HSA

An tÚdarás Sláinte agus Sábháilteachta
Health and Safety Authority

Guidelines on the Safety of Powered Gates

Our vision:

A country where worker safety, health and welfare and the safe management of chemicals are central to successful enterprise

Contents

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1. Introduction

The purpose of this guidance is to assist those who have any responsibility for the specification, design, manufacture, purchase, installation, maintenance, inspection or use of powered gates. Powered gates can injure and kill. In recent years a number of children in the UK have been fatally injured by powered gates, while in Ireland in 2015 a person was trapped and fatally injured by an electrically powered gate.

Legislation covering powered gates

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The **Safety, Health and Welfare at Work Act 2005** requires every employer and self-employed person to ensure, so far as is reasonably practicable, the design, provision and maintenance of safe means of access to and egress from a place of work. The same Act also requires the design, provision and maintenance of machinery that is safe and without risk to health. The control of hazards from powered gates needs to be addressed in any risk assessments and safety statements prepared under sections 19 and 20 of this Act.

A powered gate at a place of work is considered to be work equipment to which the provisions of **Part 2, Chapter 2 of the Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007) (as amended)** apply.

A powered gate is considered to be "machinery" under the **European Communities (Machinery) Regulations 2008 [S.I. No. 407 of 2008]** (the Machinery Regulations 2008). This places a duty on the manufacturer of a powered gate to ensure that before placing the product on the market or putting it into use at any place, that it satisfies the essential health and safety requirements and other related requirements laid down in the Regulations. These Regulations give effect in Irish law to **European Machinery Directive [2006/42/EC]** (The Machinery Directive). The implications of these Regulations are discussed further in Section 5.

Other pieces of legislation that are relevant to the design and manufacture of powered gates include the **European Construction Products Regulations** the **Low-Voltage Directive**, the **Electromagnetic Compatibility Directive** and the Radio and **Telecommunications Terminal Equipment Directive.**

It should also be noted that since the 1st October 2012 the provision of access control is subject to licensing arrangements administered by the **Private Security Authority.**

3 Hazards and controls

When identifying hazards and danger zones associated with powered gates, you should consider, among other things, the following:

- any points where persons may be injured by being crushed or becoming trapped, for example:
    - meeting point between swing gates when closing,
    - sliding gate at "end of travel" positions,
    - trapping of feet between lower edge of gate and ground,
    - space between a moving gate and a fixed object, and
    - contact with moving parts at the drive unit;
- hazards from being caught or hooked by sharp edges or projections;
- the impact forces produced by a gate when it strikes a person or an obstacle;
- hazards associated with the gates being activated automatically, or by another person (for example, by a sensor under the road surface activating a gate when a car drives over it, a remote button, a key fob pressed by a third party or a gate operated by dialling a mobile phone);
- possible ways in which safe operating systems (such as key-pad or key-fob systems) could be defeated, bypassed or inappropriately operated, thereby placing any person at risk. (This is particularly relevant where children, members of the public, or persons not familiar with a location have access to powered gates and may not recognise a risk to their safety);
- the possibility of gates becoming detached from their supports and falling over;
- all danger zones up to a height of 2.5m should be identified; and
- electrical hazards, such as electric shock or erratic behaviour due to ingress of moisture on electrical circuits.

3.1 Increased risk

Factors that can give rise to an increased risk include:

- use by children,
- use by infirm or elderly people,
- unrestricted access or other instances when it is not possible to instruct, train or supervise the gate users,
- high frequency of use or large number of people passing by, or
- a high degree of automation.

Generally, a perimeter gate, where the public may be present as users or passing by, will require the highest level of safety provision.

Powered gates: specific hazards and control measures

4

This guidance will address in detail two types of powered gates: sliding gates and hinged gates.

4.1 Sliding gates

Figure 1 shows a plan and elevation view of a cantilever sliding gate. Figure 1(a) shows a sliding gate on tracks. Areas A to H show the areas where injury could potentially be caused.

The bullet points A to H describe these hazards and the type of measures needed to control the risk from each hazard. Figure 2 shows how safe edges can be installed to prevent crush and entrapment injuries.

