond the safe working load. The only occasion where it is permissible to exceed the safe working load is if the equipment is being tested by a competent person, in which case additional precautions are required.

- (k) *unless required for the effective operation of the work, measures are taken to ensure that employees are not present under suspended loads,*
- (l) *loads are not moved above unprotected workplaces usually occupied by employees, and*
- (m) *if the hazards referred to in paragraphs (k) and (l) cannot be avoided, appropriate procedures are laid down and applied where work cannot be carried out properly any other way.*

Regulation 42(k) and (l) require the organisation of a workplace so that no person is required to work under a suspended load whether it is stationary or moving. If unavoidable, the time a person is under a suspended load should be minimised where possible. Regulation 42(m) allows for situations where this is not always possible, as in the case of a tower crane on a busy construction site. In such

circumstances it is necessary to ensure that adequate measures have been taken to reduce the risk from equipment failure or break-up of the load. Such measures include mechanical measures to hold equipment in place in the event of hose or chain failure, additional protection such as netting around a load to secure loose items, use of back-up lifting accessories, barriers restricting entry and provision of head protection.

Regulation 43: Cranes

43. (1) *An employer shall ensure that, without prejudice to Regulations 42 and 45,*
- (a) *every crane of variable operating radius, before it is taken into use—*
- (i) *has plainly marked upon it or within the cab the safe working load at various radii of the jib, trolley or crab, and in the case of a crane with a derricking jib, the maximum radius at which the jib may be worked,*
 - (ii) *is fitted with a suitable accurate automatic safe load indicator or rated capacity indicator, clearly visible to the driver showing at any time the radius of the jib, trolley or crab and the safe working load corresponding to that radius unless—*
 - (I) *it is a guy derrick crane (being a crane of which the mast is held upright solely by means of ropes with the necessary fittings and tightening screws),*
 - (II) *it is a hand crane which is being solely used for erecting or dismantling another crane, or*
 - (III) *it has been assigned by a competent person a safe working load of 1,000 kg or less, and*
 - (iii) *has an automatic safe load indicator or rated capacity indicator, if required under subparagraph (ii), which is—*
 - (I) *properly maintained,*
 - (II) *correctly used, and*
 - (III) *tested by a competent person after erection, installation or alteration of the crane for the purpose of any work before the crane is taken into use or returned to use as the case may be,*

The safe working load (SWL) is the maximum load, as assessed by a competent person, which a crane may raise, lower or suspend under the particular service conditions. On some machines, such as tower and mobile cranes, the SWL value will decrease the further out the load is suspended.

The crane driver needs information on the safe working load for any position of his or her machine.

If, for any reason, the machine has been derated, the change in SWL values must be communicated to the driver.

In addition, the driver must be automatically alerted if the machine is approaching the limits of its safe operation. This is done by means of an automatic safe load indicator, also known as a rated capacity indicator.

Under the machinery-related Directives, for machines supplied for the first time to the European market after 1 January 1995 there is a requirement for machinery with a working maximum load not less than 1,000 kg or an overturning moment not less than 40,000 Nm to be fitted with devices to both warn the driver and prevent dangerous movements of the load. Such devices are known as rated capacity limiters. For some machinery, the relevant harmonised standard has not included the requirement for a load limiting device.

- (b) in the case of a crane which is on occasion dismantled or partially dismantled any jib or boom which is separated from the crane in dismantling is clearly marked so as to indicate the crane of which it is a part,*

Cranes are inspected and certified as complete units and the integrity of this checking process will be undermined if parts from different machines are mixed up.

- (c) cranes with derricking jibs are provided with—*
 - (i) such means as will minimise the risk of the accidental raising or lowering of the jib, and*
 - (ii) a jib that does not exceed the maximum radius specified by the manufacturer, or by a competent person in a report pursuant to Regulation 53,*

Accidental movement of the jib can best be prevented by the provision of separate motors for hoisting and derricking. The jib length must not be extended beyond the specified design value unless approved in writing by the manufacturer or a competent person.

- (d) a crane travelling on rails is provided with deflector plates to remove from the rails any loose material likely to cause danger,*

The use of deflector plates is not a substitute for good housekeeping. The area around crane tracks should be kept clear of loose material.

- (e) where the safety of work equipment depends on the installation conditions on a construction site—*
 - (i) after each assembly of a tower crane or after any adjustment to any member which may affect the strength or stability of the crane, and before it is put into use, it is subject to a static test with a test coefficient of 1.25 and a dynamic test with a test coefficient of 1.1, taking account of any direction from the machine manufacturer, and*
 - (ii) where the stability of a crane is secured by means of removable weights, a diagram or notice indicating the amount and position of such weights is affixed on the crane so that it can be readily seen and each such removable weight is clearly marked with its correct weight, and*

The test coefficient ratios chosen reflect the values given in the Machinery Directives 98/37/EC and 2006/42/EC. The dynamic test refers to the machine being operated in all its configurations to check that the machine and its safety features are functioning properly.

The competent person may decide, upon information supplied by the manufacturer, to use a lower ratio and in such circumstances the competent person must consider whether it is appropriate to specify a lower SWL.

Removable ballast weights are fitted/attached to some machines to ensure their stability, and visible information on their weight and positioning is required.

- (f) *notwithstanding any other provisions of this Chapter, lifting equipment used on a construction site is examined weekly by the user as regards features related to its safe working and a record of the results is kept in a suitable form which is kept available for inspection by an inspector for 3 months from the date of examination.*

Regulation 43(1)(f) requires the weekly examination of lifting equipment used on a construction site. The purpose of the examination is to ensure that the machine is in proper working order and to confirm that no major defects have been identified.

This examination, often done by the machine operator, is not the same in scope or detail as that done for the periodic statutory examination required by Regulation 52.

The weekly examination should include a full functional test of the machine to verify operation of the limit switches but does not require overload testing.

