Technical Specification

dhf Raising Standards Safety Assured

Code of Practice for the Design, Manufacture, Installation and Maintenance of Automated Gates and Traffic Barriers

DHF TS 011:2018

Contents

Revision	Description	Date
TS-011:2016	First edition	May 2016
Corrigendum 1	Typing error corrections to para 1 in Annex A, Table B2, B9.1 and B10.1 in Annex B	Oct 2016
TS-011:2018 v3	Second edition, reformat & unify with TS 012:2018	Feb 2018

Foreword

This code of practice draws on applicable legislation, European standards, British standards and industry best practice to assist all those involved in the automated gate and barrier industry to meet their legal obligations by providing clear guidance on the design, manufacture, installation and maintenance of automated gates and barriers.

Where existing standards have been proven to be defective and where industry experience and legal precedent indicates there are common misinterpretations, this code of practice provides a workable method of mitigating the resulting risk. This is done to protect the safety and legal interests of users, service providers and owner groups.

The objectives of this code of practice are to:

i. Establish and maintain minimum safety standards for design, manufacture, installation, maintenance and operation of automated gate and barrier systems

ii. Provide guidance on the required level of user training and safety awareness

iii. Define the minimum requirements for technical documentation

iv. Define a training and competency framework

In 2011 the UK Health and Safety Executive lodged a formal objection to the package of standards covering automated gates and barriers in place at that time. After consultation and consideration, in July 2015 the European Commission issued a warning that the harmonised standard[1] (EN 13241-1:2003+A1:2011) did not, by reference to the other standards in the package, achieve a level of safety that would comply with the Machinery Directive 2006/42/EC. Those who were relying on the standards referenced by EN 13241-1 were advised to review their risk assessment to ensure that their product did in fact meet the required level of safety for legal compliance. This code of practice has been developed in part at least to address that situation, but also to collect together all the legal and standards based information required to produce and properly assess the safety of automated gates and traffic barriers.

It is envisaged that at some future point EN 12453:2017 will attain harmonisation with the Machinery Directive, see https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/machinery_en for details[2].

This code of practice is based on best practice and aims to reduce the risks associated with the automated gate or barrier to as low a level as is reasonably practicable and so help achieve compliance with the minimum safety objectives of the applicable criminal law.

Compliance with this code of practice cannot confer immunity from legal obligations

[1] See clause 4.1
[2] See clause 1.5.2.12 note 1 and clause 1.5.7.1 note 1

Scope

This code of practice contains requirements and recommendations for the design, manufacture, installation, modification, repair and maintenance of automated gate and traffic barrier systems intended primarily for vehicles, but which could also be accessed by persons.

This code of practice excludes the following:

- Lock or dock gates
- Lift doors
- Vehicle doors
- Armoured doors
- Doors to retain animals
- Theatre textile curtains
- Industrial doors (see DHF TS 012:2018)
- Domestic garage doors (see DHF TS 012:2018)
- Pedestrian doors in and controlling the entrance into buildings
- Railway crossing traffic barriers

This code of practice does not cover in detail the design or manufacture of control panels, drive units or safety devices. It does make reference to the minimum compliance requirements for these components where they are incorporated into gate or barrier systems covered by this code.

References

Normative

The current version of the following standards provides information which is supplementary to the requirements of this code of practice. Where referenced in this code, compliance with the relevant elements of these standards is mandatory for compliance with this code of practice.

BS 7671, Requirements for electrical installations, also known as the IET Wiring Regulations

ET 101, ETCI Rules for electrical Installations (Republic of Ireland)

EN 12978, Industrial, commercial and garage doors and gates – Safety devices for power operated doors and gates – Requirements and test methods

ISO 13849-1, Safety of machinery – Safety related parts of control systems - Part 1 General principles for design

BS 6375-1, Performance of windows and doors. Classification for weathertightness and guidance on selection and specification

EN 1991-1-4, Eurocode 1. Actions on structures. General actions. Wind actions

Informative

For companies undertaking the design and manufacture of mass produced or series production of automated gates or traffic barriers the current version of the following standards describe the state of the art necessary for legal compliance, notwithstanding the points raised in the foreword in regard to current standards.

EN 12604, Industrial, commercial and garage doors and gates – Mechanical aspects – Requirements.

EN 12605, Industrial, commercial and garage doors and gates – Mechanical aspects – Test methods.

ISO 13857, Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs.

EN 12453, Industrial commercial and garage doors and gates – Safety in use of power operated doors – Requirements.

EN 12445, Industrial commercial and garage doors and gates – Safety in use of power operated doors – Test methods.

EN 12635, Industrial, commercial and garage doors and gates – Installation and use.

EN 60204-1, Safety of machinery – Electrical equipment of machines, general requirements.

Definitions

Activation device

Button, switch, key switch, handheld radio transmitter, radio transponder, digital keypad, intercom, ground loop, radar movement sensor or any other device used to generate or deliver a command to a gate or barrier system.

Assembler (see section 4)

Company or person who assembles a system from components and hence takes on the responsibilities of a "manufacturer" in regard to legal compliance.

Automated gate or barrier

An automated gate or barrier primarily intended for vehicular use, but which might also be encountered by persons in industrial, commercial, residential or domestic premises.

Certificate of compliance (see Annex C)

Document issued (as required by this code) to a system manager certifying that the gate or barrier meets the requirements of this code of practice.

Declaration of conformity (see section 4 and Annex D)

A legally required document from a company or person responsible for legal compliance that the product to which it applies meets all relevant requirements of the Machinery Directive (see section 4) and all other European product safety directives applicable to that product; when first placed on the market or put into service.

Declaration of incorporation (see section 4)

A legally required document from the manufacturer of a partly completed machine (PCM) to inform the assembler of the final machinery into which it will be incorporated that the PCM fulfils the requirements of all applicable European product safety directives and that it must not be put into service until the complete machine is in full conformity with the Machinery Directive.

Extensive modification (see section 4)

An alteration to an existing system that is so extensive that a new gate or barrier has been created and hence the need for re-CE marking in accordance with the Machinery Directive. This does not occur where parts are replaced like for like, but does occur where the way it operates has changed significantly.

Installer

Individual employed by an installation contractor to install, repair, maintain or modify gate or barrier systems.

Installation contractor

Company or person responsible for the safe installation of a gate or barrier system.

Manufacturer (see section 4)

Company or person responsible for the manufacture of a component or complete system.

Maintenance contractor (see section 5)

Company or person contracted to provider maintenance, modification or repair of an existing system.

Normative

Normative Annexes are an essential part of this TS; other Annexes are labelled as informative, giving additional information. Notes in the body of the TS are informative unless declared to be normative.

Partly completed machine (see section 4)

An assembly which is almost machinery, but which cannot itself perform a specific application, an electric operator and control board is partly completed machinery.

Planned preventative maintenance (see section 5)

Routine servicing of a system, carried out on a regular basis to ensure ongoing safety and reliability.

Reactive maintenance (see section 5)

Repair, maintenance or modification carried out in response to the development of a fault.

Residual hazard (see sections 2 & 4)

The hazard that remains when the “state of the art” has been achieved. A hazard cannot be classified as “residual” if there is a state of the art means available to control the hazard. It is not possible to classify a hazard residual simply on the basis of likelihood of occurrence.

Risk assessment (see sections 2 & 4)

The process of identifying hazards and controlling them to acceptable levels; primarily, eliminating the hazard by alterations to the design, or applying control measures to hazards that cannot be resolved by design changes to achieve the state of the art. Then identifying the residual hazards and designing safe use instructions and warnings, finally assessing the maintenance needs and designing the planned preventative maintenance instructions such that a gate or barrier system can remain safe.

Safety device (see section 4)

A component which serves to fulfil a safety function, which is independently placed on the market, the failure and/or malfunction of which endangers the safety of persons, and which is not necessary in order for the machinery to function, or for which normal components could be substituted in order for the machinery to function (albeit less safely).

Safe system

A system in conformity with the requirements of this code.

State of the art (see section 4)

The state of the art is a concept required by recital 14 of the Machinery Directive. It is the level of safety required and described in current product specific standards and other readily available relevant documents. It is by this means that the state of the art can change due to advances in technology and as standards are updated without the need to edit the directive.

System manager (see section 5)

Company or person owning, or in control of, or with legal responsibility for, a gate or barrier in service. The system manager has legal responsibilities to users or others who may encounter the system in use.

System safety unknown notice (see section 5 and Annex E.2)

A notice issued to a system manager informing them that due to a lack of safe access the safety of the gate or barrier system cannot be ascertained, and hence it is not known if it is safe to use or not.

Unsafe system notice (see section 5 and Annex E.1)

A notice issued to a system manager informing them that the gate or barrier system has been assessed as being unsafe in accordance with this code of practice.

User

Anybody operating, using or passing by the gate or barrier system who may be affected by it.

1. Requirements for safety

1.1. Training and competency

Central to providing the required level of safety is the training, experience and competence of those involved, minimum requirements for training and competency are outlined in Annex H of this code.

1.2. Design and suitability of the system

The system must be designed and specified to reflect the demands of the site and the needs of users. Factors that must be considered are:

- Environment (wind, rain, flood risk, dust, ultra violet, flora and fauna)
- Location (sloping ground, emergency entry and egress, visibility and nature of traffic)
- Duty cycle (how often the system will operate per hour/24-hour period)
- User vulnerability (vicinity to the public, young children, people with physical and sensory limitations and people with learning restrictions)

The final specification must be compliant with this code, be drawn up as a design proposal and be agreed with the client.

Verification is by assessment of the design proposal.

1.3. Risk assessment

A risk assessment must be conducted for the design of a new system, installation of complete system supplied by a 3rd party, upon modification of an existing system and prior to taking on any reactive or planned maintenance of a system for the first time. The risk assessment must include the seven steps described in section 2.

Where the risk assessment of a new system supplied with a Declaration of Conformity and a CE mark by a third-party indicates that the system *does not* achieve the state of the art (this section), the installation contractor must refer to Annex I.

Where the risk assessment of such a system indicates that the state of the art *is* achieved but residual hazards are present based on its local environment or use, the installation contractor must address them.

1.4. Certificate of compliance (see Annex C)

A certificate of compliance must be issued to the client on successful completion of a compliance assessment: upon completion of a new installation, minor or extensive modification of an existing system, at initial take-over of a maintenance contract and on completion of a one-off repair of a system not under a planned maintenance contract. Alternatively, where the compliance assessment of an existing system indicates non-compliance with this code, an unsafe system notice (see Annex E.1) must be issued instead. Where access to safety critical elements is not possible in safety, it cannot be ascertained if the system is safe or not and hence a system safety unknown notice (see Annex E.2) must be issued instead.

1.5. Hazard types and control measures required for compliance

Hazard	Description	Control measures for compliance
Structural failure	Where structural faults cause falling down or derailment	1.5.1
Electrical hazards	Electric shock, fire, loss of control or safety	1.5.2
Crush	Reducing gap less than 500mm in horizontal movement, or any vertically reducing gap	1.5.3, 1.5.4, 1.5.5, 1.5.6, 1.5.7
Impact	Contact with a moving leaf in the swept area, outside of any crush zone	1.5.3, 1.5.5, 1.5.6, 1.5.7
Shear	The guillotine effect where elements pass	1.5.3, 1.5.4, 1.5.5, 1.5.6.2, 1.5.7
Draw-in	Where body parts may be dragged into a gap	1.5.3, 1.5.4, 1.5.5, 1.5.6.2, 1.5.7
Imprisonment	Where escape from an enclosed area is prevented by fault or power cut	Alternative route or 1.5.3, 1.5.9
Hooking/cutting	Sharp edges or snagging of clothing	Alternative route or 1.5.3

Installations must be designed to eliminate hazards wherever reasonably practicable rather than use sensitive devices to control hazards created by the design. All hazards related to moving parts must be controlled or eliminated up to a

height of 2.5m above ground level, or any other permanent access level, eg stairway or mezzanine floor. The requirements for safety in this section relate equally to new or existing systems.

1.5.1. Structural integrity

It must be demonstrated that the leaf and its supporting structures are designed to resist permanent deformity, ultimate structural failure and derailment in normal use, manual use or under foreseeable misuse. Any deformity that does occur in use must not be detrimental to safety or function.

The leaf, its supporting structure and any suspension elements must be designed such that falling down, collapsing or derailment is prevented in normal use and under foreseeable misuse conditions as follows:

a) Gate or barrier leaves, their supporting structures, suspension elements and fixings must be designed to withstand 2 x the total foreseeable load without permanent deformity.

b) Gate or barrier leaves, their supporting structures, suspension elements, fixings and any travel stops, must be designed to withstand 3.5 x their total foreseeable load without ultimate structural failure.

In particular, travel stops must prevent derailment (eg sliding gate) and suspension element failure (eg hinge failure) when used in manual and in windy conditions. Foreseeable misuse must be allowed for, which could mean a user moving the gate too fast in manual. It must be possible to secure the gate against wind action in the fully open and closed position, particularly when used in manual mode.

The effects of wind must be taken into account in the structural assessment. The system must remain safe when subject to foreseeable wind loadings. A system is not necessarily required to remain functional in high winds (although client/contractual requirements might require otherwise); the system must, however, remain safe. We offer the following advice in terms of likely wind speeds:

- 50 mph = Sheltered (inner city built up areas with close buildings on all sides)
- 70 mph = Normal (normal urban environments)
- 100 mph = Exposed (open rural or hill top environments)

Information on predicting wind pressures on buildings can be found in BS 6375-1 and EN 1991-1-4. This is not an exact science, hence considerable margin for error must be applied where there is doubt.

Verification of 1.5.1 is achieved by inspection, assessment of design specification and test reports.

1.5.2. Electrical safety of automated systems

1.5.2.1. Supply wiring

The supply to the installation must be provided, tested and certified to comply with BS 7671/ET 101 as currently amended. Where an existing supply is utilised, evidence must be gained to demonstrate that it has been tested to ensure safety and compliance with BS 7671/ET 101 (eg client Electrical Installation Certificate or Periodic Inspection Report copy).

1.5.2.2. System wiring

The electrical and control system beyond the supply terminals must be built and tested using the same basic principles described in BS 7671/ET 101 and EN 60204-1. It must be proven by either measurement or calculation that the total earth fault loop impedance of the entire installation is within the specification of the circuit protective device.

1.5.2.3. Isolation

A means to safely electrically isolate the system for maintenance must be provided. Where an electrical isolator is remote from the system, ie cannot been seen from the place of work, it must be prevented from being turned on and warning notices posted.

1.5.2.4. Conductive parts earthing

Where class 1 earthed equipment (230/400v earthed) is present, all extraneous conductive parts must be connected to the supply earth terminal or prove to have a resistance of less than 0.5 ohm to the earth terminal. *Please note that many 24v electric operators are in fact 230v class 1 devices.*

1.5.2.5. Differing voltage bands

Where cables containing differing voltages share a conduit, all cables must have a voltage rating of the highest voltage present or the higher voltage cable must be surrounded by an earthed metallic screen, for example, steel wired armoured (SWA) cable or similar.