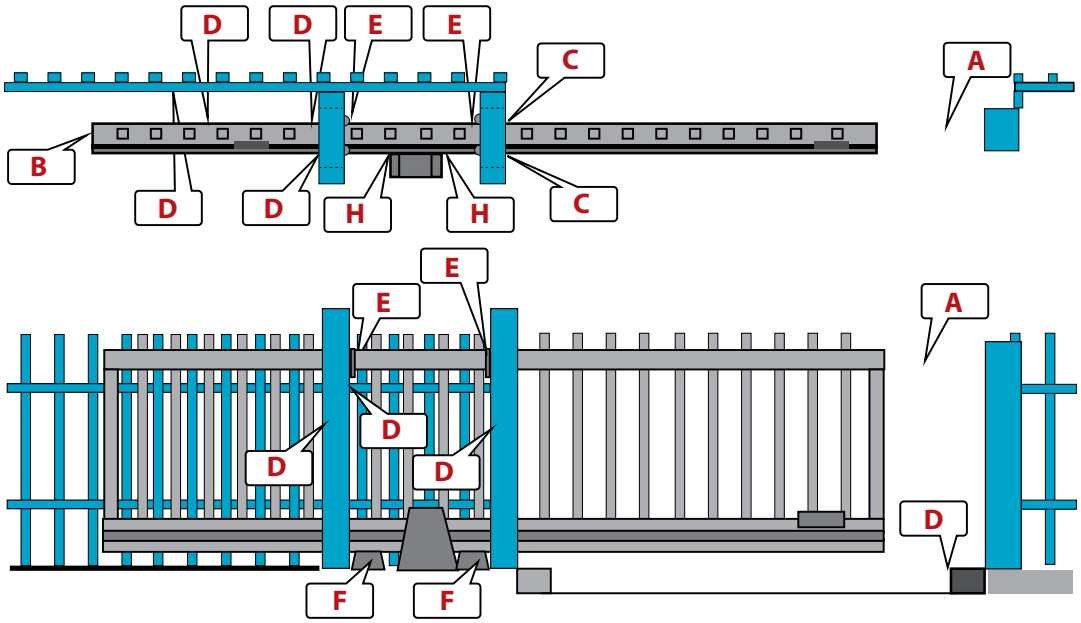

Figure 1: Plan and elevation view of a powered cantilever sliding gate

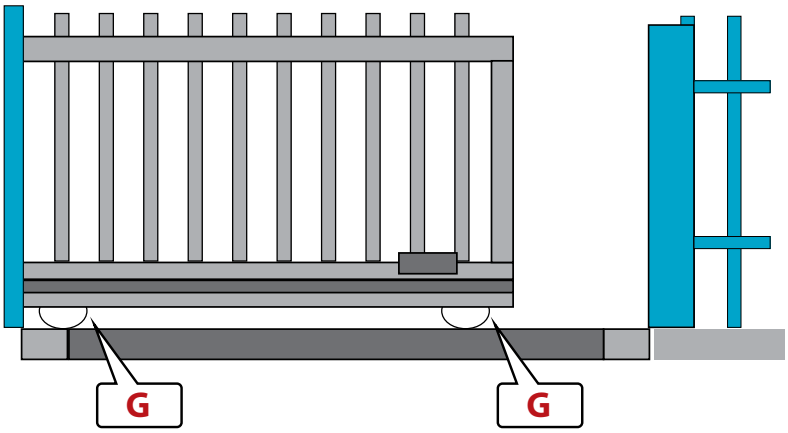

Figure 1(a): Opening area of a tracked sliding gate

4 Powered gates: specific hazards and control measures (cont'd)

A Main closing edge: crush and impact hazards controlled by either inherent force control, safety edges, light/radar curtaining or by having the gate hold-to-run.

Inherent force-control can be provided by intelligent drive units that cause the gate to reverse when an obstruction is sensed.

Safe edges are sensitive rubber switching strips which, when contact is detected, send a signal to the gate controller to reverse the movement of the gate.

Light/radar curtaining means placing a curtain of light or radar in front of the danger areas. If the curtain is breached while the gate is operating, the gate will reverse its direction. This may be installed to give protection to vehicles primarily but it will also prevent inadvertent contact with pedestrians.

Hold-to-run means that the gate can only be opened or closed by a person positioned in a safe area, consciously placing continuous pressure on a controller.