The examination concerns those matters related to the safe working of the equipment. The Regulations do not prescribe a particular form but state that a suitable form be used. The contents of such a form should include:

- Information to identify the equipment
- Date of examination
- Signature and position of person carrying out the inspection
- A checklist of the items examined including:
 - Inspection of the rated capacity indicator/limiter confirming that it is in working order
 - Confirmation that no known major defects in wire, rope and chain systems have appeared in normal operation
 - Confirmation that all limit switches are operating correctly, i.e. hoist limit, derrick limit etc.
 - Confirmation that all ropes are correctly positioned on their sheaves
 - Visual inspection of structure for major damage

- Visual inspection of hooks and other load lifting attachments
- Visual inspection of hydraulic systems for obvious damage
- Visual inspection of electrical systems for obvious damage
- Visual inspection of fuel lines for obvious damage
- Confirmation that brakes and clutches are in working order
- Confirmation that the operator's cab is in suitable condition
- Confirmation that controls are in working order
- Where provided, confirmation that the anemometer is in working order
- Any other matters recommended by the manufacturer or equipment user.

(2) The use of an excavator, telehandler, loader or combined excavator/loader as a crane is subject to Part C of Schedule 1.

Part C of Schedule 1 to the General Application Regulations 2007 covers the circumstances where lifting equipment must be tested. Regulation 55 also covers these machines. If an excavator or loader is used to lift objects other than soil, sand or similar material, it is regarded as a crane to which the provisions for cranes apply as set out in Regulation 55.

Regulation 44: Support of lifting equipment

44. An employer shall ensure that every platform or support, whether fixed or mobile, upon or from which lifting equipment is mounted or supported is suitable for the purpose.

This Regulation reflects the duty to assess support systems thoroughly before placing lifting equipment on them. In the case of ground conditions, these can change with the weather or under the influence of adjoining works.

Regulation 45: Work equipment for lifting goods or persons

45. An employer shall ensure that—

- (a) persons may be lifted only by means of work equipment and accessories suitable for this purpose, and*
- (b) work equipment for lifting or moving persons or for lifting goods is, where applicable, provided such as to—*
 - (i) prevent the risk of the carrier falling, where one exists, by the use of suitable devices,*
 - (ii) prevent the risk of the user falling from the carrier, where one exists,*
 - (iii) prevent the risk of persons being crushed, trapped or struck, in particular through inadvertent contact with objects,*

Regulation 45(b)(i) to (iii) set out the objectives that must be met by lifting equipment. Subsequent Regulations specify in more detail particular requirements for specific equipment. Further information

can be found in a range of engineering standards produced for the different types of equipment.

- (iv) *where the carrier has a roof, be equipped with a suitable inspection control station and stopping device,*
- (v) *where, in respect of a carrier with a roof, a hazard exists by virtue of the free distance in the horizontal plane beyond and perpendicular to the carrier's outer edge exceeding 0.30 m, measures to address the hazard, and*

Regulation 45(b)(iv) and (v) set out provisions aimed at the protection of those maintenance and inspection personnel who must access the roof of a lift for the purpose of their work.

- (vi) *ensure that persons trapped in the carrier in the event of an incident are not exposed to danger, can raise the alarm and can be freed, and*

Being trapped in a lift, especially if the length of the period of confinement is unknown, can be a very frightening experience. The lift must be equipped with a communication system linked to a centre which is continuously manned. Simply providing an alarm which may or may not be heard by someone is not sufficient.

- (c) *where, for reasons inherent in the site and height differences, the risks referred to in subparagraph (b)(i) cannot be avoided by other safety measures, an enhanced safety coefficient suspension rope is installed and checked every working day.*

This exemption only applies where use of the normal back-up safety devices is not applicable.

Regulation 46: Hoists and lifts

46. (1) *Without prejudice to Regulations 42 and 45, this Regulation applies to a hoist, lift, hoistway or liftway subject to the conditional exemptions under Part A of Schedule 1.*

(2) *An employer shall ensure that—*

- (a) *every hoistway or liftway is efficiently protected by a substantial enclosure fitted with gates so as to prevent, when the gates are shut,*
 - (i) *any person falling down the way, or*
 - (ii) *coming into contact with any moving part of the hoist or lift,*
- (b) *any gate referred to in subparagraph (a) is fitted with efficient interlocking or other devices to ensure that the gate cannot be opened except when the carrier is at the landing and that the carrier cannot be moved away from the landing until the gate is closed,*

- (c) every hoist or lift and every such enclosure as is referred to in subparagraph (a) is constructed so as to prevent any part of any person or any goods carried in the hoist or lift being trapped between—

 - (i) any part of the hoist or lift and any fixed structure, or
 - (ii) between the counterbalance weight and any other moving part of the hoist or lift,
- (d) efficient devices which will support the carrier together with its safe working load in the event of failure of the hoisting system are provided and maintained, where practicable, in connection with every hoist or lift,
- (e) efficient automatic devices are provided and maintained in connection with every hoist or lift which will ensure that the carrier does not overrun the highest point set for its intended travel,
- (f) every hoist or lift is installed so that it can be operated at any one time only from one position and is not operated from the carrier unless the requirements of subparagraph (h) are complied with,
- (g) the carrier bears an easily visible plate clearly showing the rated load in kilograms and, if applicable, the maximum number of passengers which may be carried, and
- (h) in the case of hoists and lifts used for carrying persons, whether together with goods or otherwise,

 - (i) efficient automatic devices are provided and maintained to prevent the carrier overrunning,
 - (ii) every carrier on each side from which access is afforded to a landing is fitted with a gate and, in connection with every such gate, efficient devices are provided to secure that, when persons or goods are in the carrier, the carrier cannot be raised or lowered unless the gate is closed and comes to rest when the gate is opened,
 - (iii) in the case of a hoist or lift where the carrier is suspended by rope or chain, there are at least two ropes or chains separately connected to the carrier, each rope or chain and its attachments being capable of carrying the whole weight of the carrier and its maximum working load,
 - (iv) efficient devices are provided and maintained which will support the carrier with its maximum working load in the event of a breakage of the ropes or chains or any of their attachments, and
 - (v) suitable efficient automatic devices are provided which will ensure that the carrier comes to rest at a point above the lowest point to which the carrier can travel.
- (3) This Regulation applies to a hoist, lift, hoistway or liftway, subject to the conditional exemptions under Part A of Schedule 1, and any reference to a gate includes reference to a door where the context so requires.
- (4) An employer shall ensure that hoists or lifts or hoistways or liftways of a class or description specified in Part A of Schedule 1 are subject to the conditions set out therein

Regulation 46 replicates and replaces the requirements for lifts that were previously provided for in the Safety in Industry Acts 1955 and 1980. However, as it would be inappropriate to apply all the requirements to every design of hoist, it was necessary to allow exceptions as contained in Regulation 27 (as amended) and in Part A of Schedule 1 to the General Application Regulations 2007. Historically, the Safety in Industry Acts 1955 and 1980 (Hoists and Hoistways) (Exemption) Order 1985 (S.I. No. 100 of 1985) would have fulfilled a similar purpose.