1.5.2.6. Communication or data cables

Where communication or data cables share a conduit with power cables, clause 1.5.2.5 above must apply with the addition that the data cable must also be screened and earthed.

1.5.2.7. Cable ratings

Cables must be rated for the voltage present and the maximum current possible; volts drop must be no more than 5% or within the control system supplier's specification.

1.5.2.8. Flexible cables

Cables used to connect equipment that moves relative to fixed elements in normal use (eg rams) must be of multi-stranded conductors to IEC 60228 class 5 or 6 (multiple fine strand copper conductor, not SWA, etc).

1.5.2.9. Electrical enclosures

- Enclosures subject to external conditions must be at least IP54
- Enclosures and drive units used below ground must be at least IP67
- Enclosures containing dangerous voltages must be marked with an appropriate dangerous voltage label and be openable only by means of key or tool

1.5.2.10. Mechanical protection of cables

All vulnerable cabling must be provided with mechanical protection by means of conduits, trunking or armouring. Vulnerable cabling is anything containing 230v or greater or anything that forms part of a control system; examples include photo beam cables, safe edge cables, light grid/laser scanner etc cables, motor cables, encoder cables or access control device cables. All cables, trunking, conduits and enclosures must have adequate UV protection where they are subject to sunlight.

1.5.2.11. Control system integrity

The control panel/motor manufacturer's Declaration of Incorporation must be present, and the relevant instruction manual followed.

Alternatively, if the manufacturer or assembler has built their own control system they must type test the system for conformity with Machinery Directive EH&SR 1.2 (Safety and Reliability of Control Systems), all other relevant EH&SRs, and all applicable product safety directives (see section 4). This will include the Electromagnetic Compatibility Directive (electrical devices) and the Radio Equipment Directive (radio devices) where applicable. Test reports must be available to prove compliance when required.

Activation of a safety device at one hazard location must not lead to any further hazards at other locations on the system. In the event of a fault in the safety system it must prevent further movement by at least the end of the current open/close cycle.

1.5.2.12. Safety device circuits

The system connecting safe edge, light grid or laser scanner etc devices must be fully compatible with the control system they are connected to such that, as installed, they conform to category 2 or 3 of EN 954-1.

The circuit must be either protected from short circuit faults by a control panel derived category 2 test of the circuit at least once in every cycle, or for some category 3 devices not protected from short circuit faults, by means of:

- minimum 1mm^2 csa conductors, and
- use of short as possible cable routing, and
- use of crimped, feruled or tinned conductor ends to prevent stray strands, and
- wherever reasonably practicable, the device must be placed within the control panel, or failing that be connected via armoured cable or cable in conduit

Note 1: Systems produced after EN 12453:2017 has become harmonized[3] with the Machinery Directive 2006/42/EC (see section 4) will be required to have all safety related parts of the control system in conformity with EN 13849-1 at minimum performance level C through the entire control system from any switch or sensing element to the motor terminals or be in full conformity with EN 60335-1 and 2; this must include any wicket gate stop switch. The following devices will additionally need to achieve at least category 2 as installed and prevent further movement by at least the end of the current open/close cycle in the event of a fault:

[3] See https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/machinery_en for details.

- Safe edge, light grid or laser scanner etc
- Hold-to-run device and limit switch

1.5.2.13. Wicket gate

Where a wicket gate is fitted in an automated gate, movement of the main gate must be stopped whenever the wicket gate is not in a safe position; devices and wiring used to achieve this must only fail to a safe condition.

Verification of 1.5.2 is achieved by inspection, assessment of documentation, demonstration and simulation of faults.

1.5.3. Guard to protect hazardous movement

Guards or fencing can be used to prevent access to hazardous movement and must:

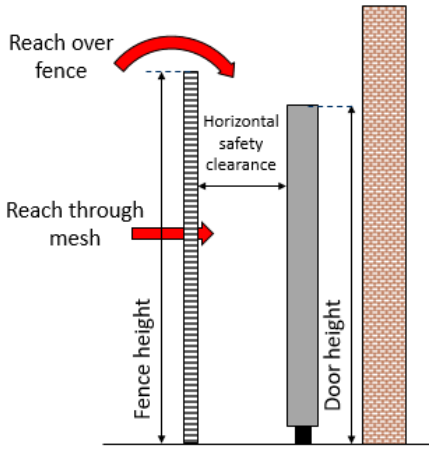
- be permanently fixed and only removable with a tool or key,and
- be durable and resistant to foreseeable abuse, and
- be designed to resist climbing with vertical elements on the outside and a maximum gap of 40mm between verticals and, conform with tables 1 and 2 for reach over and reach through protection

Height of guard	Height of hazard		
	2	2.2	2.4
	Horizontal clearance		
2	600	600	600
2.2	400	400	400
2.4	0	300	300
2.5	0	0	100

Table 1 reach over

Mesh size smallest dimension mm	Horizontal clearance		
	Slot	Square	Round
4-6	20	10	10
6-8	40	30	20
8-10	80	60	60
10-12	100	80	80
12-20	[1]900	120	120
[1]Where the length of the slot is less than 40mm the safety clearance can be reduced to 120mm			
20-30	900	550	120
30-100	900	900	900

Table 2 reach through



Verification of 1.5.3 is achieved by inspection and measurement.

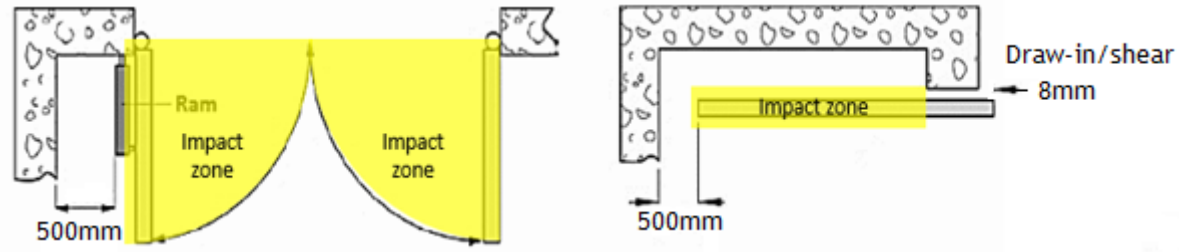
1.5.4. Safety distances

The maximum distance between fixed vertical elements is nominally 100mm (BS 6180). Where 100mm is exceeded on an existing system, the consequences of a greater separation between verticals must be risk assessed in regard to hazards arising from body parts being inserted.

Various safety distances exist (derived from EN 349 & EN 12453) to prevent injury to differing body parts:

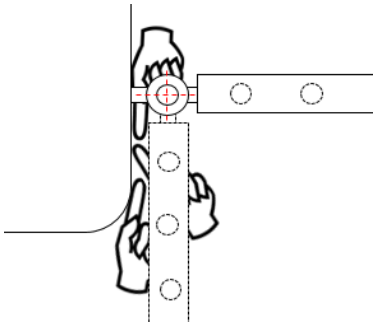
Crush hazard		Draw-in/shear hazard
Finger = 25mm Hand wrist = 100mm Arm, foot = 120mm	Leg = 180mm Head = 300mm Body = 500mm	Finger = 8mm (4mm at a hinge)

These can only be applied or utilised at points where only that size of body part could reasonably be affected. Hence use of these distances, other than 500mm, is severely restricted in most cases. For example, there is no point restricting a reducing gap to 25mm where an arm or leg could easily be inserted; the arm or leg would be seriously injured when the gap reduces to 25mm. A gap greater than 500mm between a horizontally moving leaf and a fixed object eliminates the crush hazard potential at that location.

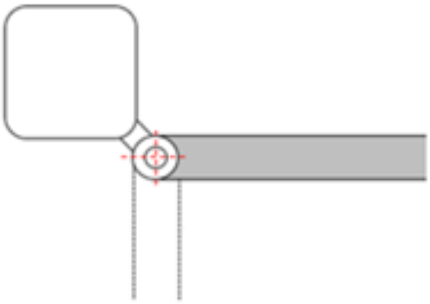


However, an impact hazard will remain across the swept area of the leaf during movement that must be controlled by one or more of the means described in 1.5.5 to 1.5.7.

Reducing gaps at the hinge area can generate very high force. Access to a reducing gap at a hinge area is possible from a variety of directions (see below). Reducing gaps at the hinge area must be avoided by safe design wherever possible. A safe design hinge area must have a gap of: less than 100mm, less than 4mm or greater than 25mm, and any gap-change must be less than 20%.



Access to reducing gaps



Safe design hinge area

Safe design hinge area criteria:

- less than 100mm, and
- less than 4mm or more than 25mm, and
- a maximum gap change of 20%

When the safe design hinge area criteria is not met, one or more of the following measures must be applied such that the hazard is controlled:

- Hold to run
- Safe edge
- Flexible guard
- Fine mesh to prevent access through the infill

Verification of 1.5.4 is by measurement or application of a range of differing sized test probes to simulate finger, hand, arm, foot, leg or whole-body access as appropriate to the reducing gap. Crushing of the test probe must not occur.

1.5.5. Hold to run

Sustained pressure on the activation device must be required to move the leaf and:

1. the leaf must travel no more than 100mm on release of the activation device, and
2. the leaf must travel no more than 50mm on release of the activation device in the last 500mm of horizontal movement, and
3. only trained users must use the system; hence the activation device must prevent unauthorised use where untrained persons might be present (by use of key switch or similar), and
4. it must only be possible to operate the activation device in such a position that allows full, direct and permanent real-time view of the leaf during the leaf movement and ensures that the person controlling the gate or barrier is not in a hazardous position (video cameras do not give a full, direct and permanent real-time view), and
5. the activation device must be the only active device, and
6. the leaf must travel at no more than 0.5m/sec (for converging leaves this means 0.25m/sec. each)

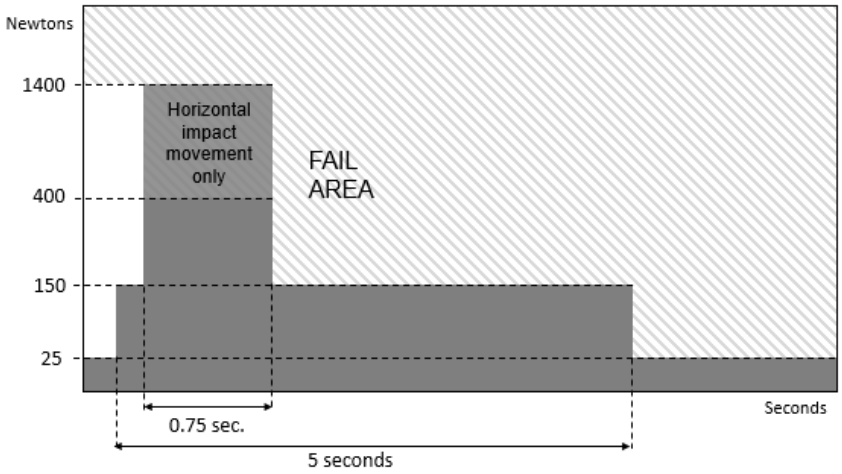
Hold to run can be used to control **crush, impact, shear or draw-in** hazards.

Verification of 1.5.5 is achieved by inspection and measurement of stopping distances at mid travel (100mm) and within the last 500mm of travel (50mm).

1.5.6. Force limitation (contact solutions)

The maximum allowable forces and durations are:

- 400N at crush, shear and draw-in hazards
  (all vertically reducing gaps and horizontally reducing gaps of 500mm or less)
- 1400N at horizontal impact hazards
  (contact with a horizontally moving leaf outside of a crush zone)
- The maximum time force can remain above 150N in all cases is 0.75 seconds
- The maximum time force can remain above 25N in all cases is 5 seconds
- The maximum time a force can exist at or below 25N in all cases is infinite



Force limitation maximum values

1.5.6.1. Supplementary photo beam

Force limitation must be supplemented with at least one horizontal photo beam wherever automatic closing is in use and wherever untrained persons might encounter the system. The beam(s) must be mounted between 700mm and 300mm above the ground and no more than 200mm horizontally from the face of the leaf. For swing and folding gates, the inner beam must be no more than 200mm horizontally from the open extremity of the swept area.

Traffic barriers may either use a single beam directly under the arm centre line or two beams, one on either side of the arm centre line. DHF *recommends inner and outer beams, particularly on sliding gates.*

Note 1: Systems produced after EN 12453:2017 has become harmonised[4] with the Machinery Directive 2006/42/EC (see section 4) with a distance greater than 150mm between the device and the opposite face of sliding and vertically moving leaves, will be required to have a beam on both sides.

1.5.6.2. Safe edge

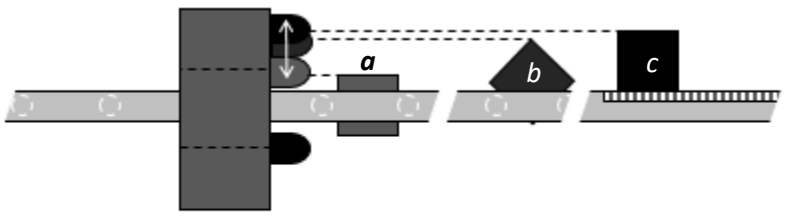
Force limitation can be provided by safe edge in resistive, optical, mechanical or pneumatic format:

- the safe edge and any control device must conform to EN 12978, and
- the safe edge must provide force limitation and reduction in accordance with clause 1.5.6, and
- the control circuit must meet the requirements of clauses 1.5.2.12

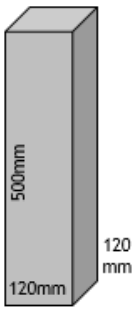
A safe edge can be used to control any **crush, impact, shear or draw-in** hazard.

1.5.6.3. Safe edge position at sliding gate shear and draw-in points

The safe edge must be positioned as close as possible to the moving leaf to prevent draw-in occurring.



a) = Infill gaps >120mm b) = infill gaps <120mm c) = fine mesh or solid



The minimum distance allowable between the moving leaf and safe edge must be verified with a rigid rectangular test piece measuring 120mm x 120mm x 500mm. The test piece must be placed as deep as possible into the leaf infill material; the safe edge must be in close enough proximity to be activated by the test piece when the leaf is moved in manual. The nature of the gaps in the leaf infill dictate safe positioning of the safe edges.

[4] See https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/machinery_en for details.

1.5.6.4. Inherent force limitation

Force limitation at some hazards can be provided by sensitive drive units:

The system must reliably provide force limitation and reduction in accordance with clause 1.5.6.

Inherent force limitation can be used to control some, but not all, crush and impact hazards.

Note 1 (normative): Inherent force limitation cannot be used to control draw-in hazards on sliding gates; by implication this will also apply to most shear hazards.

Note 2 (normative): Inherent force limitation is unlikely to be able to provide safe force in the hinge area (last 10-15% of leaf width) of swing and folding gates, particularly in reducing gaps at:

- the pier or,
- the lower edge in the pier area (kerb crossings and sloping ground) or,
- the leaf junctions/hinges of folding gates.