B Main opening edge: crush and impact hazards (crush hazard exists whenever a leaf closes to within 500mm of a fixed object, impact hazards are present throughout movement) controlled by either:

- Guarding
- Safety distances - see Figure 4
- Inherent or safety edge derived limitation of forces
- Hold-to-run or light/radar curtaining

C Entrance portal support frame: shear or draw in hazards controlled by either:

- Safety distances
- Safety edges – See Figure 2
- Hold-to-run or light/radar curtaining

D All other support frame, leaf or perimeter: shear and draw in hazards controlled by either:

- Guarding
- Safety edges
- Hold-to-run or light/radar curtaining

E Upper guide/roller draw in hazards controlled by either:

- Guarding
- Hold-to-run or light/radar curtaining

F Lower cantilever gate rolling gear hazards (see Figure 1) controlled by either:

- Lower edge slot for internal rollers
- Guarding for external or exposed rollers

G Lower tracked gate rolling gear hazards - see Figure 1(a) controlled by:

- Guard to within 8mm of ground

H Drive unit draw in hazards controlled by:

- Guard

Notes:

The preferred method of protecting risks B, D, E and H is to guard off the entire run-back area of the gate and provide a maintenance hatch for drive unit access.

List A to H is not exhaustive, other examples may exist depending on design detail.

Figure 2: Safety Edges installed on powered gates. If these make contact with a person or object the gate is automatically prevented from closing further

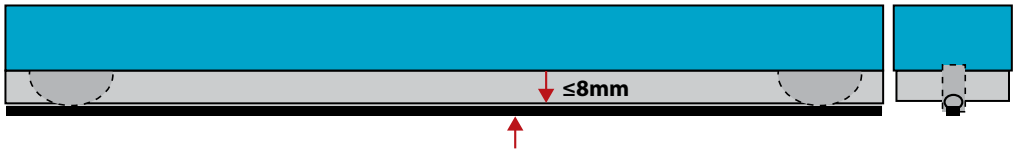

Figure 3: Guarding of base of powered gate

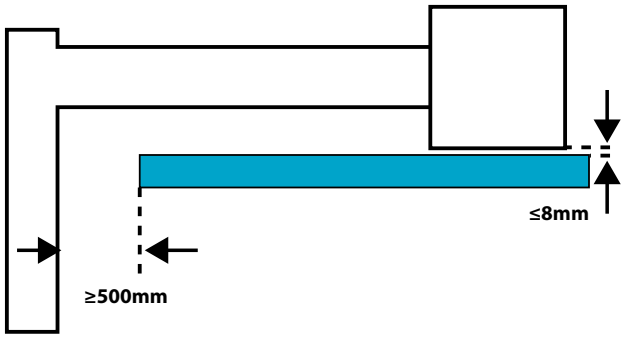

Figure 4: Gaps at gate end stopping position (when opened) should be as shown, to prevent crushing. Alternatively this area should be guarded

4.2 Hinged power gates

Hinged gates have some similar hazards to sliding gates. However, the fact that the gates swing open and closed presents some other hazards that must also be considered.

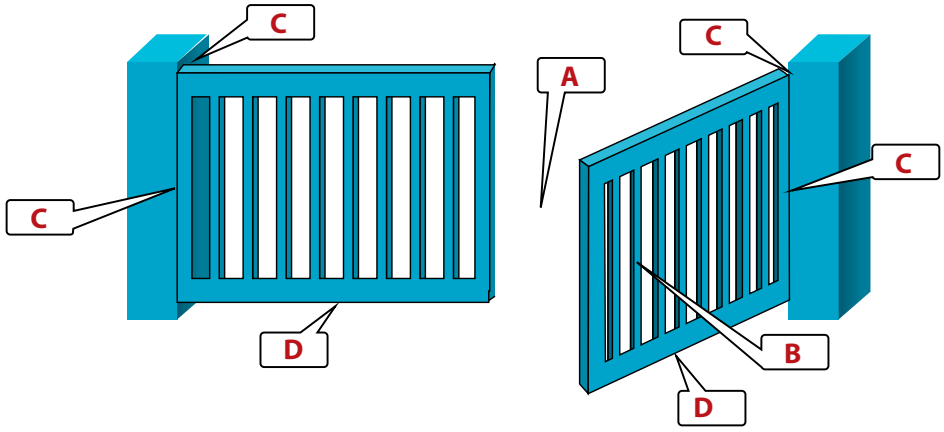

Figure 5: Elevation view of powered hinged gates including hazardous areas A-D

A Main closing edge crush and impact hazards controlled by either:

- Photoelectric beams on the closed face in combination with inherent or safety edges or limitation of forces
- Hold-to-run or light/radar curtaining

B Opening crush and impact hazards controlled by either:

(Opening crush hazards exist wherever a leaf opens to within 500mm of a fixed object, impact hazards are present throughout movement)

- Safety distances, for the **crush** element only - see Figures 6 and 7
- Inherent or safety edge limitation of forces
- Hold-to-run or light/radar curtaining

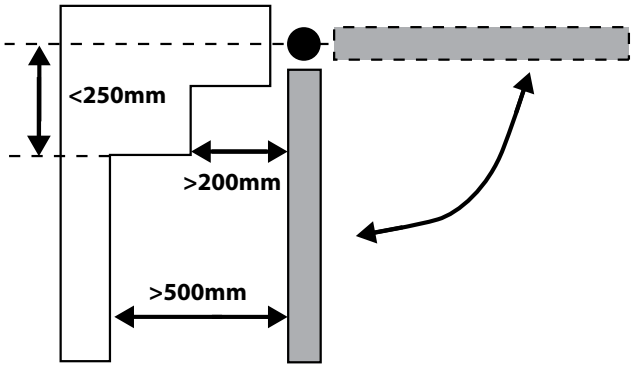

Figure 6: Safety distances to reduce crushing hazard

C Hinge area crush, draw in or shear hazards controlled by:

- Safe design hinges - see Figure 7
- Guards
- Safety edge
- Hold-to-run or light/radar curtaining

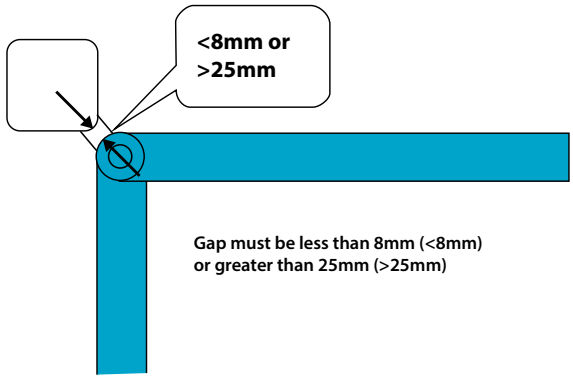

Figure 7: Safe design hinge

D Lower edge shear and crush hazards controlled by either:

- Safe distances in combination with inherent limitation of force - see Figure 8
- Safety edges on both sides of lower opening edge
- Hold-to-run or light/radar curtaining

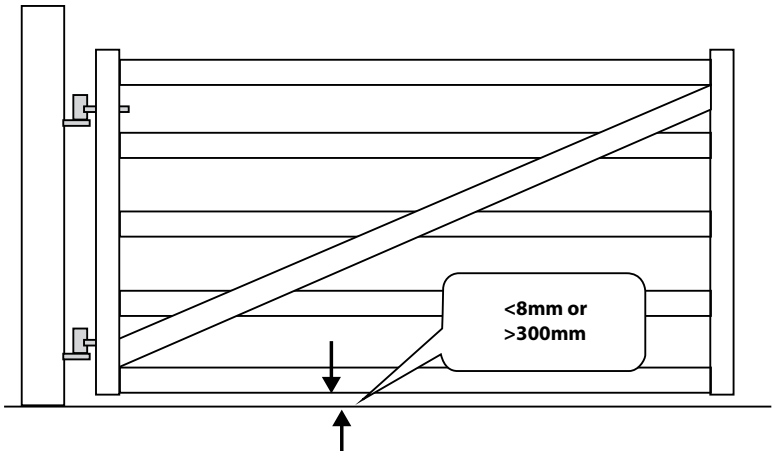

Figure 8: Safe distances to reduce crush and shear hazards of lower edge

Note:
This list is not exhaustive, other examples may exist dependant on design detail. Nonetheless, all hazards must be revealed by assessment and controlled.