Some modern lifts are not installed in enclosed lift shafts, however, the reference to enclosure above should be seen in the sense that substantial physical barriers are required to prevent people falling down a lift shaft or from being struck by a moving carrier.

Reference to “hoist or lift” in this Regulation and in Part B of Schedule 1 to the Regulations applies to those situations where the movement of the platform or carrier is restricted by a guide or guides and does not include “block and tackle” arrangements which are sometimes described in trade literature as “hoists”.

Regulation 47: Winch-operated hoists and lifts

47. An employer shall ensure that—

- (a) where a hoist or lift is operated by means of a winch, the winch is so constructed that the brake is applied when the control device is not held in the operating position, and*
- (b) a hoist is not operated by a winch where it is fitted with a pawl and ratchet gear on which the pawl has to be disengaged before the carrier can be lowered.*

Regulation 47 replicates and replaces provisions for winch-operated hoists previously provided within the domain of the Safety in Industry Acts 1955 and 1980.

Regulation 48: Conditions regarding lifting of persons

48. (1) An employer shall ensure that work equipment not specifically designed for the purpose of lifting persons is not used to this effect other than in exceptional circumstances and subject to the following conditions:

- (a) appropriate action including adequate supervision is taken to ensure safety;*
- (b) while employees are on work equipment designed for lifting loads, the control position is manned at all times;*
- (c) persons being lifted have reliable means of communication;*

- (d) *in the event of danger, there is reliable means of evacuating persons from lifting equipment;*
 - (e) *the ground underneath the equipment is even and reasonably flat;*
 - (f) *the equipment is stable under all circumstances;*
 - (g) *persons in a nonintegrated cage or basket cannot reach the controls or other dangerous parts of the lifting machine;*
 - (h) *the cage/basket is properly secured to the lifting machine;*
 - (i) *the total load is less than half the rated capacity of the lifting equipment;*
 - (j) *the lifting equipment has a capacity not less than 1,000 kg unless its manufacturer indicates that the machine is suitable for such use;*
 - (k) *hydraulically-operated machines are fitted with check valves on the hydraulic lifting cylinders, or some other suitable device, to prevent a gravity fall of the load in the event of a hydraulic failure.*
- (2) *An employer shall ensure that lifting equipment with provision for free fall is not used to lift persons.*

Regulation 48(1) deals with lifting people using machines that are designed for lifting loads, e.g. forklift trucks and telehandlers.

Reading Regulation 48 in conjunction with Part 4 of the General Application Regulations 2007 relating to work at height, particularly Regulation 100(b)(iii), means that people should only be lifted by equipment specifically designed for lifting persons. Mobile work equipment, such as mobile elevating work platforms (MEWPs), is readily available for hire or purchase.

An allowance is made for exceptional circumstances where, for example, a non-integrated platform on a forklift truck may be safer than a ladder, but in such circumstances the conditions set out above must be met.

The term “exceptional circumstances” is not applicable to jobs which are planned in advance, irrespective of their duration, nor does it apply to activities which could safely be delayed until proper access equipment is obtained. An exceptional circumstance should be a rare event.

Regulation 48(2) does not allow people to be lifted by devices which permit a free fall mode to be engaged while lifting people.

Regulation 49: Lifting accessories

49. *An employer shall ensure that—*

- (a) *lifting accessories are selected as a function of the loads to be handled, gripping points, attachment tackle and the atmospheric conditions, having regard to the mode and configuration of slinging,*

- (b) *lifting accessories are stored in a way that ensures that they will not be damaged or degraded, and*
- (c) *lifting accessories are marked in such a way that it is possible to identify the characteristics essential for safe use, having regard to Regulation 57.*

Lifting accessories such as chains and slings are placed between the lifting machine (hook) and the load. They must be suitable for the load in terms of strength and slinging configuration. Proper storage is essential to prevent them being damaged and there should be a dedicated arrangement for their storage when not in use. Users of such accessories must be able to identify them and relate them back to a competent person's inspection report.

Regulation 50: Work Equipment for lifting non-guided loads

50. *An employer shall ensure that—*

- (a) *when two or more items of work equipment used for lifting non-guided loads are installed or erected on a site in such a way that their working radii overlap, appropriate measures are taken to avoid collision between loads or the work equipment parts themselves, or both,*

A non-guided load is one where the direction of travel is not constrained by a guide or guides, e.g. a load lifted by a tower or mobile crane. Appropriate measures in such situations include work planning and supervision and the use of anti-collision or space-limiting devices. Any such system should be self-monitoring so that failure is readily detected.

While the collision potential between installed tower cranes can be readily assessed, it can be more difficult to predict the situations created by mobile cranes and teleporters in the vicinity of tower cranes and therefore extra vigilance is required.

- (b) *when using mobile work equipment for lifting non-guided loads,*
 - (i) *measures are taken to prevent the equipment from tilting, overturning or, if necessary, moving or slipping, and*
 - (ii) *checks are made to ensure that the measures are executed properly,*

A careful check of ground conditions is essential for the safe use of mobile cranes. Where necessary, work may need to be carried out to provide sufficient support and outriggers may need to be deployed for increased stability. (Regulation 43 deals with the use of safe load indicators.)

- (c) *if the operator of work equipment designed for lifting non-guided loads cannot observe the full path of the load either directly or by means of auxiliary equipment providing the necessary information,*

- (i) a competent person is in communication with the operator to guide him or her, and*
- (ii) organisational measures are taken to prevent collisions of the load which could endanger employees,*

A banksman in radio control with the driver will be necessary for those jobs where the crane driver does not have full view of the entire lifting operation. (Regulation 51 deals with signalling in more detail.)

- (d) work is organised in such a way that, when an employee is attaching or detaching a load by hand, it can be done safely, in particular through the employee retaining direct or indirect control of the work equipment,*

A load should only be raised or released when the operator handling the load has clearly signalled that it is safe to do so.