These areas will invariably need safe edges to provide safe force.

If inherent force limitation is to be relied upon for safe force in these areas, the crush force must be measured directly in that location.

Note 3 (normative): Inherent force limitation systems are unlikely to provide safe force on fully filled swing and folding gates when subject to high winds. The safety of any gate with more than 30% infill will be seriously affected by high winds. It will usually be necessary to rely on safe edges for force limitation on such gates, given that the system must be safe in all conditions.

If inherent force limitation is to be relied upon for a leaf with greater than 30% infill, evidence must be provided that safe force is achieved in high winds.

1.5.6.5. Force measurements

Testing must be carried out with an annually calibrated instrument that complies with EN 12445 or EN 12453.

1.5.6.6. Force measurement of new systems

Companies or persons who are involved in serial production of automated systems must type test their product strictly in accordance with EN 12445 or EN 12453:2017.

1.5.6.7. Force measurement of new pre-CE marked systems

Installation companies commissioning new pre-CE marked systems must conduct testing in accordance with the installation and commissioning instructions supplied with the gate or barrier, or use the methods in 1.5.6.8 to 1.5.6.11.

1.5.6.8. Force measurement of all other systems

Installation companies and maintenance contractors testing gates and barriers on site can use a lesser number of tests as follows:

Any test position that produces a result in excess of 90% of the maximum permitted value must be repeated three times and the average of all three tests taken as the actual result for that test location.

The 90% threshold values above which an average of three tests must be used are:

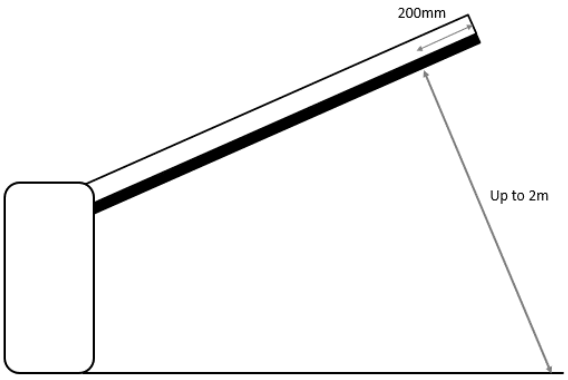
- 360N (400N maximum) for crush hazards
- 1260N (1400N maximum) for horizontal pure impact hazards
- 0.68 seconds (0.75 second maximum) for force to remain above 150N
- 4.5 seconds (5 second maximum) for force to remain above 25N

1.5.6.9. Force measurement point on traffic barriers

The measurement must be taken with a 2m maximum extension fitted to the tester:

- 200mm in from the tip of the arm, and
- at an angle that results in the face of the tester being parallel with the arm

Lightweight gravity deployed skirts (not fixed or linkaged) may be tied up out of the way for the test. This will mean that any system utilising a safe edge will need the skirt to collapse such that it reveals the safe edge



The test must result in a 400N maximum and achieve force reduction in line with 1.5.6.

Note 1 (normative): Fixed or linkage connected skirts must be assessed in terms of reachable hazards in reducing gaps in the skirt during the opening and closing phases and appropriate control measures applied in line with 1.5.

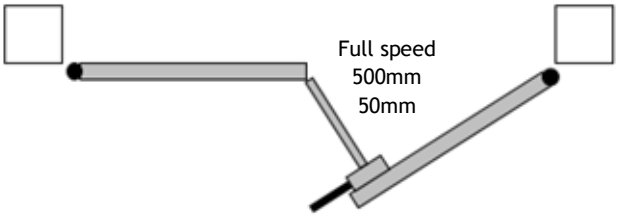
1.5.6.10. Force measurement points on swing and folding gates

Test 1. An initial measurement must be taken at the mid height (or for gates taller than 2800mm high at 1500mm above ground) with an extension on the tester that results in testing at full speed

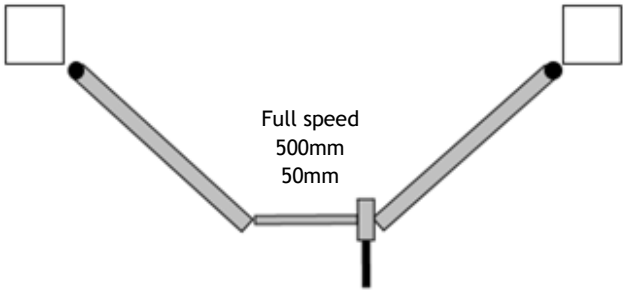
Test 2. Then at three heights with a 500mm extension on the test meter:
- 2.1. 300mm from the top of the gate (or for gates taller than 2800mm high at 2500mm above ground)
- 2.2. At the mid height or 1.5m, whichever is the lower
- 2.3. 50mm up from the base of the gate

Test 3. The point of highest reading at points in test 2 is then re measured with no extension on the test meter (50mm)

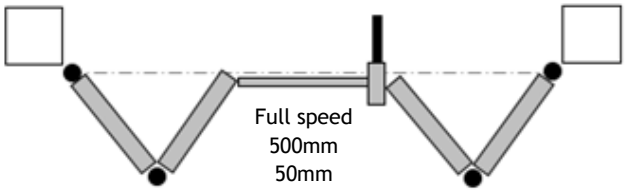
The gate must be tested in the mode in which it is to be used. If a leaf delay is used, it must be tested with that same delay; if no delay is used, the leaves must be tested as they converge.



Swing gate test positions (with leaf delay).



Swing gate test positions (without leaf delay).

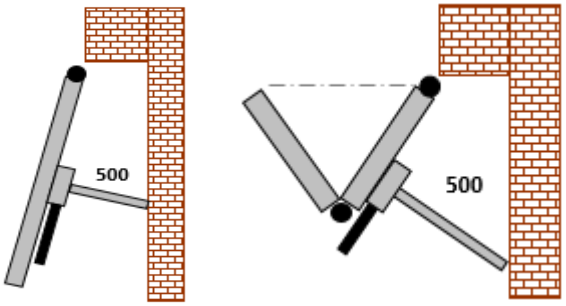


Folding gate test positions

Single leaf systems must be tested at the closing post instead of being tested against the other leaf.

Test 4. Where a swing or folding leaf opens to within 500mm of a fixed object, force must be measured in the crush zone. A measurement must be taken with a 500mm extension on the tester:

- at the most outstanding feature in the crush zone up to 2m above the floor or,
- in the absence of any outstanding features, 1m up from the floor and 1m out from the hinge.



A safe edge along the lower edge is very often the most outstanding feature.

Test 1 results must be used to assess safe force across the width of the swept area as follows:

- where the swept area *does* contain crush hazards, where there is less than 120mm under the gate *or* where the swept area has varying ground levels, the hazard is crush, test 1 must result in a 400N maximum or,
- where the swept area *does not* contain any crush hazards, where there is less than 8mm or more than 120mm under the gate *and* the swept area is level, the hazard is impact, test 1 must result in a 1400N maximum.

This method assumes that the same system and specification of providing force limitation is present at the leading edge and the lower edges, where this is not the case an alternative method must be used to verify lower edge force eg direct measurement along the lower edge against a rigid object.

Account must be taken of notes 2 and 3 of clause 1.5.6.4 in relation to inherent force limitation.

Test 2, 3 and 4 must result in a 400N maximum.

Tests 1, 2, 3 and 4 must result in force reduction in line with 1.5.6.

1.5.6.11. Force measurements points on sliding gates

Test 1. An initial measurement must be taken at the mid height (or for gates taller than 2800mm high at 1500mm above ground) with an extension that results in full speed (outside of any slow-down period)

Test 2. At three heights with a 500mm extension on the test meter:
2.1. 300mm from the top of the gate (or for gates taller than 2800mm high at 2500mm above ground)
2.2. At the mid height (or for gates taller than 2800mm high at 1500mm above ground)
2.3. 50mm up from the base of the gate

Test 3. The point of highest reading in test 2 is then re-measured with no extension on the test meter (50mm)

Test 4. Sliding gate open crush hazards are measured by repeating tests 2 & 3 during the open cycle.

Test 1 results must be used to assess safe force at safe edges protecting shear and draw-in at points where the moving leaf crosses a fixed structure. This assumes that the safe edges at the leading edge and shear/draw-in points are the same specification, where they are not, a sample of the shear/draw-in safe edge must be tested at the leading edge. The maximum allowable force at shear and draw-in points is 400N (as measured at the leading edge during full speed movement).

Test 2, 3 & 4 must result in a 400N maximum.

All tests must result in force reduction in line with 1.5.6.

1.5.7. Light grid or laser scanner etc (non-contact solutions)

Light grid, laser scanner etc or similar technology that can prevent all possible contact with hazardous movement:

1. The device must be compliant with EN 12978
2. A single beam photo electric beam is not included unless it can exclude all possible contact with the hazard, for example, attached to the lower edge of a traffic barrier boom arm
3. Does not include microwave activation devices, any background field auto adjust time must be at least 30 seconds
4. The control circuit must meet the requirements of clause 1.5.2.12

This technology can be used to control **crush, impact, shear or draw-in** hazards.

There is no need for force limitation with this technology. The device can be installed directly within the movement plane of the leaf (eg on a barrier boom arm) or set up an exclusion zone to either side of the movement plane of the leaf to prevent access to hazardous movement.

If the hazard is to be adequately protected, the leaf must stop quickly enough to prevent hazardous contact and hence the device must set up a protection zone of adequate depth to give the system time to react before hazardous contact occurs.

The requirement is that hazardous movement is stopped before hazardous contact with the leaf occurs and that the test pieces (see 1.5.7.1) are not impacted, crushed, sheared or drawn-in.

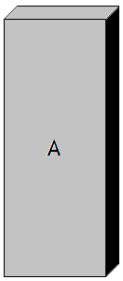
1.5.7.1. Testing of light grid or laser scanner etc

Hazards protected by light grid or laser scanner etc must be tested by means of rigid material test pieces as follows.

Test piece A.

Impact hazards.

Rigid material 700mm x 300mm x 200mm. Painted matt black on three sides RAL 7040 grey on the other three.



Test piece B.

Crush hazards.

Rigid material 300mm x 50mm painted half matt black and half RAL 7040 grey.

The test pieces must be presented to the moving leaf at all hazard locations. It must not be possible for the test piece to come into contact with hazardous movement. The test pieces are designed to simulate a part of the human anatomy and must be presented in a manner that simulates a person running, or falling into the path of the hazardous movement.

The reaction of the system to an activation of the device will be crucial because, in some locations, the resulting reversal can present a further uncontrolled hazard elsewhere on the system. For this reason, either pause or stop will be the required reaction to activation at many hazard locations on horizontally moving leaves. It is usually safe for vertically moving leaves to retract on activation, but every system must be assessed on its individual merit.

1.5.7.2. Testing of new systems

Companies or persons who are involved in serial production of automated systems must type test their product strictly in accordance with EN 12453.

1.5.7.3. Testing new pre-CE marked systems

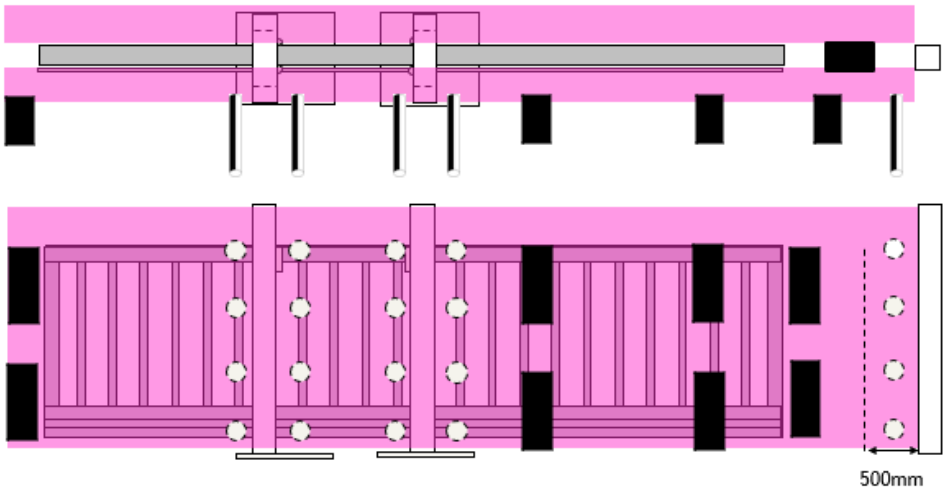
Installation companies commissioning new pre-CE marked systems must conduct testing in accordance with the installation and commissioning instructions supplied with the gate or barrier, or use the methods in 1.5.7.5 to 1.5.7.8.

1.5.7.4. Testing of existing systems as part of maintenance

Maintenance contractors testing existing systems in service must use the methods in 1.5.7.5 to 1.5.7.8.

1.5.7.5. Testing light grid or laser scanner etc on a sliding gate

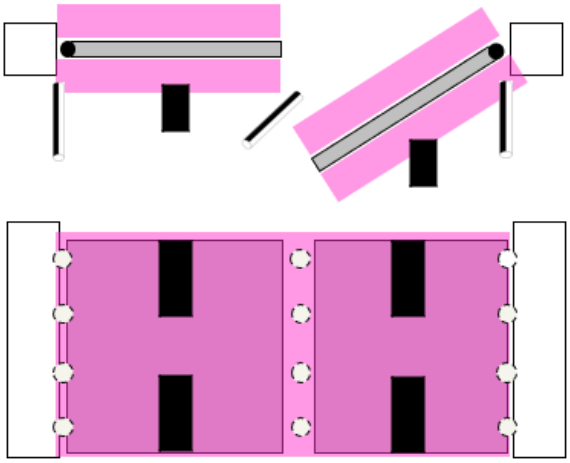
Test pieces A & B must be presented towards the moving leaf at all hazard areas up to 2.5m above ground or any other permanent access level from both sides; test piece A must be used at all impact hazards and test piece B must be used at all crush, shear and draw-in hazards.



Hazardous movement must cease before the test pieces are impacted, crushed, sheared or drawn-in.

1.5.7.6. Testing laser scanner etc on swing gates

Test pieces A & B must be presented towards the moving leaf at all hazard areas up to 2.5m above ground or any other permanent access level from both sides; test piece A must be used at all impact hazards and test piece B must be used at all crush, shear and draw-in hazards.



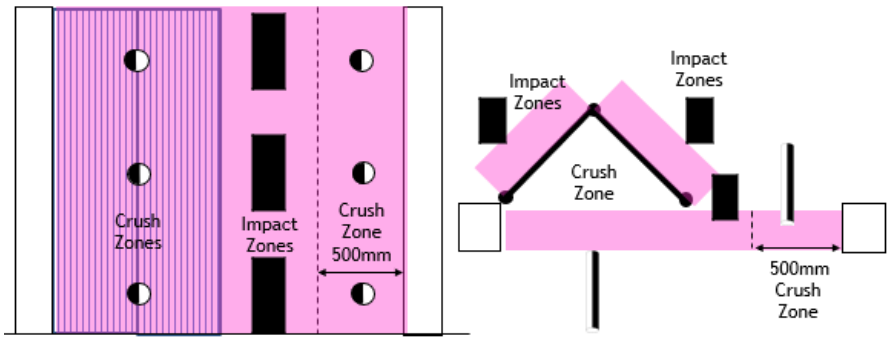
Hazardous movement must cease, or the leaf must retract before the test piece is impacted or crushed. If the leaf retracts, the leaf must remain protected during the reversal movement.