4 Powered gates: specific hazards and control measures (cont'd)

4.3 Overview of safety measures

An overview of the measures which may help to reduce risk:

- controlling separation distances between fixed and moving parts to reduce hazards from crushing, shearing and drawing-in points;
- Ensuring adequate separation distances between the control panel and the nearest danger point on the gate so that the user is not in a dangerous position and people cannot reach through a gate to operate a control panel on the other side;
- installing guards, for example a fixed guard to cover mechanical trap points such as guide rollers or sprocket drives;
- providing leaf surfaces that are smooth and free of parts that protrude which could catch people's clothing;
- operating the gate in hold-to-run mode;
- limiting the forces, for example protection built into the drive system; and
- installing sensitive protective equipment such as pressure sensitive strips (safety edges), safety sensor flooring, light/radar curtains or similar protective systems.

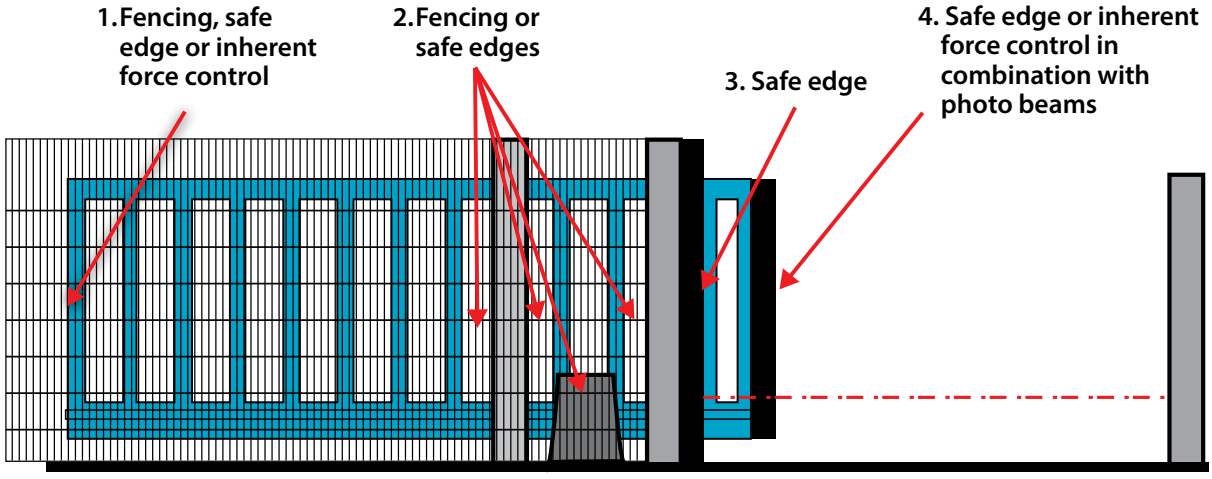

Figure 9: Control measures to protect users and members of the public

Powered gates: specific hazards and control measures (cont'd)

It may be necessary to combine the above approaches to achieve an acceptable level of safety, as indicated in table 1 of EN 12453:2001.

ISO EN 13857 provides information on safety distances to prevent hazard zones being reached.

The use of European standards (ENs) covering safety requirements, test methods and safety distances will assist the risk assessment.

EN 12453 specifies minimum levels of safeguarding of the main edge for different types of users. It also specifies a maximum crushing force of 1400N for gaps greater than 500mm, a maximum allowable crushing force of 400N for gaps between 50 and 500mm, and that the force exerted on contact must have reduced to no greater than 150N within 750 milliseconds. The gates should also reverse if they inadvertently hit someone or something, and the gates should have an emergency release mechanism in case someone gets trapped. Methods for testing forces are specified in EN 12445.

EN 12978:2003 + A1:2009 deals with electro-sensitive protective equipment (ESPE) (for example, light curtain) and pressure sensitive protective equipment (PSPE) (for example, safety edge). However, it does not cover other currently available technologies such as inherent force limitation or programmable systems (see section below on Standards).

5 Powered gates and the Machinery Regulations 2008

The installation of a new powered gate and the adaptation of a non-powered gate to a powered one are subject to these Regulations.

There are two main scenarios to be considered:

- the gate is supplied as a complete product from the factory; or
- the gate is made, assembled and installed at the location by the installer using components from various sources and is not a factory kit.