- (e) if a load has to be lifted by two or more pieces of work equipment for lifting non-guided loads simultaneously, a procedure is established and applied to ensure good co-ordination on the part of the operators,*

Tandem lifts can be particularly dangerous and require careful planning. Tower cranes must not be used for tandem lifts.

- (f) if work equipment designed for lifting non-guided loads cannot maintain its hold on the load in the event of a complete or partial power failure, appropriate measures are taken to avoid exposing employees to any resultant risks,*

For most lifting equipment, loss of power will not result in loss of control of the load. Vacuum and magnetic load holding devices should have design features incorporated to address this scenario.

- (g) suspended loads are not left without surveillance unless access to the danger zone is prevented and the load has been safely suspended and is safely held,*

The danger zone encompasses not only the area under the load but also access to the machine controls. Tower cranes on sites may need localised fencing at the crane tower to prevent unauthorised access.

- (h) open air use of work equipment designed for lifting non-guided loads is halted when meteorological conditions deteriorate to the point of jeopardising the safe use of the equipment and exposing employees to risks, and*

While manufacturers may provide guidance for their machines, individual judgement will always be required, particularly in the case of large surface area objects. Windspeeds at ground level can be less than those higher up and neighbouring building features may cause localised wind effects. Anemometers should be provided and site management should have a policy covering the issue.

Lifting operations should be suspended if an electrical storm is approaching.

- (i) adequate protection measures, in particular to avoid work equipment turning over, are taken to avoid any risks to employees.*

This provision is more general than Regulation 50(b) in that it is not limited to mobile equipment. Relevant issues include ground conditions, design of machine foundations, deployment of counterweights and stabilisers and instrumentation.

Regulation 51: Lifting equipment—signalling and operation

51. *An employer shall ensure that—*

- (a) *lifting equipment is operated by a competent person or by a person who is under the direct supervision of a competent person for the purpose of training,*
- (b) *no person under 18 years of age is employed to—*
 - (i) *give signals to the operator of lifting equipment driven by mechanical power, or*
 - (ii) *to operate any such equipment,*
- (c) *every signal given for directing the movement of lifting equipment—*
 - (i) *is distinctive in character, and*
 - (ii) *such that the person to whom it is given is able to hear or see it easily, and*
- (d) *signalling devices are—*
 - (i) *properly maintained, and*
 - (ii) *the means of communication are adequately protected from accidental interference.*

Employers may allow persons to operate lifting equipment only if they have been properly trained or are under supervision for the purpose of training.

The possession of a driving licence for road vehicles is not sufficient to cover operation of lifting equipment.

Under the Safety, Health and Welfare at Work (Construction) Regulations 2006, the operation of most site equipment is subject to the construction skills certification scheme (CSCS).

Guidance on hand signals to crane drivers can be found in Part I of Schedule 9 to the General Application Regulations 2007 and in I.S. 360, Code of Practice, Safe Use of Cranes in the Construction Industry, published by the National Standards Authority of Ireland (NSAI).

Regulation 52: Examination and testing of lifting equipment

52. (1) *An employer shall ensure that, without prejudice to Regulation 30,*
- (a) *fixed work equipment for lifting loads, including rail mounted work equipment for lifting loads, is not taken into use for the first time unless—*
 - (i) *it has been tested and thoroughly examined by a competent person, and*
 - (ii) *a certificate of test and examination specifying the safe working load and, if appropriate, the maximum numbers of persons permitted has been obtained,*
 - (b) *mobile work equipment for lifting loads is not taken into use in any place of work for the first time unless—*
 - (i) *it has been examined and certified in accordance with this Regulation, or*
 - (ii) *it is a new machine and which—*
 - (I) *is CE marked in accordance with the relevant directives of the European Communities,*
 - (II) *is accompanied by an EC declaration of conformity in accordance with the relevant directives of the European Communities,*
 - (III) *is accompanied by a certificate of test and examination for that machine signed by the person making the test, specifying the safe working load and*
 - (IV) *has not been reassembled since dispatch from the manufacturer,*

Regulation 52(1)(a) and(b) cover the examination of equipment before first use. In the case of new mobile equipment, the employer may rely on the certification of the manufacturer subject to the stated conditions being met. If this is not the case, the equipment should be examined and tested before being put into use.

- (c) *where*
 - (i) *any alteration or repair is carried out to lifting equipment or a lifting accessory, and*
 - (ii) *the alterations or repairs are relevant to the safe operation of the equipment, the equipment is examined by a competent person in compliance with this Regulation before the equipment's return to service, and*

Examination before return to use is required if any alteration or repair could affect the stability or strength of the equipment. The manufacturer's guidance should be followed, and sought if not available. Useful information may also be available from competent persons experienced in lifting plant inspection.

Even if a machine has simply been reassembled, it is advised that testing be carried out to ensure that it is in full working order.

- (d) *where a report of an examination pursuant to paragraph (3) specifies conditions for the safe working of the equipment, the equipment is used only in accordance with those conditions.*

Employers and users of equipment must be familiar with the contents of these reports and comply with any conditions laid down.

- (2) *In the case of work equipment to which paragraph (1)(b)(ii) applies, the period to the first examination pursuant to paragraph (3) shall be determined by reference to the date of the certificate referred to in paragraph (1)(b)(ii)(III).*

This provision determines the date for the first statutory examination of mobile lifting equipment covered by Regulation 52(1)(b).

- (3) *Without prejudice to Regulation 30, an employer shall ensure that work equipment of a type or class listed in column 1 of Parts B or C of Schedule 1 is not used unless it has been examined by a competent person at least once in the period specified in column 2 of Parts B or C of that Schedule or as required under the other circumstances described in Part C.*

Regulation 52(3) through reference to Parts B and C of Schedule 1 to the General Application Regulations 2007 sets down the framework for the periodic statutory examination and testing of lifting equipment and lifting accessories.

The scheme of inspection regime for the electrical generation industry continues the status quo since the introduction of the Safety, Health and Welfare at Work Act 1989.

Testing of self-erecting cranes is required before first erection on a site and again on that site if re-erected where there is uncertainty about the ground conditions. If the crane is retained on a secure base or platform, the act of dismantling and re-erecting the same structure does not constitute a change in configuration.