1.5.7.7. Testing light grids or laser scanner etc on folding gates

Test pieces A & B must be presented towards the moving leaf at all hazard areas up to 2.5m above ground or any other permanent access level; the tests must be completed on both sides; test piece A must be used at all impact hazards and test piece B must be used at all crush, shear and draw-in hazards.

In this example 2 x laser scanners are protecting the inner surfaces and a single light grid is protecting the outer face. As the devices must be active during opening and closing, traffic must wait until the gate is fully open before proceeding.

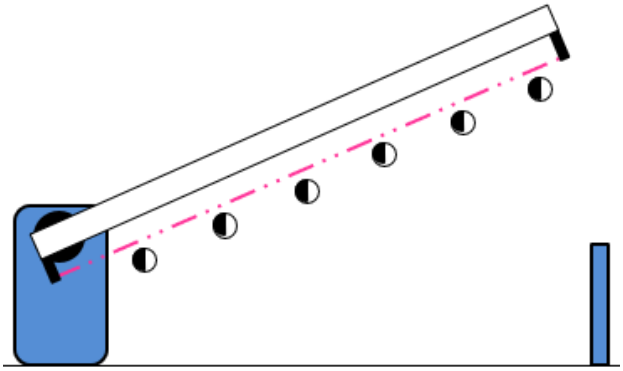
Hazardous movement must cease, or the leaf must retract before the test pieces are impacted or crushed. If the leaf retracts, the leaf must remain protected during the reversal movement.



1.5.7.8. Testing light grid or laser scanner etc on barriers

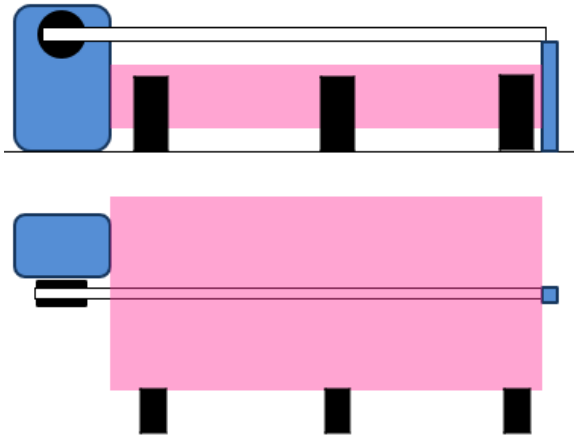
1. In this example, a single category 2 light beam is used on the underside of the beam to prevent contact.

   Test piece B must be offered under the beam at all points during closing; hazardous movement must cease or retract before contact occurs.



2. In this example, a single laser scanner is providing a complete arms-width exclusion zone either side of the boom to prevent all possible contact.

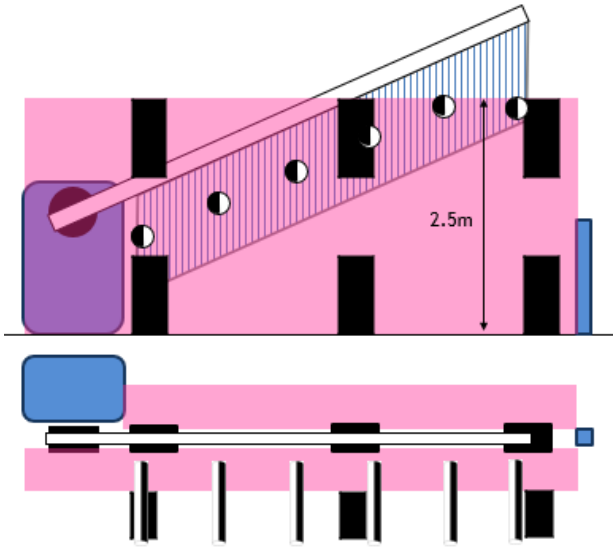
   Test piece A must be offered to all points in the protection zone from both sides, hazardous movement must cease or retract before contact with movement is possible.



3. In this example, two laser scanners or light grids are being used to provide a 2.5m high exclusion zone either side of a barrier with a linkaged (fixed) skirt to protect the reducing gaps in the skirt as the boom raises.

   As this configuration requires safety during opening and closing, vehicles must wait until the barrier is fully open before proceeding.

   Test pieces A & B must be offered to all points in the protection zone from both sides, test piece B must be offered to reducing gaps associated with the skirt. Hazardous movement must cease before contact or crushing occurs.



1.5.8. Wind effects

An automated system is required to be safe in all reasonably expected weather conditions at that location. The system must be assessed for its safety in high wind conditions, both in terms of structural integrity and moving safety, particularly where force limitation is achieved by inherent force limitation – see 1.5.6.4 note 3.

1.5.9. Imprisonment control

Imprisonment hazards caused when automated gates suffer faults or during power cuts can be controlled by providing a manual release in the potential imprisonment area. The gate or barrier must remain safe when being used in manual mode and also when power is restored unexpectedly.

1.5.10. Manual use (automated systems in manual mode)

Use of the manual opening and closing systems must not introduce hazards. Moving the leaf in manual must be achievable with ease and, where more than one person is required to move the leaf in manual mode, the user instructions must explain this.

A safe force for one person to move a leaf in manual is 390N in industrial environments.

Verification of 1.5.10 is achieved by inspection, demonstration and measurement.

1.5.11. Residual hazard control

A residual hazard is the hazard that remains after the state of the art has been achieved (1.5 to 1.5.11), for example the effects of being subject to 399N for 0.74 seconds. For very young or infirm people, the effect of a residual hazard could in fact be significant and hence the risk assessment must attempt to reduce the degree of harm possible where a high-risk level exists (eg at an infant school) by selecting non-contact solutions over force limitation or reducing operating force even further. Vehicle protection must be included when providing residual hazard protection as the state of the art is primarily concerned with the safety of people.

Residual hazards must be addressed by applying suitable warning measures, eg one or a combination of:

- Multiple height photo beams
- Warning lamps
- Ground loop (vehicle protection)
- Even lower force than 1.5.6
- Audible warning devices
- Signage
- Pedestrian railings
- Hazard tape
- Reflective materials
- Zone lighting
- Ground markings
- Traffic lights
- Traffic calming
- User warnings
- Safe use instructions
- User training

Selection of appropriate residual hazard controls must be arrived at based on a local risk assessment. Unlike the main body of hazards dealt with by the state of the art, the control of residual hazards can be based on likelihood of occurrence. The need for warning devices and protection systems reduces as the likelihood of contact with a residual hazard diminishes on a given site. Care is required none the less. In the event of an incident, the findings of the risk assessment will be brought into judgement to some degree at least.

Written user warnings, safe use instructions and user training must also be provided and are an important aspect of residual hazard control.

Verification is by inspection and comparison with the risk assessment.

2. Risk assessment process

The risk assessment process in this section applies equally to new or extensively modified systems, reactive maintenance, planned preventative maintenance and minor modifications. Reference is made to the Machinery Directive Essential Health and Safety Requirements in this section, but the Machinery Directive Essential Health & Safety Requirements are technically only relevant, and hence need to be recorded, for new and extensively modified systems (see section 4).

The actual requirements for safety are however the same for all automated gate and barrier work and are described in section 1 which reflects and clarifies the requirements of the various applicable standards and represents the state of the art.

This risk assessment process must be conducted for the design of a new system, installation of a complete system supplied by a 3rd party, upon modification of an existing system and prior to taking on any reactive or planned maintenance of a system for the first time.

The risk assessment process must be split into seven distinct steps, described below in 2.1 to 2.7. and recorded as per 2.8.

2.1. Describe the system

Describe the system type, number of leaves, size, nature of users, topography, environment, activation methods, duty cycle, etc.

2.2. Identify and make a numbered list of all possible hazards associated with the system, including those arising from foreseeable misuse

Make a list of all possible hazards associated with the system, eg structural failure, electrical faults, control system or safety system failure, misuse, moving parts, wear and tear, etc. This part is simply a numbered list of all the things that could present a hazard in normal use and under foreseeable misuse. This section must not be confused with describing specific “faults” with a given gate or barrier; it is simply a list of potential hazards.

2.3. Resolve as many hazards as possible by application of, or checking the existing, safe design principles

Attempt to resolve as many of the hazards listed in step 2 by altering the design, making design change proposals or conducting safe design checks to eliminate the hazard or make the hazard inaccessible, eg by providing or checking for structural integrity, safe design hinges, guards or enclosures, etc.

2.4. Apply, or check the existing, state of the art control measures for the remaining hazards

Consider all remaining hazards and apply (or propose) a control measure that conforms to the state of the art according to the relevant standard, eg hold-to-run, inherent force limitation, safe edge force limitation, light grid, laser scanner etc, electrical safety measures, monitoring of safety devices etc in accordance with the requirements for safety part of this code. In all cases, the state of the art is the minimum acceptable level of safety.

2.5. Identify the remaining minor residual hazards

Residual hazards must be very minor with very low degree of harm potential and not be controllable by state of the art means; if the hazard can be controlled by state of the art means, then it cannot be declared as residual.

Identify and list all remaining residual hazards, consider user vulnerability (eg high numbers of children, persons with physical/sight/hearing/learning limitations) and if necessary consider reducing the hazard further eg even lower force, additional photo beams, non-contact technology or re-design etc.

2.6. Design user instructions and warnings

Design (or review the existing) warning systems, signage, markings, user warnings and safe use instructions that identify, explain and address the remaining residual hazards.

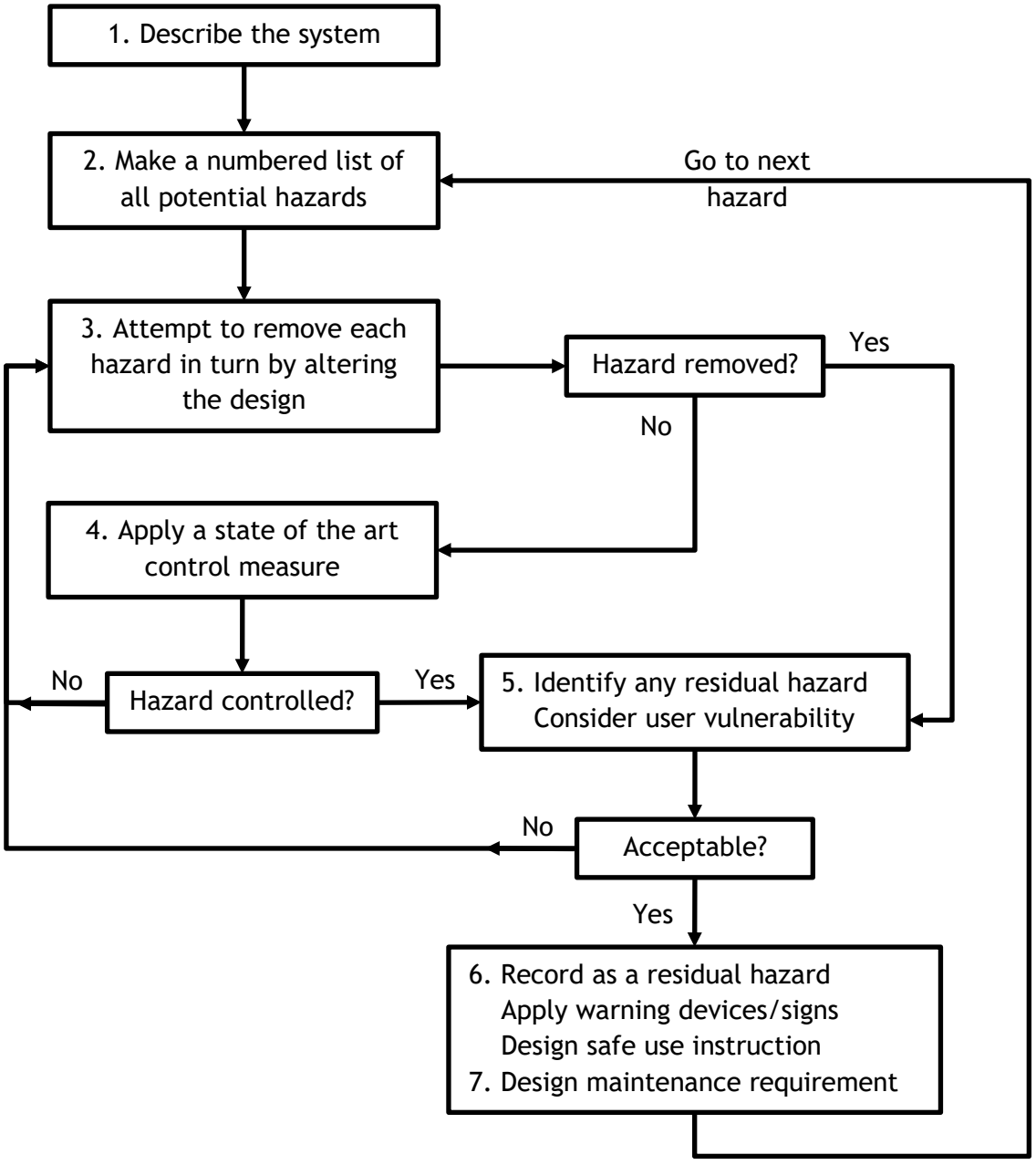
2.7. Design planned preventative maintenance instructions

Design (or review the existing) maintenance instructions that will enable the system to be kept in a safe condition in future service. Describe the inspections, cleaning, lubrication, adjustment, parts replacements, testing and the skills necessary to keep the system working in a safe condition.

2.8. Record the process

Record all seven steps and retain them for inclusion on the relevant technical or maintenance file.

Annex A sets out one possible way of executing and recording this process. If this system is not used, any alternative method must achieve the same level of safety and clearly document all seven steps.



Risk assessment process flow diagram

3. Commissioning

The commissioning process is a series of inspections, checks and tests conducted to ensure a system is functioning correctly and safely prior to placing into service or returning to service following maintenance, repair or modification. The actual steps necessary will be dictated by the exact nature of the system in question but must in any case ensure it is safe before leaving in service. The commissioning process is a combination of following manufacturers installation instructions and checks to ensure that all hazards present have been identified, prevented, controlled or reduced correctly and that nothing has been missed.

The process must cover at the very least the following areas, but also assess every possible critical element based on the site, environment, design, user profile and client requirement.