5.1 Powered gates which are produced complete

Where a powered gate is fully manufactured and shipped from the factory as a complete product (even though it may be in kit form and require assembly and installation on site), the manufacturer must ensure that:

- the gate meets the essential health and safety requirements set out in the Regulations,
- it is CE marked, and
- it comes with a Declaration of Conformity and comprehensive instructions for installation, use and maintenance.

They should also provide information on actions to be followed if there is an accident or breakdown, especially where someone is trapped by the mechanism. The manufacturer must also create a technical file which is described further in section 8.1.

The installer takes responsibility for safe installation according to the manufacturer's instructions.

5.2 In situ manufacture or assembly of a powered gate

The person or organisation who takes responsibility for combining machines or components, or builds their own, is a manufacturer under these Regulations and therefore takes on the responsibilities of a manufacturer as outlined in the previous section.

In this scenario, powered gates will in effect be manufactured on site from various components (this is particularly the case when re-using existing leaves). The installation involves bringing together component parts, many of which have been manufactured by others, into a new complete piece of machinery.

Manufacturing (that is, the design and assembly of the various elements) in these cases may be done by the:

- site operator themselves,
- a single "installing" contractor,
- a principal or "turnkey" contractor managing and co-ordinating the work of other installing sub-contractors and suppliers, or
- the main product manufacturer.

The person responsible as the "manufacturer" will be whoever has responsibility for the design and choice of components for the gate installation. Normally this will be the installer, although it can be a main contractor who co-ordinates the roles of a number of sub-contractors, or even the premises owner or occupier if they do the work themselves or design the system and get a contractor to do the actual assembly work. During gate commissioning, and before the gate is put into service, they must ensure the gate and any safety systems are set and configured so that it is safe for use.

Duties of a commercial or professional owner

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Commercial property owners, landlords, or facilities managers of properties with powered gates, have duties under the Safety, Health and Welfare at Work Act 2005 to ensure the safety of people using or in the vicinity of such gates. They have a responsibility to ensure that their staff, other workers, visitors or members of the public are not put at risk by the gate's design, construction, operation or lack of maintenance. The control measures will include some of those outlined in section 4.

Commercial owners should consider acquiring the services of a reputable company, contractor or competent person familiar with the requirements of the Machinery Regulations and relevant European Directives and Standards, to assist them with their risk assessment obligations.

The gate, as an item of work equipment, must be kept, by means of adequate maintenance, in a condition that is safe for use. The gate should be regularly maintained by a reputable company. This maintenance should include a test of the safety features of the gate (to ensure they are set and working correctly) and a test of the closing forces. The test of the closing forces requires the use of measuring equipment and the tester should be competent in the use of such equipment. A log should be kept of the maintenance and testing by the person in control of the day-to-day management of the property.

The owner should ask the gate maintenance company to demonstrate how to release the gate in an emergency. Releasing the gate should be easy and quick to do. There may also be a need to inform other users how to do this.

The owner should also be familiar with the safety features of the gate, including:

- any safety edges (usually rubber "buffer" strips running the full height of the gate);
- light beams, or other sensors, to detect a person or object in the way of the closing gate;
- the operation of the force limitation device (although this is unlikely to be enough to stop injury on its own); and
- fixed guards at other areas, for example where the vertical bars of a gate slide close to the vertical bars of a fence.

Again, a reputable company should be able to illustrate and explain the safety features.

7 Actions by a domestic owner

A domestic owner of a powered gate who may have concerns about its safe operation should have the gate examined by a competent person who is familiar with the requirements of the Regulations and relevant European Directives and Standards.

Although a domestic premises is outside the scope of the 2005 Act, nevertheless private owners are advised to have powered gates examined if they have concerns. These concerns might arise if the safety measures outlined in this document are absent.

8 Purchasing a new gate

A person purchasing a new powered gate, or applying a power mechanism to an existing gate, should determine whether the gate installation is a complete factory kit as described in section 5.1 or an on-site manufacture as described in section 5.2. If the latter, the installer should be asked to demonstrate that they can meet their duties under the Machinery Regulations.

