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 011:2019

Contents

Revision	Description	Date
TS-011:2016 v1	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
TS 011:2019 v4	Third edition, review and incorporation of EN 12453:2017	Mar 2019

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.

The objectives of this code of practice are to:

(i) explain the 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) explain the minimum requirements for technical documentation

(iv) advise on 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 (EN 13241-1:2003+A1:2011) did not, by reference to the other standards in the package (primarily EN 12453:2000), achieve a level of safety that would comply with the Machinery Directive 2006/42/EC. Those who were relying on EN 12453:2000 and EN 12604:2000, by reference from EN 13241, were advised to review their risk assessment to ensure that their product did in fact meet the required level of safety for legal compliance.

BS EN 12453:2017 has now been published in the UK as an update to the original 2001 UK version but sadly has still not achieved the level of safety required for Machinery Directive compliance, despite the presence of an annex ZA that claims to confer compliance. A standard does not actually confer compliance with the Directive until it has been listed in the Official Journal.

https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/machinery_en

BS EN 12453:2017 contains a foreword, warning users not to rely on this standard (or by reference BS EN 12604:2017) for compliance with the Machinery Directive; HSE have also issued a warning.

http://www.hse.gov.uk/safetybulletins/revision-standards-powered-doors.htm

Where existing standards have been proven to be defective, or where industry experience or legal precedent has indicated there are common misinterpretations, this code of practice provides a workable method of mitigating the resulting risk.

As compliance with standards is technically in law mostly voluntary, the term “should” as opposed to “must” is used in many of the clauses. Users of this code are reminded however that product specific standards represent the legal minimum level of safety acceptable in law (variously the state-of-the-art or reasonable & practicable measures depending on legal jurisdiction) and hence where these standards are not followed, an equal or improved level of safety must be achieved – see 4.1.1. Account must also be taken of the fact that, in some areas, existing standards are not deemed adequate for legal compliance and hence additional steps must be taken; the advice given in this code strives to address these shortfalls. This is done to protect the safety and legal interests of users, service providers and owner groups.

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

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:

(i) lock or dock gates (for boats)
(ii) lift doors
(iii) doors in vehicles
(iv) armoured doors (e.g. safe or strong room doors)
(v) doors/gates mainly for the retention of animals
(vi) theatre textile curtains
(vii) industrial doors (see DHF TS 012:2019)
(viii) domestic garage doors (see DHF TS 012:2019)
(ix) doors used exclusively for pedestrians (see EN 16005)
(x) railway crossing traffic barriers (contact Network Rail in the UK for guidance).

This code of practice does not cover in detail the requirements for design or manufacture of control panels, drive units or safety components, although reference is made to the minimum requirements and documentation required for supply and use of these components.

References

Normative

The latest versions of the following standards provide information which is supplementary to the requirements of this code of practice. Where referenced in this code of practice, compliance with the relevant elements of these standards is a requirement for compliance with this code.

For dated references, the latest edition of the publication referred to applies (including amendments).

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 13241:2003+A2:2016, Industrial, commercial and garage doors and gates – product standard - performance characteristics.

EN 12453:2017, Power operated industrial, commercial and garage doors and gates – safety in use.

EN 12604:2017, Industrial, commercial and garage doors and gates – mechanical aspects.

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

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

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

Machinery Directive 2006/42/EC

https://ec.europa.eu/docsroom/documents/9202/attachments/1/translations/en/renditions/native

European Commission Guide to Machinery Directive compliance

https://osha.europa.eu/en/legislation/guidelines/guide-application-machinery-directive-200642ec

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 powered gate or barrier system.

Assembler

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

Automated gate or barrier

A powered 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

Document issued to a system manager certifying that the gate or barrier meets the requirements of this code of practice. Not to be confused with or replace a Declaration of Conformity (below).

Declaration of conformity

A legally required document from a company or person responsible for legal compliance stating 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

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.

Extensive modification

An alteration to an existing system that is so extensive that a new gate or barrier has been created and hence the need for CE marking or 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

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

Maintenance contractor

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

Partly completed machine

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

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

Reactive maintenance

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

Residual hazard

The hazard that remains when the legal minimum “state-of-the-art” degree of safety has been achieved.