3.1. Structural integrity

- Foundations, structures, supports, welding and fixings are secure and resilient
- Guides, tracks, rollers and hinges are secure and resilient
- Travel stops secure, properly aligned and resilient
- Safety distances to prevent crush hazards correct (measure)
- Enclosures and fencing is secure and has the correct safety clearance/aperture size

3.2. Electrical safety

- Supply is tested or has been certified by others
- Earth connections present and continuity to earth is tested
- Isolation is functional and securable in the off position off where required
- Cabling is secure and protected mechanically
- Wire terminations correct and secure
- All cable entries are sealed
- Enclosures are sealed and secured by key or tool
- Dangerous voltage labels in place
- Polarity, continuity, insulation, earth fault loop, RCD function etc are tested
- Safety device wiring achieves category 2 or 3 as installed

3.3. Functional tests and settings

- Guides, rollers and hinges operate smoothly maintain the correct level
- Limit switches are properly set
- Operating logic correct for safety in use
- Safety device function and system response correct
- Photo beam function and response correct
- Wicket gate switches operate the stop function
- Loop detectors operate the correct command
- Intercoms, keypads, key switches, buttons, transmitters etc operate the correct command
- Overall, that the system operates as designed and as required by the client

3.4. Performance tests

- Hold-to-run overtravel (measure)
- Light grid or laser scanner etc performance (test piece)
- Force limitation (force tester)

3.5. Warning devices, signage and markings as per risk assessment

- Warning lamps function and are visible
- Audible warning devices function correctly
- Road markings in place and visible
- Warning signs in place, visible and comprehensible
- Pedestrian railings in place and secure
- Pedestrian routes marked and visible

3.6. Risk assessment

- All hazards identified and recorded
- All hazards correctly controlled
- Residual hazards correctly identified and recorded
- User warnings identified and residual hazards explained
- Safe use instructions reflect the residual hazards
- Maintenance instructions adequate

3.7. User information

- User training completed
- User warnings provided and explained
- User instructions provided and explained
- Maintenance instructions provided and explained
- Declaration of Conformity provided (new systems)
- Certificate of compliance provided (existing systems)
- CE label fitted, visible and contains the correct information
- Commissioning completed and signed off
- Site left clean, tidy and all waste material properly disposed of

4. Legal compliance

New and extensively modified systems

4.1. Harmonised European standard

A harmonised standard is a European standard (EN) which is recognised by the European Commission as conferring a presumption of conformity with legislation on a product complying with the standard. There are two standards currently harmonised with the Machinery Directive covering systems within the scope of this code:

- EN 13241, Gates and barriers primarily for vehicle use but also accessed by pedestrians
- EN 12978, Sensitive devices for gates, doors and barriers

Please note the warning relating to EN 13241 and the Machinery Directive in the foreword on page 2 of this code.

4.2. Machinery Directive

Compliance with the Machinery Directive (currently 2006/42/EC) is mandatory for the company or person who manufactures or brings an automated gate or barrier into service for the first time due to the:

- Supply of Machinery (Safety) Regulations 2008 in the UK
- European Communities (Machinery) Regulations 2008 in the Republic of Ireland

Previous versions of the directive have been in force without any significant change to the applicable Essential Health and Safety Requirements set out in Annex 1 of the directive:

1. Foreseeable misuse
1.1.2. Principles of safety integration
1.1.3. Materials & products
1.1.5. Design of gates/barriers to facilitate handling
1.2.1. Safety & reliability of control systems
1.2.2. Activation devices
1.2.3. Starting
1.2.4. Stopping
1.2.6. Failure of power supply
1.3.1. Stability of foundations
1.3.2. Risks of break up during operation
1.3.4. Risks due to surfaces, edges or angles
1.3.5. Risks related to combined machinery
1.3.6. Risks related to variations in operating conditions
1.3.7. Risks related to moving parts
1.3.8. Choice of protection against risks from moving parts
1.3.9. Risks of uncontrolled movements
1.4.1. General requirements of guards
1.4.2.1. Special requirements for fixed guards
1.4.3. Special requirements for protective devices
1.5.1. Electricity supply
1.5.4. Errors of installation
1.5.14. Risk of being trapped
1.5.15. Risk of slipping, tripping or falling
1.6.1. Machinery maintenance
1.6.2. Access to operation position & servicing points
1.6.3. Isolation of energy sources
1.7.1. Information
1.7.1.2. Warning devices
1.7.2. Warnings
1.7.3. Markings

A new or extensively modified automated system must conform to the Essential Health and Safety Requirements of the directive, taking into account the current "state of the art" (recital 14). This will mean achieving or exceeding the level of safety prescribed in current product specific standards (**EN 12453**). The directive is written such that the state of the art can change as standards improve without the need for revision of the directive itself.

The company or person responsible for conformity is whoever first creates the system within the European Economic Area or who first imports it into the European Economic Area (EEA).

Some common routes to market are set out below.

Scenario:	Responsible person or company:
Product made by manufacturer within EEA and sold under the manufacturer's brand	The manufacturer
Product made outside EEA	The importer
Product made for a distributor based in the EEA under the **distributor's own** brand	The distributor
Product created by distributor in the EEA using components from various suppliers	The distributor
Product created by an assembler using components from more than one supplier	The assembling company

A "product" can be a complete finished system or a kit of parts, provided it is complete.

The following activities create a responsibility for legal compliance:

a) Importing a complete automated gate or barrier into the EEA from outside the EE
b) Manufacturing a complete automated gate or barrier within the EEA
c) Adding an electric operator to an existing manually-operated gate
d) Modify a complete system prior to or during installation in a way not permitted in the manufacturer's instructions
e) Make an extensive modification to an existing automated system that alters the way it operates eg:

- Changing from sliding to swing operation
- Changing from ram operation to an underground operator system
- Altering the opening width such that new leaves, supports or foundations are created

f) Assembling components from more than one manufacturer to make a complete gate or barrier, either on site or in your own workshop, eg:

- Fabricate a gate and install an operator from a 3rd party supplier
- Install a gate from one manufacturer with an operator from another
- Buy a collection of components from a supplier not certified by them as a complete system
- Buy components from multiple sources which you assemble

4.2.1. Risk assessment

Key to Machinery Directive conformity is hazard identification and control:

a) The nature of the system and its intended use must be assessed
b) A risk assessment must be conducted that identifies and lists all potential hazards present and identifies which of the Essential Health and Safety Requirements are applicable
c) An attempt must then be made to eliminate as many of the identified hazards as possible by making design modifications to eliminate or reduce the danger wherever possible
d) Any hazard that cannot be eliminated or adequately reduced by design changes must be reduced with a measure that achieves the current state of the art
e) Signage, warning devices etc and safe use instructions must be designed to address the residual hazards.
f) Minor residual hazards must then be listed; hazards that can be eliminated or controlled by state of the art means cannot be declared and retained as residual hazards
g) A set of user warnings and safe use instructions must be created and supplied
h) Detailed maintenance instructions must be created and supplied

4.2.2. Partly completed machine

The directive defines a partly complete machine (PCM) as:

"An assembly which is almost machinery, but which cannot itself perform a specific application. A drive system is partly completed machinery. Partly completed machinery is only intended to be incorporated into or assembled with other machinery or other partly completed machinery or equipment, thereby forming machinery."

The manufacturer of partly complete machinery must supply it with:

a) A Declaration of Incorporation under the Machinery Directive
b) Installation instructions for the PCM
c) Maintenance instructions for the PCM

The PCM must be in full compliance with and be CE marked under all applicable directives except the Machinery Directive; components in this category include electric operator and control panel combinations

It is not possible to supply a complete machine minus safety devices under a Declaration of Incorporation to avoid full compliance; such a machine would in fact be a complete machine without adequate safety.

4.2.3. Safety device

The directive defines a safety device as:

"A component which serves to fulfil a safety function, which is independently placed on the market, the failure and/or malfunction of which endangers the safety of persons, and which is not necessary in order for the machinery to function, or for which normal components may be substituted in order for the machinery to function."

The manufacturer of a safety device must CE mark the device under the Machinery Directive and ensure that it is in full conformity with the applicable Essential Health and Safety Requirements. It must be supplied with a Declaration of

Conformity under the directive and also be in full conformity with all other applicable directives eg Electromagnetic Compatibility and Radio Equipment Directives, components in this category are:

- Safe edge and any associated control device
- Light grid, laser scanner etc and any associated control device

As sensitive devices are listed in Annex iv of the directive, they must either be manufactured in full conformity with the relevant harmonised standard (EN 12978) or be subject to type testing by a test laboratory notified by the European Commission to test safety devices under the Machinery Directive.

4.2.4. Maintenance instructions

Detailed planned preventative maintenance instructions must be drawn up by the assembler or manufacturer of the completed system and supplied to the client, the instructions must accurately describe the:

- Inspections
- Cleaning
- Lubrication
- Adjustment
- Replacements
- Testing
- Required frequency of maintenance

The maintenance instructions must specify the required frequency of maintenance and the qualifications, skills and experience needed to execute the required maintenance tasks.

A log book must be provided to the client so that they can record the completed maintenance.

4.2.5. Safe use instructions

Instructions that identify and explain the residual hazards and how to safely use the system must be drawn up and supplied to the client. They must include electrical isolation, manual use, what to do in the event of a fault or damage and how to change batteries etc.

4.2.6. Declaration of Conformity (see Annex D)

The completed system must be supplied with a Declaration of Conformity that declares conformity with the Machinery Directive, and all other relevant directives, see Annex D.1.

4.2.7. CE mark

The system must bear a CE plate that includes:

- Manufacturer or assembler name and address
- Product designation or serial number
- 2006/42/EC
- The year of manufacture

Mounted visibly and indelibly on the system see Annex D.2.

4.2.8. Technical file

The company or person responsible for compliance of a new or extensively modified automated system must compile a technical file and retain it unchanged for at least 10 years after installation, or manufacture of the last unit in serial production, to evidence the entire compliance process. The file must be assembled and provided on request from relevant authorities (such as HSE, Trading Standards, Environmental Health or the Police). There is no requirement to share the technical file with the client. This file must not be confused with a maintenance file, see section 5.

The technical file must contain at least:

a) Technical drawings and specifications for the structure, foundations and safety critical elements such as hinges, guides, stops and fixings
b) Calculations for loadings
c) Detailed instructions for installation and commissioning that include any testing required
d) The risk assessment
e) The list of residual hazards
f) A list of standards or parts of standards that are being relied on as evidence or part evidence of compliance
g) Test reports from 3rd parties (where used)

h) A copy of the Declaration of Incorporation for any partly complete machine components used.
i) A copy of the Declaration of Conformity for any safety devices used.
j) Force test report (where force limitation is used)
k) Light grid or laser scanner etc test report (where presence detection is used)
l) Electrical test certificates and reports
m) A copy of the installation manuals for all components used
n) A copy of the user warnings and safe use instructions
o) A copy of the planned preventative maintenance instructions
p) The Declaration of Conformity

Companies involved in serial production must operate and maintain a factory production control system; the system need not be independently certified (eg to ISO 9001) but must be comprehensive, documented and maintained.

Companies involved in repeat use of components (eg PCMs and safety devices) must maintain a similar system to ensure that compliance and documentation keeps pace with any supplied product changes. See Annex G.

4.3. National statutes applicable to new systems

4.3.1. England, Scotland and Wales

Section 3 of the Health and Safety at Work Act 1974 requires that employers and the self-employed as part of their work ensure that systems they install are safe. Section 6 requires that systems for use at work must be manufactured to be safe. Section 7 requires that employees take reasonable steps to ensure the safety of themselves and others who may be affected by their work.

The Electricity at Work regulations 1989 require that electrical systems are installed to prevent electric shock and fire due to electrical faults. The regulations also dictate that electrical work is only conducted by persons who possess the knowledge or experience, or are working under such degree of supervision as may be appropriate, to prevent harm. Live working must be avoided wherever possible.

4.3.2. Northern Ireland

Article 5 of the Health and Safety at Work (Northern Ireland) Order 1978 requires that employers and the self-employed as part of their work ensure that systems they install are safe. Article 7 requires that systems for use at work must be manufactured to be safe. Article 8 requires that employees take reasonable steps to ensure the safety of themselves and others who may be affected by their work.

The Electricity at Work regulations NI 1991 require that electrical systems are installed to prevent electric shock and fire due to electrical faults. The regulations also dictate that electrical work is only conducted by persons who possess the knowledge or experience, or are working under such degree of supervision as may be appropriate, to prevent harm. Live working must be avoided wherever possible.

4.3.3. Republic of Ireland

Where a system is installed by a person engaged in a trade, business or other undertaking (whether for profit or not), then that person will have duties under the Safety, Health and Welfare at Work Act 2005 to ensure the resulting system is safe.

The Safety, Health and Welfare at Work (General Applications) Regulations 2007 also require that electrical systems are installed to prevent electric shock and fire due to electrical faults. The regulations also dictate that electrical work is only conducted by persons who possesses the knowledge or experience, or are working under such degree of supervision as may be appropriate, to prevent harm. Live working must be avoided wherever possible.

In appropriate cases, a charge of reckless endangerment under the Non-Fatal Offences Against the Person Act 1997 may be considered.

The lists of applicable legislation are not exhaustive; other criminal legislation may well apply at any given location dependent on the precise details of the system and its location.

4.4. Negligence

Any company or person who by their action or inaction causes injury to persons or property could be pursued in the civil courts for damages. This would include the manufacturer, distributor, importer, owner, manager, landlord of a gate or barrier system.

Verification of section 4 is by document assessment and comparison with the product in question.

5. Legal compliance

Existing systems - repair, maintenance and modification

Persons or companies with legal responsibilities in the field or repair maintenance and modification of existing systems fall into two distinct groups:

a) Maintenance contractors: this group includes any company or person maintaining, repairing or modifying an existing system

b) System managers: this group includes:
   - Owners
   - Workplace managers
   - Landlords
   - Managing agents
   - Facilities managers

Companies or persons in these groups have various criminal and civil legal obligations depending on the environment and national jurisdiction that the system exists in.

5.1. England, Scotland and Wales

Regulations 5 and 18 of the Workplace (Health, Safety and Welfare) Regulations 1992 require that gates and barriers at workplaces are safe and subject to a system of maintenance (system manager responsibility).

Section 3 of the Health and Safety at Work Act 1974 requires that employers and the self-employed as part of their work ensure that systems in their care are safe (eg landlords, workplace managers, owners, managing agents, facilities managers and maintenance contractors).

The Electricity at Work regulations 1989 require that electrical systems are maintained to prevent electric shock and fire due to electrical faults. The regulations also dictate that electrical work is only conducted by persons who possesses the knowledge or experience, or are working under such degree of supervision as may be appropriate, to prevent harm. Live working must be avoided wherever possible; this will mean at the very least that electrical systems are electrically isolated prior to maintenance for basic electrical checks.

5.2. Northern Ireland

Regulation 5 and 18 of the Workplace (Health, Safety and Welfare) Regulations (Northern Ireland) 1993 require that gates and barriers at workplaces are safe and subject to a system of maintenance (system manager responsibility).