- (4) *Where equipment referred to in paragraph (3) has already been thoroughly examined in accordance with the relevant statutory provisions in force prior to the introduction of these Regulations, the beginning of the period referred to in paragraph (3) shall be deemed to be the date of the last such examination.*

The above provision credits examination work carried out under legislation in force up to 1 November 2007. See also Regulation 52(6).

- (5) *The requirements of this Regulation do not apply to the work equipment listed under Part D of Schedule 1.*

While the equipment listed in Part D of Schedule 1 to the General Application Regulations 2007 has some lifting function, it is outside the scope of Regulation 52 but is still work equipment to which Regulation 30 applies and, therefore, the employer must have an appropriate scheme of inspection prepared.

- (6) *Where a thorough examination has been carried out in compliance with the relevant statutory provisions in force immediately before the commencement of these Regulations, the examination shall be regarded as being in compliance with this Chapter and this Regulation does not apply until after the expiry of the period specified under those statutory provisions.*

- (7) *An employer shall ensure that a thorough examination is carried out as soon as practicable if one is outstanding under the relevant statutory provisions from the period before the commencement of these Regulations.*

The introduction of new legislation cannot be used as an excuse to delay examinations that were due under previous legislation.

Regulation 53: Reports by competent persons

53. (1) *A competent person carrying out an examination under Regulation 52 shall—*
- (a) *prepare a report of the result of every examination and test as referred to in Regulation 52 containing the particulars that are set out in Part E of Schedule 1,*
 - (b) *where work equipment is examined pursuant to Regulation 52 and the examination reveals that the equipment can only be used safely if certain repairs are carried out or if the person making the examination foresees a need for such repairs—*
 - (i) *inform in writing the owner and user of the need for such repairs or the potential need,*
 - (ii) *not later than 20 days after the completion of the examination, send a copy of the report of the examination to the Authority where immediate cessation of the work has been advised, and*
 - (iii) *in the case of potential need for repairs, specify the period within which, in his or her opinion, the repairs shall be carried out.*
- (2) *A competent person carrying out an examination under Regulation 52(3) may specify a period less than that in column 2 of Parts B or C of Schedule 1 if in that person's opinion a more frequent examination is required but, if this is done, he or she shall provide the reason for the opinion in writing to the owner and user of the work equipment.*

Regulation 53 sets out a range of duties for any competent person who conducts statutory examinations of lifting equipment. Such examinations are separate from maintenance examinations. The competent person may be an employee of the organisation or external to it. If the person is an employee, he or she has to be in a position to exercise independent judgement.

If the Health and Safety Authority has reason to believe that the examinations and/or the reports of such examinations are not adequate, it has the power to require re-examinations to be conducted by another entity. It may also do the same if it is not satisfied as to the ability of the competent person.

Repairs should not be carried out in the course of statutory examinations and the report of an examination must reflect the conditions as found.

A copy of the report must be sent to the Health and Safety Authority where immediate cessation of work has been advised. Work should cease if there are defects in safety-related instrumentation or if the defect poses an immediate threat to the stability or strength of the equipment or its ability to control a load.

Regulation 54: Keeping of records and registers of lifting equipment

54. (1) *An employer shall ensure that a report produced under Regulation 53, or a copy of it—*
- (a) *is kept at the place of work when the lifting equipment is permanently located there,*
 - (b) *in the case of lifting equipment on a construction site, is kept at the site office or at the business address of the contractor for whom the report was made, and*
 - (c) *in the case of mobile equipment, is kept on the equipment in addition to being available for inspection at the address of the equipment owner.*
- (2) *An employer shall ensure that—*
- (a) *a register of lifting equipment and lifting accessories containing details of the equipment, distinguishing number, date of first use and date of last thorough examination and testing is maintained and kept available for inspection by an inspector, and*
 - (b) *if the equipment does not have a distinguishing number or mark, one of long lasting duration is provided.*

Regulation 54(1) deals with the keeping of examination reports so that they are available at the point of use. See also Regulation 30(d) with regard to the availability of reports to those who use the equipment.

Regulation 54(2)(a) calls for the creation of a lifting register so that one can tell at a glance the scope of equipment for examination and its current status. The register may be in electronic or printed form.

If the employer has separate locations, each with their own lifting inventory, a location-specific inventory may be useful.

Regulation 54(2)(b) addresses the situation where lifting equipment for some reason may not have a distinguishing number/mark. In this case, the employer is obliged to provide it with one so that accurate inspection and examination records may be maintained.

Regulation 55: Safe working loads for excavators, draglines, telehandlers, loaders or combined excavators and loaders when used as cranes

55. (1) In this Regulation, reference to “machine” is a reference to an “excavator, dragline, telehandler, loader or combined excavator and loader when used as a crane”.

(2) An employer shall ensure that—

- (a) before a machine to which this Regulation applies is first used, a competent person—*
 - (i) specifies the safe working load or loads which may be raised and lowered by the machine, or where its safe working load depends on the configuration of the machine, its safe working load for the different configurations are determined, and*
 - (ii) provides a signed certificate specifying the safe working load and any necessary safety provisions,*
- (b) the certificate referred to in subparagraph (a)(ii) is kept available for inspection with the machine,*
- (c) a machine is not loaded beyond the relevant safe working load specified in the certificate required by subparagraph (a)(ii),*
- (d) the specified safe working load or loads and the outrigger position and the length of jib or boom to which the safe working loads relate is either plainly marked on the machine or a copy of the table relating safe working loads to the distance worked is affixed in a clearly visible position in the driver’s cab,*
- (e) if, after the issue of the certificate required by subparagraph (a)(ii), a machine undergoes any substantial alteration or repair likely to affect the specified safe working loads, that certificate is cancelled and a new certificate is obtained,*
- (f) hydraulically-operated machines, except for machines with a maximum rated lift capacity of a 1,000 kg or less, are fitted with check valves on the cylinders used for lifting or by another means to prevent a gravity fall of the load in the event of a hydraulic failure,*
- (g) in the case of a telehandler, the safe working load is not greater than 1,000 kg unless fitted with an automatic safe load indicator or rated capacity indicator,*
- (h) unless a machine is fitted with an automatic safe load indicator or a rated capacity indicator, the safe working load is the same for all radii at which a jib or boom is operated and is not greater than the load which the machine in its least stable configuration is designed to lift with that jib or boom,*
- (i) means of identification are plainly marked on machines to which this Regulation applies, and*
- (j) machines to which this Regulation applies are examined and tested periodically in accordance with Parts B and C of Schedule 1.*

Regulation 55 sets out the requirements for machines such as excavators if they are used to lift objects,

e.g. trench boxes or pipes. In such cases they are regarded as cranes and the provisions apply. Another example is when a load is suspended from the forks of a teleporter.