Risk assessment

The process of identifying hazards and controlling, or checking that they are controlled, to legally acceptable levels.

Safety component

A component which serves to fulfil a safety function and 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

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. The state-of-the-art represents the minimum level of safety permitted by the Directive. 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

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. The system manager is very often the client of the installation or maintenance contractor.

System safety unknown notice

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 in question cannot be ascertained, and hence it is not known if it is safe to use or not.

Unsafe system notice

A notice issued to a system manager informing them that the gate or barrier in question 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

This section is based on information gained from current and past standards; primarily EN 12453 and EN 12604. Where a requirement reflects a change that only applies to systems installed after a certain date, this is declared in the relevant clause. Overall, the requirements for safety in this section relate equally to new or existing gates & barriers.

1.1. Training and competency

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

1.2. Design and suitability of the system

The system should be designed and specified to reflect the demands of the site and the needs of users and yet remain safe. Factors that should be considered are**: a)** environment (wind, rain, flood risk, dust, ultra violet, flora and fauna); **b)** location (sloping ground, emergency entry and egress, visibility and nature of traffic); **c)** duty cycle (how often the system will operate per hour/24-hour period); **d)** user vulnerability (vicinity to the public, young children, people with physical and sensory limitations or people with learning restrictions). The final specification should be compliant with this code, be drawn up as a design proposal and be agreed with the client.

1.3. Risk assessment

A suitable and sufficient risk assessment should be conducted and recorded as evidence of compliance for: **a)** the design of a new gate or barrier; **b)** installation of complete gate or barrier supplied by a 3rd party; **c)** upon modification of an existing gate or barrier; **d)** and prior to taking on reactive or planned maintenance of a gate or barrier for the first time. The risk assessment should include the seven steps described in section 2 and be recorded and retained as evidence of compliance. Where the risk assessment is being conducted for the design of a new powered gate or barrier, it should include a list of Machinery Directive Essential Health and Safety Requirements complied with (see section 4).

Where the risk assessment for installation of a new CE marked gate or barrier, supplied by a third-party (see section 4), indicates that the gate or barrier *does not* achieve the state-of-the-art (the requirements for safety in this section), the installation contractor should refer to and apply the process described in Annex H.

Where the risk assessment of such a gate or barrier indicates that the state-of-the-art *is* achieved but residual hazards are present based on its local environment or use, the installation contractor should address them - see 1.5.11.

1.4. Certificate of compliance

A certificate of compliance should be issued to the client on successful completion of a compliance assessment: **a)** upon completion of a modification of an existing gate or barrier; **b)** at take-over of a gate or barrier under maintenance contract; **c)** following a one-off repair of a gate or barrier not under a planned maintenance contract.

Where the compliance assessment of an existing gate or barrier indicates non-compliance with this code, an unsafe system notice (see Annex C.1) should be issued instead.

Where access to safety critical elements is not possible in safety, it cannot be ascertained if the gate or barrier is safe or not and hence a system safety unknown notice (see Annex C.2) should be issued instead.

1.5. Hazards and hazard control strategy

Hazards are the things that could potentially cause harm. All gate and barrier systems possess hazards. Some hazards like structural failure, electric shock and crush at the leading edge are generic to all systems, other hazards are more system or site specific. The first step is always to identify and list all potential hazards present. Hazards do not represent what is wrong or deficient with a system, they are the things that could go wrong and hence need to be prevented or controlled. Installations should be designed to eliminate or reduce hazards wherever reasonably practicable rather than use sensitive devices to control hazards created by the design.

Hazards should be controlled by one of four main strategies:

(i) safe design (structural integrity, remove the hazard or make it inaccessible), 1st priority