Article 5 of the Health and Safety at Work (NI) Order 1978 requires that employers and the self-employed as part of their work ensure that systems in their care are safe (eg landlords, workplace managers, owners, managing agents, facilities managers and maintenance contractors).

The Electricity at Work regulations NI 1991 require that electrical systems are maintained to prevent electric shock and fire due to electrical faults. The regulations also dictate that electrical work is only conducted by persons who possess the knowledge or experience, or are working under such degree of supervision as may be appropriate, to prevent harm. Live working must be avoided wherever possible; this will mean at the very least that electrical systems are electrically isolated prior to maintenance for basic electrical checks.

5.3. Republic of Ireland

If the premises are a workplace, there are specific duties to maintain the system in a safe condition under the Safety, Health and Welfare (General Applications) Regulations 2007 (system manager responsibility).

If the system is controlled by a person engaged in a trade, business or other undertaking (whether for profit or not), then that person will have duties under the Safety, Health and Welfare at Work Act 2005. This may, for example, include landlords, managing agents, workplace owners/managers, facilities managers and maintenance contractors. Landlords of rented houses will additionally have duties under the Housing (Standards for Rented Houses) Regulations 2008.

The Safety, Health and Welfare at Work (General Applications) Regulations 2007 also require that electrical systems are maintained to prevent electric shock and fire due to electrical faults. The regulations also dictate that electrical work is only conducted by persons who possesses the knowledge or experience, or are working under such degree of supervision as may be appropriate, to prevent harm. Live working must be avoided wherever possible; this will mean at the very least that electrical systems are electrically isolated prior to maintenance for basic electrical checks.

In appropriate cases, a charge of reckless endangerment under the Non-Fatal Offences Against the Person Act 1997 may be considered.

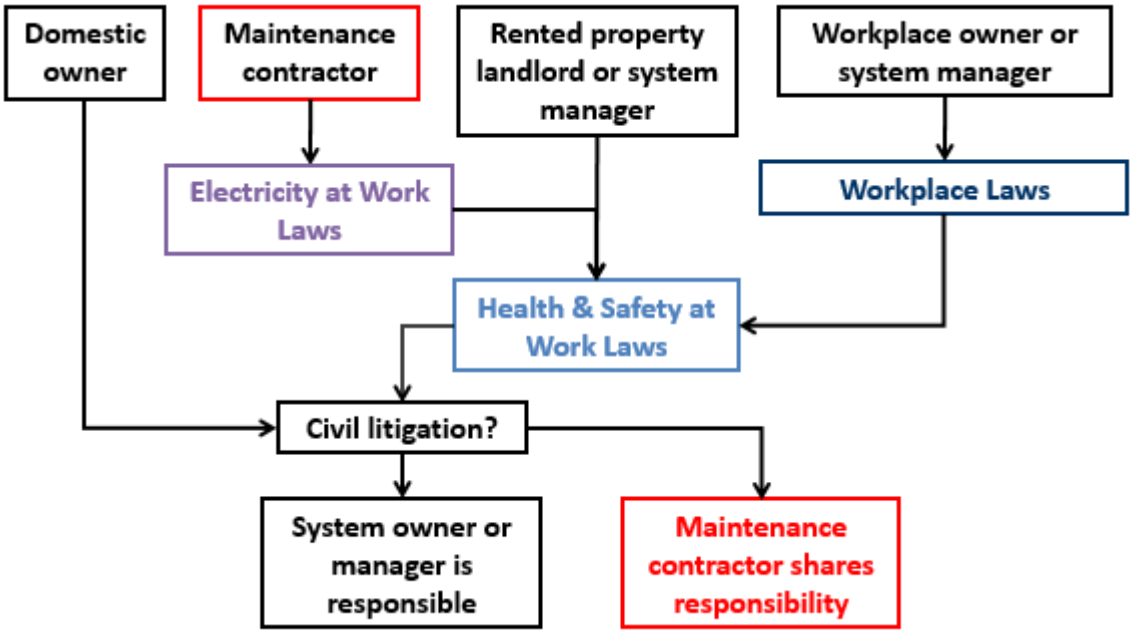
The lists of applicable legislation are not exhaustive; other criminal legislation may well apply at any given location dependent on the precise details of the system and its location.

5.4. All areas of UK and Ireland

Any person, maintenance contractor or system manager, may be subject to civil claims for negligence if something they do, or fail to do, results in injury or damage to the property of a 3rd party.

It must be understood that, in the event of an incident with a system, the ensuing investigation will assess the input and actions of all parties associated and no guarantee of the outcome can be given. The investigation will ask who did what, what did those involved know about the condition of the offending system and then what action could they have reasonably taken, or did they take to prevent the occurrence?

The lists of applicable legislation are not exhaustive; other criminal legislation may well apply at any given location dependent on the precise details of the system and its location.



Flow diagram indicating the responsibilities of duty holders

5.5. The management of the maintenance process

A system manager or person with ownership/management responsibilities for a system has various criminal and/or civil legal responsibilities for its safety, depending on the nature of the site. A maintenance contractor working on system has criminal and civil legal responsibilities both during maintenance, repair or modification work and on completion of the works (see 5.1 to 5.4).

Health and safety law requires that reasonable and practicable steps are taken to provide safety; this level of safety is generally accepted to be that described by current product specific standards and other publicly available information.

There will always be some discussion about just how unsafe a given system actually is and the conversation often gets steered towards the likelihood of occurrence of an incident. Where children or untrained persons are potentially affected, the emphasis of the risk assessment must be on degree of harm rather than likelihood of occurrence; in many cases, it is foreseeable that children could play on or around these systems or that untrained persons might encounter them. The current range of standards and codes of practice covering automated gates and traffic barriers have generally dealt with this element and therefore a system is either safe or not safe in accordance with the relevant standard or code.

Despite this, it is possible to discriminate to some degree and not all hazards will necessarily result in a system needing to be taken out of service:

– Where a hazard is classified as “safety critical”, the system must not be returned to service by a maintenance contractor or, for that matter, by a system manager.

– Where a hazard is classified as "requiring improvement", the system could possibly be left in service at the discretion of the maintenance contractor and/or the system manager.

Examples of hazards classified as Safety Critical or Requiring Attention are listed in 5.5.10.

In either case, the system manager must be fully informed, and an unsafe system notice (see Annex E.1) issued. Where a hazard has been classified "requiring attention" and the system is left in service, the system manager remains potentially liable to criminal prosecution or civil legal action in the event of a near miss or injury incident and hence must be given the opportunity to take the system out of service.

DHF recommends the following process to manage maintenance, repair and modification works.

5.5.1. Step 1 Inform the client

Before going to site, the maintenance contractor must explain to the system manager that, as a duty of care to themselves, the system must be taken out of service for initial electrical and structural safety checks prior to the actual work or assessment process and, that if during maintenance or assessment work, the system proves to have safety critical defects, it will not be put back into service by the maintenance contractor.

5.5.2. Step 2 Assess the work

a) Once on site, the maintenance contractor must assess the system for safety before starting work, in so far as is possible in its current condition.

b) The maintenance contractor must also assess the extent of work requested to be done by the system manager in terms of its likely impact on the safety of the system.

c) If assessment is not possible in safety due to lack of access, a System Safety Unknown (see Annex E.2) notice must be issued.

If step 2 reveals that the system will be safe on completion of the proposed work, then the maintenance contractor can continue with the contracted work. If it subsequently becomes obvious during the work that the system will have safety critical defects on completion, the maintenance contractor must not put the system back into service.

If step 2 reveals that the proposed work will not result in a safe system:

a) The maintenance contractor must explain all the exposed hazards to the system manager, verbally and, as soon as possible, in writing.

b) The maintenance contractor must also explain to the system manager what additional work (if any) might be necessary to properly diagnose the hazards; it may prove necessary to replace or adjust drive units, control boards, hinges or rolling gear etc or work to gain access before a complete assessment is possible.

c) The maintenance contractor must inform the system manager in writing of the measures that will be necessary to make the system safe.

5.5.3. Step 3 Complete the work

The maintenance contractor must then request clearance from the system manager to complete both the contracted work and the required safety upgrade work.

If the system manager requires that the maintenance contractor completes only the contracted maintenance work (some client organisational, procurement, tendering or contractual issues may dictate this) then the maintenance contractor must not put a system with "safety critical" defects back into service and only leave a system with "requiring improvement defects" in service with written permission from the system manager.

The maintenance contractor must explain to the system manager how service can be restored (eg explain where the switch is or how it has been secured against collapse). In this case, it would be reasonable for the contractor to assume that the required safety upgrade work is intended to be undertaken later. The contractor must also inform the system manager in writing (using the unsafe system notice) that there could be legal consequences for them in the event of an incident involving the system if it is returned to service in its current state.

5.5.4. Step 4 Subsequent visits

If, on a subsequent visit, the maintenance contractor finds the system is still in service in an unsafe condition, the process must be repeated and the system manager re-informed in writing of the potential hazards and of the potential consequences present, using the unsafe system notice. The maintenance contractor must not be the person who puts the system back into service with safety critical defects at any stage.

5.5.5. Mitigating action

Although a maintenance contractor must never put a system with safety critical defects back into service, in many cases, a system could revert to manual use or be controlled in hold-to-run in order to maintain security at the site. This cannot of course be achieved where the problem is potential structural failure.

5.5.6. Conclusion of the process

It must be understood that, in the event of an incident with a system, the ensuing investigation will assess the input and actions of all parties associated and no guarantee of the outcome can be given. The investigation will establish who did what, what did those involved know about the condition of the offending system and then what action could they have reasonably taken, or did they take to prevent the occurrence? Clearly, it will be very important that those with a responsibility to inform (primarily the maintenance contractor) have done so in a very clear and precise manner.

It is advised that, when informing about defects affecting a system, this information is not confused with a quote to improve it; hence it will be better if these two functions are contained in two separate documents. The unsafe system notice must be just that and not be ambiguous in any way. This code requires the use of specific document templates to cover the informing of safety element of the process (see Annex E.1 & E.2).

It must also be noted that if a maintenance contractor continues to arrive at a site repeatedly to find that the system is still in use with safety critical defects, at some point it will begin to look as if the system manager and the maintenance contractor are colluding to maintain an unsafe condition. In order to avoid this, and in the overall pursuit of safe systems, we would advise that if, at the third visit to the site, the system manager is still resisting safety improvements, then the maintenance contractor will have to consider in greater detail the risks involved in their continued involvement. It will be advisable at this stage to request a formal meeting with the system manager to discuss their ongoing intentions for safety of the system and to explore the possibility of staged improvements or other hazard mitigation strategies. DHF can offer its members support and guidance at this stage on a case by case basis.

Ultimately, if a system manager is clearly refusing to have a site made safe, then we would advise that the relationship may need to be ended and that the relevant authorities (eg HSE, HSA or Local Authority Environmental Health Department) be informed. DHF can again offer considerable support to members at this very final and ultimately undesirable stage.

5.5.7. Maintenance file

Differing from, and not to be confused with a technical file, the maintenance file is a record of completed maintenance and alterations to a system throughout its life. Where a maintenance file is located in the same place as a technical file care must be taken to avoid any confusion between the two records.

The maintenance file must include the following:

- A copy of the maintenance contract or service agreement
- A copy of the current Planned Preventative Maintenance instructions (where PPM is contracted)
- The risk assessment for initial take-over of maintenance or reactive first visit
- The risk assessment for any alteration
- The maintenance log (or a copy of it where it is retained by the system manager)
- Declarations of Conformity or Incorporation for safety device or partly complete machine replacements
- A copy of installation manuals for parts replacements (where they differ from the original)
- A copy of updated user instructions issued as a result of alterations
- A copy of unsafe system notices issued
- A copy of the certificate of compliance
- Copies of any other relevant communications with the client

5.5.8. Disclaimer documents

A lot of time and expense has gone into obtaining good solid legal advice on this subject but there is no legal precedent for such a document in this environment. Even if the system manager agrees to take responsibility, there is no guarantee that the maintenance contractor culpability will be assured.

Such a document would be attempting to transfer the ***criminal*** responsibilities of one party (the maintenance contractor) to another (the system manager) by means of a ***civil*** contract; this is not possible in criminal law.

Verification of section 5 is by document assessment and comparison with the product in question.

5.5.9. Maintenance frequency and content

Maintenance frequency and content must in the first instance be specified by the manufacturer or assembler of the complete system. In the absence of a specified frequency and content or if the specified schedule of maintenance proves inadequate, the maintenance contractor must design a maintenance schedule that is judged suitable to keep the system in a safe condition. Where the system manager disputes or refuses a revised schedule, this must be treated as a "requires improvement" hazard and notified to the system manager in the manner outlined in this section.

Force limitation, light grids and laser scanners etc must be performance tested at least annually but need not be tested at every maintenance visit (providing that function is checked) throughout the year unless changes are made that might alter performance eg:

- When safe edges are replaced with a different type or size
- When a control panel that has torque adjustment is replaced
- When a drive unit or optical device is replaced
- When structural changes are made that could affect performance

5.5.10. List of hazards classified as 'Safety Critical' and 'Requires Improvement'

Safety Critical Do not return to service	**Requires Improvement** Could be left in service with system manager agreement
Structural failure imminent	Minor structural improvement necessary
Crush, shear, draw-in or impact hazard not protected below 2.3m above permanent access level	Crush, shear, draw-in or impact hazard not protected but between 2.3m and 2.5m above a permanent access level
Force or time limits over maximum by more than 25%: – 400N (crush, shear and draw-in hazard) = 500N or more – 1400N (impact hazard) = 1750N or more – 150N exceeded (all hazards) for 1 second or more – 25N exceeded (all hazards) for more than 10s	Force and time limits over maximum by less than 25%: – 400N (crush, shear and draw-in hazard) = up to 499N – 1400N (impact hazards) = up to 1749N – 150N exceeded for up to 0.99 second – 25N exceeded (all hazards) between 5s and 10s
Wicket gate without cut out switch wired to stop circuit	Safe edge/light grid installed, performance is correct but does not achieve category 2 or 3
	Hinge strength unknown but judged to be safe currently
System protected solely by horizontal photo beams (no force limitation, light grid/laser scanner etc or hold to run)	Two hinge swing system with inverted top hinge, but appears structurally sound
Hold-to-run in use but some hazards not visible	Hold-to-run by radio fob
Hold-to-run with overtravel exceeding 125mm	Hold-to-run with overtravel up to 125mm
Sliding system without adequate travel stops	Swing door or gate without travel stops
Structural failure due to wind probable	Wind strength unknown but appears safe
Safety fence provided but easily defeatable (reach over/through)	Safety fence mesh size/clearance not to ISO 13857 but only defeatable by extreme action
Safe edge fails test piece test and is more than 140mm from moving leaf at a sliding gate draw-in hazard (sliding gate)	Safe edge fails test piece test but is less than 140mm from moving leaf at draw-in hazard (sliding gate)
	Insufficient photo beams to supplement force limitation
	Danger of vehicle impact or impact to vehicle
	Insufficient visibility in darkness
	Insufficient signage or ground markings
Electrical	
Class 1 electrical equipment not earthed	Class 1 electrical equipment, wiring, earthing and fuse all suitable, RCD required but not fitted
Exposed live conductors	Unprotected cable in good condition
Damaged cabling - safety or power circuit	IP rating incorrect but appears safe currently
Disconnection time at earth fault beyond safe limits	

Annex A. (Informative)

Automated gate or barrier risk assessment

Job reference: .....