Documentation 9

9.1 Technical file

The Machinery Regulations require several key documents to be created in a "technical file". This file must be retained by the responsible person (the individual or organisation responsible for CE marking) for at least ten years. The documentation would include the following:

- a description of the gate, including technical drawings, electrical and control schematics, and design calculations;
- risk assessments, including hazards identified and protective measures implemented to secure compliance with the applicable health and safety requirements;
- test results, including force testing results where applicable;
- any standards or technical specifications used, indicating the essential health and safety requirements covered by these standards;
- declarations of Incorporation or Conformity from suppliers of drives, controls and safety devices;
- installation instructions provided by suppliers of drives, controls and safety devices;
- a copy of the operating instructions and maintenance log book issued to the customer; and
- a copy of the Declaration of Conformity issued to the customer.

9.2 Declaration of Conformity

This document must be drawn up by the person responsible for CE marking. The exact format is not prescribed but it must contain the following:

- name and address of the responsible person;
- description and identification of the machinery;
- a sentence declaring that the machinery fulfils the provisions of the Machinery Directive 2006/42/EC. Where relevant, similar sentences relating to other directives which are applicable;
- a reference to the harmonised standards used (if appropriate), for example EN 13241-1:2003;
- references to other technical standards and specifications used; and
- signature, date and place of the declaration.

A copy of the declaration must be supplied with the gate.

10 CE marking

The marking consists of the letters "CE", affixed clearly and indelibly to the machine.

In addition to the CE mark, all powered gates must be marked clearly and indelibly with the following information:

- the business name and full address of the manufacturer,
- designation of series or type,
- serial number, if any, and
- the year in which the manufacturing process was completed.

Standards covering powered gates

11

These guidelines contain text adapted or directly taken from various standards; readers are advised to consult the source documents.

One of the key duties of the manufacturer of a product is to ensure that it meets the essential health and safety requirements of the Machinery Regulations. These requirements cover physical performance criteria as well as markings and the supply of information to the user.

Detailed technical solutions for meeting these essential health and safety requirements are can be found in European harmonised standards. Other European Standards contain requirements for various other aspects of the gate's performance and design. Should a manufacturer choose not to comply with relevant European Standards they are still obliged to demonstrate that their product fulfils the essential safety requirements laid down by the Regulations.

Where the level of safety to be applied is not readily apparent through the use of standards, then a full risk assessment is likely to be required so that the correct level of safety is determined and provided. This is particularly relevant given that many of the standards were designed principally for "type testing" a product in the factory or test laboratory. Some of these standards were developed in the 1990s and the "state of the art" has progressed since then, with new technology for safety devices becoming available.

This means in practice that where a gate is created on site rather than in a factory, or where the physical layout differs from that assumed by the factory or test laboratory, it may not be possible to apply the standards in full. However, by completing a risk assessment, appropriate solutions using current technology, which goes beyond the requirements in the currently published standards, can be applied.

It should be noted that standards are subject to change, so manufacturers and installers should at all times be aware of the most up-to-date version of any relevant standards.

The following is a non-exhaustive list of current applicable standards, available from the National Standards Authority of Ireland (NSAI).

IS EN 12433-1:2000, Industrial, Commercial and Garage Doors and Gates / Terminology / Part 1: Types of Doors

Defines terminology for doors, barriers and gates intended for installation within the reach of people, for which the main intended uses are giving safe access for goods and vehicles accompanied by people in commercial and industrial premises and in residential garages.

IS EN 12433-2:2000, Industrial, Commercial and Garage Doors and Gates / Terminology / Part 2: Parts of Doors

Defines the terms for parts of most types of doors, barriers and gates in common use.

IS EN 12444:2000, Industrial, Commercial and Garage Doors and Gates / Resistance to Wind Load / Testing and Calculation

Provides the test method and calculation of resistance to wind load for doors in a closed position.

11 Standards covering powered gates (cont'd)

IS EN 12445:2000, Industrial, Commercial and Garage Doors and Gates / Safety in Use of Power Operated Doors / Test Methods

Defines the test methods to be applied to a power operated door or gate to demonstrate compliance with the requirements specified in EN 12453:2000. In particular it specifies the methods of measuring the forces developed by a power operated door or gate and defines force testing requirement points on sliding and swing gates.