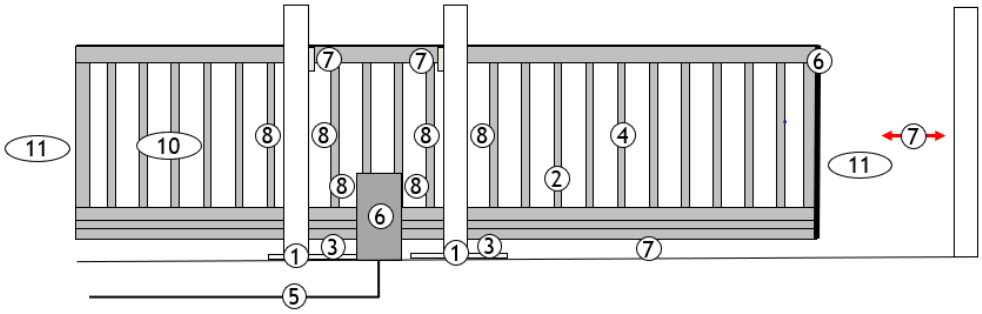
(ii) human visual control (hold to run)

(iii) safe contact (limit the exerted force on people)

(iv) non-contact presence detection (ensure that hazardous movement cannot make contact with people).

1.5.1. Common hazards

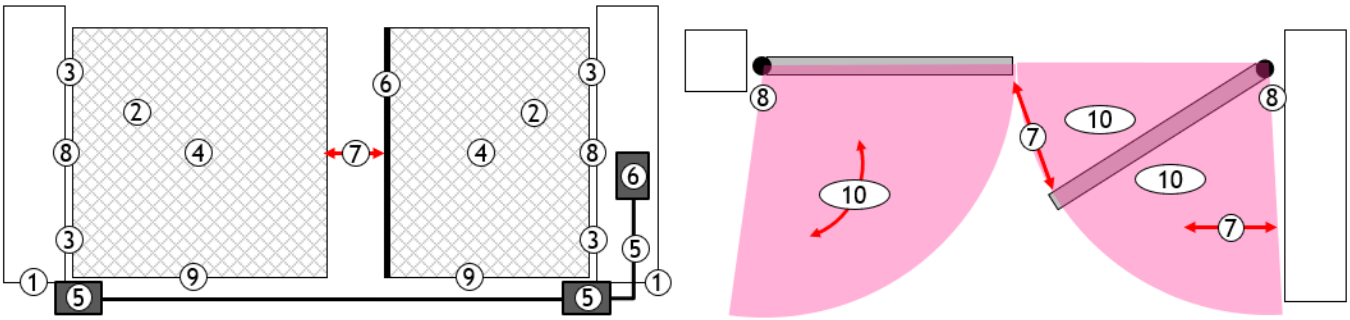
1.5.1.1. Common sliding gate hazards and acceptable control measures



Other hazards commonly exist; all hazards must be identified and controlled in the same manner as those shown here.

1	Structural failure - supporting structures	Provide adequate strength 1.5.2
2	Structural failure - leaf	Provide adequate strength 1.5.2
3	Structural failure - guides, rolling gear & travel stops	Provide adequate strength 1.5.2
4	Structural failure - wind load	Provide adequate strength 1.5.2
5	Electrical - shock/fire	Provide electrical safety 1.5.3
6	Control - faults in safety systems	Provide control system integrity 1.5.3.11 & 12
7	Crush - within 500mm of a fixed object (open/close)	Safety distance 1.5.4, hold to run 1.5.5, force limitation 1.5.6 or presence detection 1.5.7
8	Crush, shear & draw-in - at the supports & drive	Enclosure 1.5.4, hold to run 1.5.5, safe edge 1.5.6or presence detection 1.5.7
9	Crush - at guide rollers when below 2.5m	Enclosure 1.5.4, hold to run 1.5.5, presence detection 1.5.7
10	Shear - through perimeter fence	Enclosure 1.5.4, hold to run 1.5.5, presence detection 1.5.8
11	Impact - swept area	Enclosure 1.5.4, hold to run 1.5.5, force limitation 1.5.6, presence detection 1.5.7