The Health and Safety Authority's view on the application of Regulation 55(f) is that reference to "cylinders used for lifting" includes the cylinders for both the main boom and dipper arm.

Regulation 56: Specific requirements for scotch and guy derrick cranes

56. An employer shall ensure that, where a scotch and guy derrick crane is to be used,

- (a) the jib of a scotch derrick crane is not erected between the back stays of the crane,*
- (b) a load which lies in the angle between the back stays of a scotch derrick crane is not moved by that crane,*
- (c) appropriate measures are taken to prevent the foot of the king post of any scotch derrick crane from being lifted out of its socket or support whilst in use, and*
- (d) where the guys of a guy derrick crane cannot be fixed at approximately equal inclinations to the mast so that the angles between adjacent pairs of guys are approximately equal, such other measures are taken as will ensure the stability of the crane.*

Regulation 56 deals with a particular design of crane. Both forms of derrick crane incorporate a vertical mast which carries the suspension ropes for a low-pivot derricking jib and in both cases the mast rotates with the jib as the jib is slewed.

Regulation 57: Construction, testing, examination and safe working load of lifting accessories

57. (1) An employer shall ensure that—

- (a) subject to paragraph (2), a chain, rope or other lifting accessory is not used in raising or lowering or as a means of suspension unless—*
 - (i) it is of good construction, sound material, adequate strength, suitable quality and free from patent defect,*
 - (ii) it is properly installed and used,*
 - (iii) it is properly maintained,*
 - (iv) it is used only for the purpose for which it was intended,*

- (v) *except in the case of a fibre rope or fibre rope sling, it has been tested and examined by a competent person and there has been obtained a certificate of such test and examination specifying the safe working load and signed by the person making, or responsible for, the carrying out of the test and examination,*
 - (vi) *in the case of a fibre rope or fibre rope sling, information from the manufacturer on its safe working load is available, and*
 - (vii) *it is marked in plain legible figures and letters with the safe working load and a means of identification, unless paragraph (2) applies to the safe working load,*
- (b) *a chain, rope or lifting gear is not loaded beyond its safe working load except for testing purposes as specified by, and under the direction of, a competent person appointed to carry out the tests,*
- (c) *a hook used for raising or lowering or as a means of suspension is either—*
- (i) *provided with an efficient device to prevent the displacement of the sling or load from the hook, or*
 - (ii) *of such shape as to reduce as far as possible the risk of such displacement,*
- (d) *a sling used for raising or lowering on a lifting appliance is securely attached to the appliance and the method of attachment is not a method likely to result in damage to any part of the sling or to any lifting gear supporting it,*
- (e) *a double or multiple sling is not used for raising or lowering if—*
- (i) *the upper ends of the sling legs are not connected by means of a shackle, ring or link of adequate strength, or*
 - (ii) *the safe working load of any sling leg is exceeded because of the angle between the sling legs,*
- (f) *where a load is being lifted or otherwise moved, adequate steps are taken by the use of suitable packing, or otherwise, to prevent the edges of the load from coming into contact with a sling, rope or chain, where this would involve risk of personal injury,*
- (g) *a load is not raised, lowered or suspended on a chain or wire rope which has a knot tied in any part of the chain or rope under direct tension,*
- (h) *a chain which is shortened or joined to another chain by means of bolts and nuts inserted through the links is not used for raising, lowering or suspending any load, and*
- (i) *where a chain or lifting gear is made of such material that would require annealing or a form of heat treatment to ensure its safety, the chain or lifting gear—*
- (i) *is effectively annealed or subjected to an appropriate form of heat treatment under the supervision of a competent person and at intervals as specified by a competent person, and*
 - (ii) *is not used in raising or lowering or as a means of suspension unless a report has been made in writing of every annealing or appropriate heat treatment signed by the competent person under whose supervision the annealing or heat treatment was carried out.*

- (2) *Where the safe working load of a rope or rope sling is—*
- (a) *contained in the report made pursuant to Regulation 53 and the rope or sling is so marked as to enable its safe working load as specified in that report to be ascertained from the report, or*
 - (b) *in the case of a fibre rope or a fibre rope sling, contained in a table of safe working loads clearly visible in a prominent position at the workplace the ropes or rope slings do not need to be marked with their safe working load.*

The term “lifting accessories” is explained in Regulation 27. Regulation 57 covers their marking, use, test and examination. Lifting accessories must be uniquely marked to ensure the conduct of proper maintenance and inspection procedures. Certain practices are banned in subparagraphs (1)(g) and (h) as they can reduce the overall strength of the rope or chain.

The question is sometimes asked as to what constitutes a load or a lifting accessory, for example, are concrete skips suspended from hooks, typically off tower cranes, a load or a lifting accessory? These skips constitute work equipment, are subject to deterioration liable to result in a danger to safety and are subject to periodic inspection and, if necessary, testing pursuant to Regulation 30(b) of the General Application Regulations 2007. One way of viewing whether a situation is covered by “work equipment” or “lifting equipment” is to divide the equipment into:

- Lifting machine/equipment as far as the hook
- Lifting accessory between the lifting equipment and the load
- The load.

In the case of a concrete skip, it is suspended by lifting accessories and constitutes a load, which in the example above, is also work equipment.

Regulation 58: Delivery of loads with lifting accessories attached

58. *Where—*
- (a) *any article, material or other load intended for use in construction work is delivered at, or adjacent to, a construction site with a chain, rope or other lifting accessory attached thereto and designed for use as a means of raising and lowering that class of load when removing the same from the point of delivery to a position on the site, and*
 - (b) *the chain, rope or gear is free from patent defect whether of construction or quality and is not owned or hired by any contractor who is undertaking construction work on the site,*

this Chapter does not apply in respect of the use of such chain, rope or lifting gear for raising or lowering the load so long as the chain, rope or gear remains attached to the article, material or load.