IS EN 12453:2000, Industrial, Commercial and Garage Doors and Gates / Safety in Use of Power Operated Doors / Requirements

Defines the performance requirements in regard to the safety in use for any type of power operated doors, gates and barriers intended for installation in areas within the reach of people, and where the main intended uses are giving safe access for goods and vehicles accompanied or driven by people in industrial, commercial or residential premises. It specifies minimum levels of safeguarding of the main edge related to the way the gate is used, such as hold-to-run, limitation of forces, and means of detection of presence of a person or obstacle.

IS EN 12489:2000, Industrial, Commercial and Garage Doors and Gates / Resistance to Water Penetration / Test Method

Defines the test method to determine the resistance to water penetration for doors in a closed position. Applies to all doors provided in accordance with prEN 13241: 1998 (now EN 13241-1:2003 + A1 2011).

IS EN 12604:2000, Industrial, Commercial and Garage Doors and Gates / Mechanical Aspects / Requirements

Describes the mechanical requirements for doors, gates and barriers intended for installation in areas within the reach of people and for which the main intended uses are giving safe access for goods and vehicles accompanied by people in industrial, residential and commercial premises. It deals with significant mechanical hazards such as crushing, shearing, cutting, entanglement, drawing in or trapping, falling or ejected parts, loss of stability and contact with wheels.

IS EN 12605:2000, Industrial, Commercial and Garage Doors and Gates / Mechanical Aspects / Test Methods

Defines test methods to verify the mechanical requirements for doors, gates and barriers intended for installation in areas within the reach of people and for which the main intended uses are giving safe access for goods and vehicles accompanied by people in industrial, commercial and residential premises.

IS EN 12635:2002 + A1 2008, Industrial, Commercial and Garage Doors and Gates / Installation and Use

Describes the information to be provided by the door manufacturer and the components manufacturer to ensure safe installation, operation, use (including maintenance and repair) of doors, gates and barriers intended for installation in areas within the reach of people, and for which the main intended uses are giving safe access for goods and vehicles accompanied or driven by people in industrial, commercial or residential premises.

IS EN 12978:2003 + A1 2009, Industrial, Commercial and Garage Doors and Gates / Safety Devices for Power Operated Doors and Gates / Requirements and Test Methods

Applicable for design, construction and testing of sensitive protective devices where the device is used to detect pedestrians including in particular applications, slow moving elderly people, slow moving disabled people and children who may be exposed to injury by power operated doors, gates and barriers, electrically powered from a public supply and intended for installation in areas in the reach of people, and for which the main intended uses are giving safe access for goods and vehicles accompanied or driven by people in industrial, commercial, public or residential premises.

IS EN 13241-1:2003 + A1 2011, Industrial, Commercial and Garage Doors and Gates / Product Standard / Part 1: Products without Fire Resistance or Smoke Control Characteristics

Describes the safety and performance requirements for doors, gates and barriers intended for installation in areas within the reach of people, and for which the main intended uses are giving safe access for goods and vehicles accompanied or driven by people in industrial, commercial or residential premises.

IS EN 349:1993 + A1 2008, Safety of Machinery / Minimum gaps to avoid crushing of parts of the human body

Describes minimum gaps relative to parts of the human body and is applicable for achieving adequate safety by avoiding crushing zones.

IS EN ISO 13857:2008, Safety of Machinery / Safety distances to prevent Hazard Zones being reached by upper and lower limbs

Establishes values for safety distances, appropriate for protective structures, in both industrial and non-industrial environments to prevent machinery hazard zones being reached.

12 Other sources of information

The Door and Hardware Federation in the UK have produced guidance for the powered gate industry which has been endorsed by the UK Health and Safety Executive.

Also available on the web is guidance produced in English by the Italian body UNAC concerning the motorisation of sliding gates (guide number 1) and hinged gates (guide number 2).

13 Acknowledgements

In producing this guidance material the Health and Safety Authority wishes to acknowledge the following publications:

- Health and Safety Executive (UK), Bulletin No: FOD WSW 1-2010, Risks to pedestrians from crushing zones on electrically powered gates
- Health and Safety Executive (UK), Bulletin No: FOD 7-2010 Risks to pedestrians from crushing zones on electrically powered gates - 2
- Door and Hardware Federation (UK), Guide to gate safety legislation and standards.
- EU Commission Website for Machinery Directive.

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