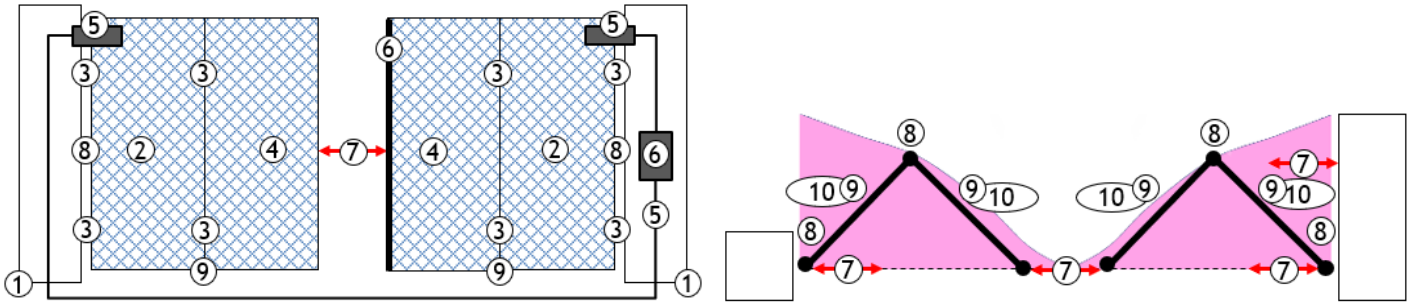
1.5.1.2. Common swing gate hazards and acceptable control measures



Other hazards commonly exist; all hazards must be identified and controlled in the same manner as those shown here.

1	Structural failure - supporting structures	Provide adequate strength 1.5.2
2	Structural failure - leaf	Provide adequate strength 1.5.2
3	Structural failure - hinges, fixings & travel stops	Provide adequate strength 1.5.2
4	Structural failure - wind load	Provide adequate strength 1.5.2
5	Electrical - shock/fire	Provide electrical safety 1.5.3
6	Control - faults in safety systems	Provide control system integrity 1.5.3.11 & 12
7	Crush - within 500mm of a fixed object (open/close)	Safety distance 1.5.4, hold to run 1.5.5, force limitation 1.5.6 or presence detection 1.5.7
8	Crush - hinge area	Safety distance 1.5.4, flexible guard 1.5.4, hold to run 1.5.5, safe edge 1.5.6 or presence detection 1.5.7
9	Crush - under gate	Safety distance 1.5.4, hold to run 1.5.5, force limitation 1.5.6, presence detection 1.5.7
10	Impact - swept area	Hold to run 1.5.5, force limitation 1.5.6, presence detection 1.5.7

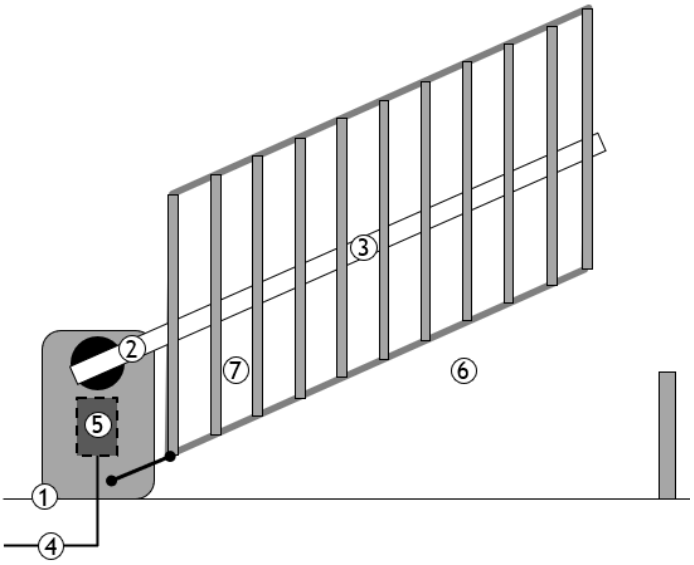
1.5.1.3. Common folding gate hazards and acceptable control measures



Other hazards commonly exist; all hazards must be identified and controlled in the same manner as those shown here.

1	Structural failure - supporting structures	Provide adequate strength 1.5.2
2	Structural failure - leaf	Provide adequate strength 1.5.2
3	Structural failure - hinges, fixings & travel stops	Provide adequate strength 1.5.2
4	Structural failure - wind load	Provide adequate strength 1.5.2
5	Electrical - shock/fire	Provide electrical safety 1.5.3
6	Control - faults in safety systems	Provide control system integrity 1.5.3.11 & 12
7	Crush - within 500mm of a fixed object (open/close)	Safety distance 1.5.4, hold to run 1.5.5, force limitation 1.5.6 or presence detection 1.5.7
8	Crush - hinge area	Safety distance 1.5.4, flexible guard 1.5.4, hold to run 1.5.5, safe edge 1.5.6 or presence detection 1.5.7
9	Crush - under gate	Safety distance 1.5.4, hold to run 1.5.5, force limitation 1.5.6, presence detection 1.5.7
10	Impact - swept area	Hold to run 1.5.5, force limitation 1.5.6, presence detection 1.5.8

1.5.1.4. Common traffic barrier hazards and acceptable control measures



Other hazards commonly exist; all hazards must be identified and controlled in the same manner as those shown here.