Some loads incorporate lifting fittings so that they can be handled without the use of separate lifting accessories. Where these fittings are part of the load and are not reusable, it is not practical to subject them to the provisions of Chapter 2 of Part 2 of the General Application Regulations 2007 relating to the use of work equipment. Nevertheless, those handling the load must check that the lifting attachments are sound before using them.

Regulation 59: Duty of persons who hire lifting equipment to others

59. Without prejudice to section 16 of the Act, a person who hires out lifting equipment for use by others, shall comply with the duties set out in Regulations 52 and 54.

Regulation 60: Duty of the master of a ship in respect of examination of lifting equipment

60. The master of a ship shall comply with the duties set out in Regulations 52 and 54.

Regulation 61: Duty of the owner of a fishing vessel in respect of examination of lifting equipment

61. The owner of a fishing vessel shall comply with the duties set out in Regulations 52 and 54.

Regulations 59 to 61 clarify, for the relevant sectors, those responsible for ensuring that lifting equipment is examined and tested in accordance with the Chapter 2 of Part 2 and Schedule 1 to the General Application Regulations 2007 relating to the use of work equipment, and require that proper records are kept.

SCHEDULE 1 Regulations 43, 46, 52, 53, 55

REQUIREMENTS FOR WORK EQUIPMENT

Part A — Exemption from certain provisions of Regulation 46

<i>Class or description of hoist or hoistway</i>	<i>Requirements of Regulation 46 which do not apply</i>	<i>Condition</i>
<p>1. <i>Pavement hoist for goods.</i></p> <p><i>Hoistways of pavement hoists, that is to say, hoists in the case of which the provision of a permanent enclosure at the top landing would obstruct a street or public place or yard or other open space where persons are required or liable to pass.</i></p>	<p><i>Paragraph (2)(a) in so far as it requires the hoistway to be protected by an enclosure and gate at or above the top landing.</i></p> <p><i>Paragraph (2)(b) in the case of the top landing.</i></p>	<p><i>The hoistway shall be securely covered and fastened at the top landing except when access is required for goods or materials.</i></p> <p><i>Measures shall be taken to minimise the risk of persons falling down the hoistway whilst the top landing is open.</i></p>
<p>2. <i>Hoists used solely for lifting material directly into a machine.</i></p>	<p><i>Paragraph (2)(a) and (b).</i></p>	<p><i>Measures shall be taken to prevent hazards from falling objects or contact with moving parts.</i></p>
<p>3. <i>Hoists used for raising or lowering or tipping standard gauge or broader gauge railway rolling stock.</i></p>	<p><i>Paragraph (2)(a), (b) and (h)(ii).</i></p>	<p><i>So far as is reasonably practicable, means shall be provided at such entrances to the enclosure to prevent any person from falling down the hoistway or being struck by any moving part of the hoist.</i></p>
<p>4. <i>Drop-pit hoists used for raising or lowering wheels or bogies detached from standard-gauge or broader gauge railway rolling stock.</i></p>	<p><i>Paragraph (2)(a), (b) and (h)(ii) and (iii).</i></p>	

<p>5. Hoistways of hoists into or from which goods or materials are loaded or unloaded automatically and to the carrier to which there is no access for persons.</p>	<p>Paragraph (2)(a) in so far as it requires the fitting of gates at the openings in the enclosure where goods or materials are loaded or unloaded.</p>	<p>So far as is reasonably practicable, means shall be provided at such openings to the hoistway to prevent any person from falling down the hoistway or being struck by any moving part of the hoist.</p>
<p>6. Any hoist or lift used to raise a motor vehicle.</p>	<p>Paragraphs (2)(a), (b) and (c).</p>	
<p>7. Hoists and lifts, used as working platforms, not of a movable type, which do not pass through any floor and which are used in the butchering of animals.</p>	<p>Paragraphs (2)(a), (b) and (h)(iii).</p>	

Part B – Period of thorough examination of lifting equipment, lifting accessory equipment or other miscellaneous equipment

<i>Column 1</i>	<i>Column 2</i>
<i>Description of lifting equipment or lifting accessory or other miscellaneous equipment</i>	<i>Period within which a thorough examination must occur</i>
<i>Hoist or Lift</i>	<i>6 months</i>
<i>Tailboard goods lift</i>	<i>12 months</i>
<i>Suspended access equipment</i>	<i>6 months</i>
<i>Mast climbing work platform</i>	<i>6 months</i>
<i>Lifting accessories including chains, ropes, rings, hooks, shackles, clamps, swivels, spreader beams and spreader frames, vacuum lifting devices</i>	<i>6 months</i>
<i>Items provided for support of lifting equipment</i>	<i>12 months</i>
<i>Mobile elevating work platform</i>	<i>6 months</i>
<i>Crane</i>	<i>12 months</i>
<i>Tower crane climbing rig</i>	<i>6 months</i>
<i>Crane used in dock work, shipbuilding, ship-repairing</i>	<i>12 months</i>
<i>Fork lift truck including interchangeable accessories</i>	<i>12 months (6 if used to lift persons)</i>
<i>Telehandler including interchangeable accessories</i>	<i>12 months (6 if used to lift persons)</i>
<i>Vehicle lifting table</i>	<i>12 months</i>

<i>Hoisting equipment on fishing vessels</i>	<i>12 months</i>
<i>Winches used for lifting loads</i>	<i>12 months</i>
<i>Other lifting machines (materials only) unless specified in Part D of this Schedule</i>	<i>12 months</i>
<i>Other lifting machines (personnel) unless specified in Part D of this Schedule</i>	<i>6 months</i>
<i>Equipment located in premises used primarily for generating, transforming switching or otherwise regulating electrical energy.</i>	<i>In compliance with a scheme of inspection and testing drawn up by a competent person</i>
<i>Patient hoist</i>	<i>6 months</i>

Part C – Circumstances requiring testing of lifting equipment as part of a thorough examination

as amended by the Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2007 (S.I. No. 732 of 2007))