Site address: .....

Postcode: .....

Assessment conducted by: .....

☐ Machinery Directive applicable (new system or extensive modification)

☐ Machinery Directive not applicable (existing system)

☐ New ☐ Repair ☐ Planned maintenance ☐ Modification

☐ Swing ☐ Sliding ☐ Folding ☐ High speed ☐ Barrier ☐ Wicket gate

Other .....

Number of leaves ..... Leaf 1 width ..... Leaf 2 width .....

Material ..... Height ..... Weight .....

Percentage infill ..... Expected operations per hour ..... and per 24-hour period .....

Terrain:

☐ Paved ☐ Unmade/gravel ☐ Sloping ☐ Kerb crossing ☐ Crowned road

Weather conditions:

What weather conditions will the system be exposed to?

☐ Inside location ☐ Outside location ☐ Sheltered ☐ Exposed

Estimated maximum wind speed: .....

Other .....

Users and others who may encounter the system:

☐ No untrained persons present ☐ Untrained persons could be present

☐ High numbers of vulnerable persons present

(eg young children, physical disabilities, sight impairment, frail, elderly)

Activation methods:

☐ Hold to run ☐ Keypad entry ☐ Intercom ☐ Free exit button ☐ Loop free exit ☐ Radio key fob

☐ Proximity access control ☐ GSM/phone activation

Other .....

Nature of vulnerable persons .....

Reason/location for vulnerable persons .....

List of potential hazards (including foreseeable misuse)

Generic hazards present with all systems are shown, the other more system specific hazards must be added, some guidance is shown in brackets, edit as required.

No.	**Hazard description** (generic hazards affecting all systems shown in bold)
1	**Foundations and supporting structure failure** (derailment or collapse due to supporting masonry, post, foundation or fixing failure)
2	**Leaf structure failure** (derailment or collapse due to gate leaf or barrier boom failure)
3	**Hinge, guide or rolling gear failure** (derailment or collapse due to hinge, guide wheel, cantilever carriage failure)
4	**Travel stop failure** (derailment or collapse due to the absence or failure of physical travel stops in manual or automated use)
5	**Structural failure due to wind load** (derailment or collapse due to wind load)
6	**Electrical faults causing shock or fire** (earthing, insulation, earth loop, RCD, cable protection etc BS 7671/ET 101 & EN 60204-1)
7	**Control system faults causing loss of safety** (safe edge, light grid, laser scanner etc, wicket gate switch, limit switch control system faults)
8	**Crush at the leading edge** (gates and barriers)
9	**Impact in the swept area** (gates)
10	**Lack of maintenance** (faults or loss of safety caused by corrosion, wear and tear, vandalism, accidental damage etc)
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Control measure employed

Use the hazard numbers from the hazard list and describe how the hazard has been removed (safe design) or controlled by state of the art means

Safe design = S
Control measure = C

No.	Applied Measure	S	C
1		☐	☐
2		☐	☐
3		☐	☐
4		☐	☐
5		☐	☐
6		☐	☐
7		☐	☐
8		☐	☐
9		☐	☐
10		☐	☐
11		☐	☐
12		☐	☐
13		☐	☐
14		☐	☐
15		☐	☐
16		☐	☐
17		☐	☐
18		☐	☐
19		☐	☐
20		☐	☐

Risk assessment aide memoire

☐ **Foreseeable misuse** catered for

1. Principles of safety integration:

Wherever possible safe design has been used over application of safety devices to eliminate hazards:

☐ Fixed guard ☐ Safe design hinge area ☐ Anti-climb fence

☐ Other ……

☐ Specification/drawings are in the technical/maintenance file

2. Structural integrity:

The following are adequate to support 2 x the leaf speed & weight, the force applied by the automation and expected wind loadings without permanent distortion and 3.5 x their total loading without ultimate failure:

☐ Foundations ☐ Supporting masonry ☐ Support structures ☐ Posts ☐ Fixings

☐ Gate leaf structure ☐ Brackets

☐ Specification/drawings are in the technical/maintenance file

3. Derailment prevention:

The following are adequate to protect the system against single component failure due to the force applied by the leaf speed & weight, automation and expected wind load:

☐ Travel stops ☐ Hinges ☐ Guides ☐ Rolling gear

Hinges, fixings and travel stops need to be rated at 3.5 x their actual load to achieve this, where this is not the case further strengthening or a backup device is required.

☐ Hinge backup device provided

☐ Specification/drawings are in the technical/maintenance file

4. Electrical safety

☐ Supply inspected tested and certified to BS 7671/ET 101 ☐ 30mA RCD present on supply

☐ Wiring beyond the supply inspected and tested

☐ Wiring beyond the supply rated for current, voltage and environment

☐ All conductive metalwork connected to earth

☐ Enclosures are of correct IP rating for location and contents

☐ Enclosures containing dangerous voltages only openable with key or tool

☐ All pole isolator provided and lockable “off” when not visible from the gate system

☐ Test results and certificates are in the technical/maintenance file

5. Control system reliability:

☐ Control system manufacturer DOI present ☐ Control system manufacturer instructions followed

☐ Control system manufacturer cable specification followed ☐ Voltage bands segregated

☐ Cabling protected from damage ☐ Enclosures sealed ☐ Wiring and cabling tested

☐ Declarations and specifications are in the technical/maintenance file

Where a manufacturer Declaration of Incorporation is not provided a complete Machinery Directive conformity assessment process must be undertaken and documented for the control system; to include other relevant directives, eg Low Voltage, Electromagnetic Compatibility and Radio Equipment Directives, the responsibility for this falls to the assembler.

6. Safety device integrity:

☐ Safety device manufacturer Declaration of Conformity present

☐ Safety device manufacturer instructions followed

☐ Cabling protected from damage ☐ Enclosures sealed

☐ Category 2 device test protocol is compatible with control system test protocol

☐ Declarations and specifications are in the technical/maintenance file

Where a manufacturer Declaration of Conformity is not provided a complete Machinery Directive conformity assessment process must be undertaken and documented for the safety device; to include other relevant directives, eg Low Voltage, Electromagnetic Compatibility and Radio Equipment Directives, the responsibility for this falls to the assembler.

7. Activation devices:

☐ Safely placed ☐ Activating the correct (safe) command

☐ Hold-to-run activation device protected from unauthorised use

☐ Leaf stops within safe over-travel limits under hold-to-run control

☐ Specifications are in the technical/maintenance file

8. **Cutting and hooking hazards** ☐ Eliminated/protected

9. Vehicle being impacted by a moving gate:

☐ Outer photo beam ☐ Single height ☐ Dual height Height ……

☐ Inner photo beam ☐ Single height ☐ Dual height Height ……

☐ Ground loop(s) for safety ☐ Ground loop(s) for activation ☐ Signage ☐ Road markings

☐ Specification/drawings are in the technical/maintenance file

10. Vehicle and pedestrian control methods:

☐ Zone lighting in the hours of darkness ☐ Warning beacon(s) ☐ Warning sounder

☐ Signage ☐ Ground markings ☐ Gate or barrier mounted lights

☐ Gate or barrier mounted signage ☐ Reflective material ☐ *Pedestrian railings provided

☐ *Dedicated pedestrian access provided ☐ Traffic lights ☐ Traffic calming

Other ……

☐ Specification/drawings are in the technical/maintenance file

**Does not remove the need for pedestrian safety at vehicle access gates and barriers.*

11. Trip hazards:

☐ Trip hazards reduced to a minimum ☐ Trip hazards made clearly visible

☐ Specification/drawings are in the technical/maintenance file

12. Residual hazards:

1. .....
2. .....
3. .....
4. .....
5. .....
6. .....

☐ Residual hazards explained in the user manual

☐ Document copies are in the technical/maintenance file

13. Maintenance:

☐ Planned maintenance instructions (schedule) provided

☐ Planned maintenance instruction content and frequency adequate

☐ Planned maintenance completed ☐ Maintenance log present/available

☐ Maintenance log updated ☐ Provide documentation

☐ User instructions and warnings provided

☐ Document copies are in the technical/maintenance file

14. Applicable Machinery Directive Essential Health and Safety Requirements complied with

This section only needs to be completed where the Machinery Directive applies (new or extensively modified systems) an explanation of the EH&SRs can be found in Annex B.

☐1. Foreseeable misuse
☐1.1.2. Principles of safety integration
☐1.1.3. Materials & products
☐1.1.5. Design of gates to facilitate handling
☐1.2.1. Safety & reliability of control systems
☐1.2.2. Activation devices
☐1.2.3. Starting
☐1.2.4. Stopping
☐1.2.6. Failure of power supply
☐1.3.1. Stability of foundations
☐1.3.2. Risks of break up during operation
☐1.3.4. Risks due to surfaces, edges or angles
☐1.3.5. Risks related to combined machinery
☐1.3.6. Risks related to variations in operating conditions
☐1.3.7. Risks related to moving parts
☐1.3.8. Choice of protection against risks from moving parts
☐1.3.9. Risks of uncontrolled movements
☐1.4.1. General requirements of guards
☐1.4.2.1. Special requirements for fixed guards
☐1.4.3. Special requirements for protective devices
☐1.5.1. Electricity supply
☐1.5.4. Errors of installation
☐1.5.14. Risk of being trapped
☐1.5.15. Risk of slipping, tripping or falling
☐1.6.1. Machinery maintenance
☐1.6.2. Access to operation position & servicing points
☐1.6.3. Isolation of energy sources
☐1.7.1. Information
☐1.7.1.2. Warning devices
☐1.7.2. Warnings
☐1.7.3. Markings

Completed by: ..... **Signature:** ..... **Date:** .....

Position: .....

Verified by: ..... **Signature:** ..... **Date:** .....

Position: ..... **Diploma ULN:** .....

Annex B. (Informative)

Explanations of essential health and safety requirements

1. Foreseeable misuse:
Must be considered and provided for in the risk assessment.

1.1.2. Principles of safety integration:
The system must be designed in the following order:
a) Safe design used wherever possible to eliminate hazards
b) Safety systems/devices must be applied for hazards that cannot be designed out
c) Warnings must be provided for minor residual hazards

1.1.3. Materials & products:
All materials must be suitable for use and environment, oils and other hazardous substances must be properly contained.

1.1.5. Design of machinery to facilitate handling:
Manufacturers of complete systems must provide a lifting plan for their clients.

1.2.1. Safety & reliability of control systems:
A Declaration of Incorporation must be present from the control system manufacturer and the relevant installation manual followed. All cabling must be protected against damage, voltage bands separated, cable size appropriate for current and volts drop, IP ratings and cabling appropriate for environment.

1.2.2. Control devices:
Must be safely placed and activate a safe response.

1.2.3. Starting:
Not possible when a safety device is activated where that would result in dangerous movement.

1.2.4. Stopping:
There must be no automatic re-start after stop command, stop must override all other commands. Emergency stop is not normally required on fully automatic systems because activation of stop by an un trained person can cause trapping where the existing safety system would have provided adequate safety (stop and reverse).

1.2.6. Failure of power supply:
Loss of power must not present danger to users, eg provision of manual release, battery backup or non-locking drives. Use of the system in manual must be safe and the system must be safe if power is restored unexpectedly.

1.3.1. Stability of foundations:
Foundations, supporting structures, fixings, leaves, guides, rollers, stops, hinges and foundations must be designed to withstand 2 x their actual load without permanent distortion.

1.3.2. Risks of break up during operation:
Supporting structures, fixings, leaves, guides, rollers, stops, hinges and foundations must be designed to withstand 3.5 x actual loading without failure. No single component failure can be allowed to cause a dangerous situation.

1.3.4. Risks due to surfaces, edges or angles:
All sharp edges and hooking hazards must be removed or protected.

3.5. Risks related to combined machinery:
Control system integrity must be maintained when combining systems, eg bollards and gate systems from differing manufacturers. When this is done by an installation contractor, they have become the modifier of a control system and must ensure compliance with EH&SRs 1.2.1.

1.3.6. Risks related to variations in operating conditions:
The expected wind load must not compromise safety.

1.3.7. Risks related to moving parts:
All moving parts hazards must be identified in the risk assessment.

1.3.8. Choice of protection against risks arising from moving parts:
Hazards identified in 1.3.7 must be controlled in line with this code.

1.3.9. Risks of uncontrolled movements:
No single component failure can be allowed to cause dangerous movement eg sliding gate on a slope.

1.4.1. General requirements of guards:
Mesh size and horizontal clearances must be appropriate, securely fixed and made anti climb.

1.4.2.1. Special requirements for fixed guards:
Only removable by key or tool, fixings must be retained on the guard when it is removable for maintenance.

1.4.3. Special requirements for protective devices:
Sensitive devices must only fail to safe, by good wiring practice and using devices in conformity with EN 12978 that achieve category 2/3 as installed.

1.5.1. Electricity supply:
The supply must be provided, tested and certified to ET 101 or BS 7671/ET 101. All cabling wiring and earthing must be provided and tested to the state of the art eg EN 60204-1.

1.5.4. Errors of installation:
Instruction manuals must be followed by competent, trained, skilled fitters. All work must be inspected and tested on completion.

1.5.14. Risk of being trapped:
Manual release must be provided as appropriate.

1.5.15. Risk of slipping, tripping or falling:
Must be identified and controlled, residual hazards must be highlighted and explained in the user warnings.

1.6.1. Machinery maintenance:
Detailed maintenance instructions must be specified in the planned preventative maintenance instructions, including the required maintenance frequency.

1.6.2. Access to operation position & servicing points:
Access for maintenance in safety must be provided.

1.6.3. Isolation of energy sources:
An electrical isolator must be provided within sight of the system or made lockable on the off position. Isolators must be “all pole” design switching line and neutral conductors.

1.7.1. Information and warnings:
Warning signs and ground markings must be provided where identified in the risk assessment.

1.7.1.2. Warning devices:
Must be provided where identified in the risk assessment, eg flashing lights, traffic lights and sounders etc.

1.7.2. Warning of residual risks:
Must be explained in the user instructions and warnings.

1.7.3. Marking of machinery:
The system must be marked visibly, legibly and indelibly with the following minimum particulars:
a) Business name and full address of the manufacturer
b) CE mark and 2006/42/EC
c) Serial number
d) Year of manufacture/installation
e) Electrical hazard labels where required.

1.7.4. Instructions:
User instructions and warnings must be carefully compiled and passed to the client along with the required user training and demonstration.

Annex C. (Normative)

Certificate of compliance

Job reference: .....

Site address: .....

Postcode: .....