1	Structural failure - supporting structures	Provide adequate strength 1.5.2
2	Structural failure - arm, pivots and fixings	Provide adequate strength 1.5.2
3	Structural failure - wind load	Provide adequate strength 1.5.2
4	Electrical - shock/fire	Provide electrical safety 1.5.3
5	Control - faults in safety systems	Provide control system integrity 1.5.3.11 & 12
6	Crush - under the arm, or lower rail of a linkaged skirt	Safety distance 1.5.4, hold to run 1.5.5, force limitation 1.5.6 or presence detection 1.5.7
7	Crush - at verticals and linkage of linked skirt only, when below 2.5m	Safety distance 1.5.4, flexible guard 1.5.4, hold to run 1.5.5, safe edge 1.5.6 or presence detection 1.5.7

A free hanging, lightweight, gravity deployed skirt, does not normally present a significant crush hazard, but once the skirt has collapsed on contact, the barrier arm does!

1.5.2. Structural integrity

The supporting structures, the leaf and any supporting elements should be designed (new systems) or assessed as being able (existing systems) to resist permanent deformity, ultimate structural failure or derailment in normal use, manual use or under foreseeable misuse. Any deformity that does occur in use should not be detrimental to safety or function.

1.5.2.1. Design strength

The leaf, its supporting structure and any suspension elements should be designed (new systems) or assessed as capable of (existing systems) resisting falling down, collapsing or derailment in normal use and under foreseeable misuse conditions. The prescribed design safety factors (from EN 12604) are as follows:

(i) gate or barrier leaves, their supporting structures, suspension elements and fixings should be designed to withstand 2 x the total foreseeable load without permanent deformity

(ii) gate or barrier leaves, their supporting structures, suspension elements, fixings and travel stops, should be designed to withstand 3.5 x their total foreseeable load without ultimate structural failure.

As these are the ***design strength*** safety factors required, any on site testing at these levels could seriously damage a system hence, EN 12604 suggests that any non-destructive testing should be conducted at 1.1 x times ultimate theoretical maximum load. The safety factors quoted in (i) and (ii) above should be used as an indicator of the levels of overengineering necessary when *assessing* existing systems on site. The responsibility for initial assessment of any existing structures to support the load (new systems) is a job for an architect, principle designer or surveyor.

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

1.5.2.2. Post 2018 swing and folding gates

Swing and folding gate systems produced since 2018 (post publication of EN 12604:2017) should be protected against hinge failure such that if a hinge fails the gate will not drop nor move more than 300mm off its vertical axis. They should also be protected against being lifted more than 50% of their hinge pin length.

1.5.2.3. Resistance to wind load

The effects of wind should be taken into account in the structural assessment. The system should 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 should, however, remain safe. DHF offer the following advice in terms of likely maximum wind gust speeds:

(i) 50 mph = Sheltered (inner city, built up areas with close buildings on all sides)

(ii) 70 mph = Normal (normal urban environments)

(iii) 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 should be applied where there is doubt.

1.5.3. Electrical safety of powered systems

Electricity at work legislation requires that work on electrical systems should be conducted by an electrically skilled person (e.g. qualified electrician) or by someone being instructed by an electrically skilled person (e.g. a trained installer following an installation manual and using safe isolation procedures). This does not make the installer an electrically skilled person, only skilled enough to execute a specific task.

1.5.3.1. Supply wiring

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

1.5.3.2. System wiring

The control panel/motor manufacturer's installation manual should take precedence in this regard. Where cable specifications and installation methods are prescribed in the manual, they should be followed. *Continued over page.*

Where no installation manual is available, the principles outlined in EN 60204-1 should be applied. Where the control panel/motor manufacturer prescribes the use of an RCD in the supply circuit one should be present upstream of the system.