<i>Column 1</i>	<i>Column 2</i>
<i>Description of Equipment</i>	<i>Period within which or conditions under which testing is required</i>
<i>All lifting equipment</i>	<i>After any substantial alteration or repair affecting its strength or stability</i>
<i>Fixed lifting equipment</i>	<i>Before first use</i>
<i>Tower crane</i>	<i>After each assembly</i>
<i>Mobile crane</i>	<i>Every 4 years</i>
<i>Winch</i>	<i>Every 4 years</i>
<i>Self erecting crane</i>	<i>After erection and before first use on site and after any change in configuration or support conditions</i>
<i>Pulley block, gin wheel or sheer legs or supporting systems for same, used in the raising or lowering of any load weighing 1,000 kg or more</i>	<i>Before first use</i>

Part D – Equipment that has a lifting function, is subject to Regulation 30 and is not subject to Regulation 52

- (a) Bottle jack*
- (b) Pallet truck*
- (c) Tractor hitch*
- (d) Height adjusting components of machine tools*
- (e) Fixed machinery for raising/lowering pallets*
- (f) Vehicle wheelchair hoist*

- (g) Lifting equipment designed to lift wheelie bins of volume less than 360 litres*
- (h) Escalators and conveyors*
- (i) Platform lifts for level changes of 1.2 m or less*

Part E — Information to be contained in report of thorough examination

1. *The name and address of the employer or owner for whom the thorough examination was made.*
2. *The address of the premises at which the thorough examination was made.*
3. *Particulars sufficient to identify the lifting equipment including, where known, its date of manufacture.*
4. *Date of this examination and date of the last thorough examination if known.*
5. *The safe working load of the lifting equipment or, where its safe working load depends on the configuration of the lifting equipment, its safe working load for the different configurations that have been determined.*
6. *The purpose of the examination including examination before putting into use for the first time, examination after installation or after assembly at a new site or in a new location, examination after repairs or alterations and periodic examination.*
7. *In relation to every thorough examination of lifting equipment—*
 - (a) identification of any part found to have a defect which is or could become a danger to persons and a description of the defect;*
 - (b) particulars of any repair, renewal or alteration required to remedy a defect found to be a danger to persons;*
 - (c) in the case of a defect which is not yet but could become a danger to persons—*
 - (i) the time by which it could become such danger;*
 - (ii) particulars of any repair, renewal or alteration required to modify it;*
 - (d) the latest date by which the next thorough examination must be carried out;*
 - (e) where the thorough examination included testing, particulars of any test;*
 - (f) identification of parts not accessible for examination.*
8. *The name, address and qualifications of the individual making the report and, where appropriate, the name and address of the individual's employer.*
9. *Where appropriate, the name and position of a person signing or authenticating the report on behalf of its author.*

APPENDIX

Sources of Further Information and Bibliography

General

This bibliography is not intended to be exhaustive. Dates are current at time of publication. The most recent/current standard/publication should be obtained in each instance.

The *Irish Standards Catalogue* published by the National Standards Authority of Ireland (NSAI) may be purchased from: NSAI, 1 Swift Square, Northwood, Santry, Dublin 9; Tel. (01) 807 3800; Fax (01) 807 3838; Website: www.nsai.ie

The ILO's (International Labour Organisation) *Encyclopaedia of Occupational Health and Safety* provides an excellent general overview of safety, health and welfare issues. Contact the Publications Unit at ILO-London; Tel: +44 20 7828 6401; Website: www.ilo.org/global/lang--en/index.htm

The European Agency for Safety and Health at Work can be contacted at: Gran Via 33, E-48009 Bilbao, Spain; Tel: +34 944 794360; Fax: +34 944 794383; Website: <http://osha.europa.eu/en/front-page>

Health and Safety Executive (HSE) priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA, UK; Tel: +44 1787 881165; Fax: +44 1787 313995; Website: www.hse.gov.uk

See also the Enterprise & Industry webpage of the European Commission at <http://ec.europa.eu/enterprise>

Bibliography

Council Directive 89/655/EEC of 30 November 1989 concerning the minimum safety and health requirements for the use of work equipment by workers at work (OJ L 393, 30.12.1989, p. 13)

Council Directive 95/63/EC of 5 December 1995 amending Directive 89/655/EEC concerning the minimum safety and health requirements for the use of work equipment by workers at work (OJ L 335, 30.12.1995, p. 28)

I.S. EN 349 1992 + A1 2008, Safety of Machinery – Minimum gaps to avoid crushing of parts of the human body

I.S. EN 62305:2006, Protection against lightning – Part 1: General principles, Part 2: Risk management, Part 3: Physical damage to structures and life damage

Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 (S.I. No. 619 of 2001)

2010 Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations 200

Guidelines to the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001
[Dublin: Health and Safety Authority, ISBN 1-84496-002-1]

Short Guide to the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001
[Dublin: Health and Safety Authority, ISBN 1-84496-008-0]

IS EN ISO 13857:2008, Safety of machinery – Safety distance to prevent danger zones being reached by the upper and lower limbs

B.S. PD 5304:2005, Guidance on safe use of machinery, [British Standards Institution, ISBN 0-580-46818-6]

EN ISO 3471:2008:Earth moving machinery- Roll-over protective structures- Laboratory tests and performance requirements [replaced EN 13510:2000]

EN 1993-6,:2007, Eurocode 3: Design of steel structures – Part 1-6: Crane supporting structures

Directive 98/37/EC of the European Parliament and of the Council of 22 June 1998 on the approximation of the laws of the Member States relating to machinery as amended by Directive 98/79/EC (OJ L 207, 23.7.1998, p. 1) and as repealed from 29 December 2009 by Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast) (OJ L 157, 9.6.2006, p. 24)

Safety in Industry (Abrasive Wheels) Regulations 1982 (S.I. No. 30 of 1982)

Safety, Health and Welfare at Work (Fishing Vessels) Regulations 1999 (S.I. No. 325 of 1999)

Safety, Health and Welfare at Work (Construction) Regulations 2006 (S.I. No. 504 of 2006)

Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2008 (S.I. No. 130 of 2008)

Safety, Health and Welfare at Work (Construction) (Amendment) (No. 2) Regulations 2008 (S.I. No. 423 of 2008)

Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2010 (S.I. No. 523 of 2010)

I.S. 360:2004 Code of Practice, Safe Use of Cranes in the Construction Industry, published by the National Standards Authority of Ireland (NSAI)

Notes

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