Reason for issue:

☐ New system ☐ New maintenance contact ☐ Repair ☐ Modification

Assessment conducted by:

Structural integrity

☐ Foundations, structures, supports, welding and fixings are provided secure and resilient

☐ Guides, tracks, rollers and hinges are secure, aligned and resilient

☐ Travel stops secure, properly aligned and resilient

☐ Safety distances to prevent crush hazards correct

☐ Fencing is secure and has the correct safety clearances

Electrical safety

☐ Earth connections correct and secure

☐ Wire terminations correct and secure

☐ Enclosures and cable entries sealed

☐ Supply conforms to BS 7671/ET 101

☐ Isolation is functional

☐ Safety devices achieve category 2 or 3 as installed

☐ Cabling is secure and protected mechanically

☐ Cable sizes and specifications correct

☐ Dangerous voltage labels in place

☐ Conductive metalwork continuity to earth is tested

☐ Electrical tests completed

Functional tests and settings

☐ Limit switch/system properly set

☐ Safety device function and response correct

☐ Wicket gate switches operate the stop function

☐ Operating logic correct for safety in use

☐ Photo beam function and response correct

☐ Loop detectors operate the correct command

☐ Intercoms, keypads, key switches, buttons, transmitters etc operate the correct command

☐ The system operates as designed

Safety performance tests

☐ Hold-to-run overtravel measured

☐ Light grid or laser scanner etc tested

☐ Force limitation tested

☐ Force test results assessed and indicate safe force at all hazards protected by force limitation

Warning devices, signage and markings

☐ Warning devices, signage and markings provided as per the risk assessment

☐ Warning lamps function correctly

☐ Audible warning devices function correctly

☐ Road markings in place and visible

☐ Warning signs in place, visible and comprehensible

☐ Pedestrian barriers in place and secure

☐ Pedestrian routes marked and visible

Risk assessment

☐ All hazards identified

☐ All hazards correctly controlled

☐ Residual hazards correctly identified

☐ User warnings explain residual hazards

☐ Safe use instructions reflect the residual hazards

Maintenance

☐ Maintenance instructions adequate

☐ Maintenance interval adequate

☐ Maintenance tasks completed

Maintenance interval …… months

User information

☐ User training completed

☐ User warnings provided and explained

☐ User instructions provided and explained

☐ Maintenance instructions provided and explained

☐ Maintenance log provided (new systems) and updated (existing systems)

☐ Declaration of Conformity provided (new systems)

☐ CE label fitted (new systems)

On the date indicated this system is in full compliance with DHF TS 011:2018, is safe and at that time satisfied the legal obligations of both the owner and the maintaining company.

Completed by: …… **Signature:** …… **Date:** ……

Position: ……

Verified by: …… **Signature:** …… **Date:** ……

Position: …… **Diploma ULN:** ……

Annex D.1. (Informative)

Declaration of conformity
(New and extensively modified systems)

Company:	Address: .....

Declaration of Conformity

Description & unique identification number: .....

The company above declares under its own authority that the system above is fully compliant with:

- 2006/42/EC - Machinery Directive

The company additionally declares under its own authority that the system is in full compliance with the following directives:

- 2014/30/EU - Electromagnetic Compatibility Directive (EMC)
- 2014/53/EU - Radio Equipment Directive (RED)

Place and date of declaration: .....

Name & signature of the responsible person: .....

Annex D.2.

CE mark
(new and extensively modified systems)

Company:	Address: .....
CE **2006/42/EC**	**Year:** ..... **Description:** ..... **Unique identification no:** .....

Annex E.1. (Normative)

Unsafe system notice

Date: .....

Dear: ..... **Job reference number:** .....

System type: .....

Reference: .....

Location: .....

In our opinion, the above system is currently not safe for operation.

Continued use of this system may result in damage to property or injury to users or members of the public generally.

Overleaf is a list faults we consider necessary to be rectified before the system can be regarded as safe in operation.

We also attach an estimate of the cost of this work if undertaken by us.

You are reminded that, as the system manager, you have a legal duty of care to users and to visitors to the premises (including trespassers). If the system is not maintained in a safe condition, any party whose property is damaged, or who is injured by the system is likely to be able to sue for damages. If you have insurance covering such risks, your insurance contract is likely to oblige you to disclose material facts to your insurer such as, in this case, the fact that the system is not considered safe.

Depending on location and use, there may well also be responsibilities for the system manager under health and safety law (see over for details). Failure to meet duties imposed by health and safety legislation could result in criminal proceedings.

Due to our own responsibilities under criminal law as a system maintainer, we are unable to leave a system with "safety critical" defects in service. Where a system has lesser safety issues that are rated as "requiring improvement", we may leave the system in service at your discretion. Where a system with defects requiring improvement is left in service, there may well still be legal liabilities for the system manager in the event of an incident resulting in damage to property or injury. We strongly advise that all safety related defects are resolved with immediate effect to protect the interests of both the system manager and users of the system.

The system has been left: .....

(eg *"switched off", "set to hold to run control", "as found", "secured against collapse" etc*)

Yours faithfully: ..... **Signature:** .....

Applicable Legislation

The actual document used will contain a list of applicable legislation at this point (as indicated in section 5 of this code), for efficiency the list has not been replicated here. Complete document templates are available from the DHF website.

Exposed system hazards:

SC = Safety Critical

RI = Requiring Improvement

1. SC/RI: .....

2. SC/RI: .....

3. SC/RI: .....

4. SC/RI: .....

5. SC/RI: .....

6. SC/RI: .....

Annex E.2. (Normative)

System safety unknown notice

Date: .....

Dear: ..... **Job reference number:** .....

System type: .....

Reference: .....

Location: .....

We are unable to gain access to some safety critical elements of your system.

As part of routine maintenance, repair or modification works we need to gain access to the safety critical areas of your system for inspections, adjustments, cleaning, lubrication or testing. Without this access we are unable to ascertain the safety of your system and hence are unable to determine whether or not it is safe to use.

Continued use of the system could result in damage to property or injury to users or members of the public generally. You are reminded that, as the system manager, you have a legal duty of care to users and to visitors to the premises (including trespassers).

If the system is not maintained in a safe condition, any party whose property is damaged, or who is injured by the system is likely to be able to sue for damages. If you have insurance covering such risks, your insurance contract is likely to oblige you to disclose material facts to your insurer such as, in this case, the fact that safety of the system could not be ascertained.

Depending on location and use, there may well also be responsibilities for the system manager under health and safety law (see over for details). Failure to meet duties imposed by health and safety legislation could result in criminal proceedings.

Due to our own responsibilities under criminal law as a system maintainer, we are unable to leave a system in service where we cannot ascertain its safety. If a system is left in service where the safety of it cannot be ascertained, there may well be legal liabilities for the system manager in the event of an incident resulting in damage to property or injury. We strongly advise that you arrange for structural alterations that will make routine access for maintenance of your system possible with immediate effect to protect the interests of both the system manager and users of the system.

We would be happy to advise what access is necessary.

The system has been left: .....

(eg *"switched off", "set to hold to run control", "as found", "secured against collapse" etc*)

Yours faithfully: ..... **Signature:** .....

Applicable Legislation

The actual document used will contain a list of applicable legislation at this point (as indicated in section 5 of this code), for efficiency the list has not been replicated here. Complete document templates are available from the DHF website.

Annex F. Informative

Residual hazard Signs

Gate moves without warning

Keep clear
(Gate move towards you)

Trip hazard

Dangerous voltage within

Hazard tape

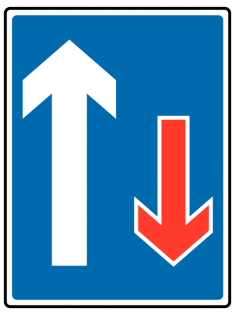
Hazard area

Stop

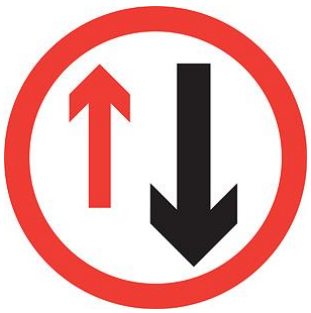
No entry

One way

Pedestrians



Priority over oncoming vehicles



Oncoming vehicles have priority

Annex G. (Informative)

Factory production control (FPC) checklist

This section highlights some of the areas for consideration when designing a Factory Production Control system as an alternative to a full ISO 9001 system. An FPC system is needed wherever manufacture of gates or traffic barriers occurs.

General

- Are written procedures/work instructions issued to the shop floor?
- Are they "controlled" so that updates can be consistently applied?
- Identify the documents relevant to the product(s) being CE marked
- Do you directly control the machinery used to manufacture the product?
- If not, and you use a sub-contractor, what controls are in place?

Personnel

- Who is the management representative in overall charge of FPC and with responsibility for ensuring that its requirements are applied?
- Are the personnel involved in production qualified and trained to operate and maintain the equipment and carry out production line duties?

Equipment

- Is maintenance of the process machinery carried out to written procedures at regular intervals?
- Are the results recorded?
- Is the inspection equipment correctly maintained and calibrated to ensure constant accuracy of tests performed during FPC?
- How is the frequency of calibration controlled?
- Are records kept?

Design

- Where relevant, are the responsibilities for the stages of the design process defined?
- Do procedures contain details of any design checks to be carried out?
- Raw materials and components
- What are the procedures/routines covering the purchase of raw materials and components?
- Do purchase orders detail specific requirements such as grade of steel or type of glass?
- Are specifications agreed with certain suppliers?
- Are any certificates of analysis or conformity requested from suppliers?
- Are batches of raw materials or components traceable through the production process and in finished products?
- If so, how is this traceability maintained?

Production process control

- How is the flow of production controlled? Are job sheets or works orders raised for each batch/day/week of production?
- How is progress recorded?
- What records are generated?
- Are all production processes and procedures recorded at regular intervals?
- Who records the processes?
- Is the recording automatic?
- How is the documentation organised?
- Is product testing carried out on site?
- If not, then where?
- Check test records for recent production. Do the results match the requirements of the technical specification?

Traceability and marking

- How are product batches traceable through the production process and in finished products?
- What records are maintained of where the finished products are shipped?
- How is production batch number traceability maintained after dispatch to assist in traceability in the event of a complaint being received?
- How long are records kept?

Non-conforming product

- Is there a documented inspection system that allows detection of defects before delivery?
- What proportion of products is inspected?
- How are any non-conforming products identified and stored?
- What records are kept?

Corrective action

- Does the system include action to prevent future non-conformities?
- Who is responsible for:
  - Investigating the cause of non-conformities?
  - Correcting non-conformities?
- Is there an adequate documented system concerning complaints received about products and is the system integrated into the FPC?
- How are customer complaints addressed?

Handling, storage and packaging

- Are procedures in place for storing and handling raw materials, components and products to prevent damage and deterioration?

Annex H. (Normative)

Training and competency

The following training requirements are the minimum acceptable for the roles identified.

Unsupervised installer:

- Basic health and safety - CSCS or similar
- Manual handling – certificate
- DHF Automated Gate Safety Diploma
- Locating underground services (where ground is broken) – certificate
- Asbestos awareness – certificate (when working in buildings)
- Work at height training – certificate (when working at height)
- Manufacturer's product training or company in-house product training – certificates

Supervised installer:

- Basic health and safety - CSCS or similar
- Asbestos awareness - certificate
- Manual handling – certificate
- Locating underground services (where ground is broken) – certificate
- Work at height training – certificate
- Manufacturer's product training or company in-house product training – certificates

Supervision does not need to be direct on site, it can be remote supervision that directs and verifies the reporting and documentation from site, the supervisor/verifier must be a current DHF Automated Gate Safety Diploma holder.

Provision of electrical supply:

- BS 7671 C&G or ET 101 Irish equivalent
- NVQ 2 (UK) or NFQ 4 (Ireland)

On site welding:

- NVQ 2 (UK) or NFQ 4 (Ireland) or employer's self-certification of competence
- Self-certification for self-employed

Off-site welding fabricators:

- NVQ 2 (UK) or NFQ 4 (Ireland) or employer's self-certification of competence
- Self-certification for self-employed

On site surveyor:

- Basic health and safety - CSCS or similar
- DHF Automated Gate Safety Diploma
- Product awareness – in-house proof
- Work ate height training (where work at height is required) - certificate

Specifiers:

- DHF Automated Gate Safety Diploma
- Product awareness – in-house proof

Annex I. (Normative)

Complete new system non-compliance process

When an installation contractor buys in a system from a 3rd party supplier they must be careful to understand what they are being supplied with and the basis under which the collection of parts is being supplied. Is the system a disparate collection of parts, or a complete automated system? If the collection of parts is being supplied as a complete system the supplier bears the responsibility for legal compliance, if not the installation contractor must bear the ultimate responsibility for compliance.

There may be occasions where an installation contractor has been supplied with a complete system supported by a Declaration of Conformity with the Machinery Directive and a CE mark, but the system appears to have some hazards that are not protected in line with the state of the art. If this happens, it is important to understand the various roles and responsibilities under criminal or civil law (see section 4):

1. The supplier of the complete system is responsible for compliance
2. The installation contractor must follow the supplier's installation instructions
3. The installation contractor has a duty to report any apparent non-compliance to the supplier, and ultimately to the client if the supplier declines to respond
4. If the installation contractor makes safety improvements not authorised by the supplier, the installation contractor takes on responsibility for compliance and could suffer some loss of warranty cover
5. The client has legal responsibilities if they choose to keep the system in service below the state of the art

There is potential for the installation contractor to bear legal liability when they fail to communicate any concern over the safety of a system to either the supplier or the client if they could reasonably have been expected to understand the issues at stake, eg they are qualified in automated gate and barrier system standards and legislation.

There are obvious conflicts of interest at stake when this happens, considerable care will be needed to protect the criminal, civil and commercial interests of all concerned parties; DHF offer the following advice:

1. Contact the supplier in writing explaining the apparent non-compliance, listing the exposed hazards and requesting a state of the art solution.
2. If refused, contact DHF if you are a member, or if the supplier is a DHF member. DHF will assist with negotiations and attempt to achieve an amicable resolution.
3. Where this action does not result in an acceptable solution the installation contractor has three remaining options:
    i. Resolve the hazards with state of the art modifications themselves and take over responsibility for compliance.
    ii. Report the apparent non-compliance to the relevant national authority, eg HSE, Trading Standards or Local Authority Environmental Health Officer (DHF will assist members with this)
    iii. Inform the client of the apparent unprotected hazards and allow the client to decide how they wish to proceed.

Where a complete system does achieve the state of the art when installed in line with the supplied instructions, but the installation contractor assesses that there are residual hazards that need further control measures to be applied, the installation contractor must apply them in line with their own onsite risk assessment. Such measures might include vehicle loop detectors, additional photo beams, traffic lights, signage, markings, railings, lights or sounders etc.

Notes:

Contact us for more information

Email: info@**dhf**online.org.uk

Telephone: (0)1827 52337

Address: **dhf** 42 Heath Street, Tamworth, Staffordshire B79 7JH