1.5.3.3. Isolation

A means to safely electrically isolate all poles (single phase = double pole & 3 phase = 4 pole) from the system for maintenance should be provided. Where an electrical isolator is remote from the gate or barrier (cannot been seen from the place of work), it should be possible to secure the isolator in the off position. Acceptable methods are multi pole switches or plug and socket combinations.

Safe isolation practices should be applied when working on electrical systems and warning notices posted as appropriate during the works.

1.5.3.4. Conductive parts earthing

The control panel/motor manufacturers installation manual should take precedence in this regard. Where the earthing requirements are prescribed in the manual, they should be followed. Where class 1 earthed conductive equipment (230/400v earthed) is present, all reachable extraneous conductive parts should have a continuity of no more than 0.5Ω to the supply earth terminal. *Please note that many 24v electric operators are in fact 230v class 1 devices.*

1.5.3.5. Differing voltage bands

Where cables containing differing voltages share a conduit, all cables should have a voltage rating of the highest voltage present or the higher voltage cable should be surrounded by an earthed metallic screen, for example, steel wired armoured (SWA) cable or similar. The control panel manufacturer's installation manual should take precedence in this regard. Many panel manufacturers do not allow conduit sharing at differing voltage bands.

1.5.3.6. Communication or data cables

Where communication or data cables share a conduit with power cables, clause 1.5.3.5 above should apply with the addition that the data cable should also be screened and earthed.

1.5.3.7. Cable ratings

The control panel/motor manufacturer's installation manual should take precedence in this regard. Where cable specifications and installation methods are prescribed in the manual, they should be followed. Cables should be rated for the voltage present and the maximum current possible; volts drop should be no more than 5% or within the control system supplier's specification. Cable sizes should not deplete the earth fault loop resistance required by the circuit protective device.

1.5.3.8. Flexible cables

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

1.5.3.9. Electrical enclosures

Enclosures subject to external conditions should be at least IP54 (to prevent insect or slug ingress).

Enclosures and drive units used below ground should be at least IP67. As IP67 only covers temporary immersion, where IP67 components are used underground, effective drainage should be provided.

Enclosures containing exposed dangerous voltages (55v or more) should be marked with an appropriate dangerous voltage label and be openable only by means of key or tool.

1.5.3.10. Mechanical protection of cables

All vulnerable cabling should be provided with mechanical protection by means of conduits, trunking or armouring. Vulnerable cabling is anything containing 55v or greater or anything that forms part of a control system; examples include photo beam cables, safe edge cables, non-contact presence detection cables, motor cables, encoder cables or access control device cables. All cables, trunking, conduits and enclosures should have adequate UV protection where they are subject to sunlight.

1.5.3.11. Control system integrity

Manufacturers and assemblers should only use gate or barrier specific control panel and drive systems supplied with an appropriate Machinery Directive Declaration of Incorporation and installation manual. The supplied manual should be followed, a copy of both documents should be retained and kept in the technical file for the competed system.

Alternatively, if the manufacturer or assembler has built their own control system, they should type test the system for conformity with Machinery Directive Essential Health and Safety Requirements (EH&SR) 1.2 Safety and Reliability of Control Systems and; 1.5.1 Electrical Supply, and any other applicable EH&SRs in addition to all other applicable product safety Directives (see 4.1). This will include the Electromagnetic Compatibility Directive (electrical devices) and the Radio Equipment Directive (radio devices) where applicable. EN 12453:2017 and the relevant parts pf EN ISO 13849-1 describe the current requirements.

1.5.3.12. Safety device circuits

Manufacturers and assemblers should use gate or barrier specific safety devices (EN 12978 compliant) supplied with an appropriate Machinery Directive Declaration of Conformity and follow the supplied installation manual; a copy or the original of both documents should be retained and kept in the technical file.

The system connecting safe edge and non-contact presence detection devices should be fully compatible with the control system they are connected to such that, as installed, they conform to category 2 or 3. The circuit should 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:

(i) oversized and robust conductors, and

(ii) the use of short as possible cable routing, and

(iii) the use of crimped, feruled or tinned conductor ends to prevent stray strands.

Wherever reasonably practicable, the device should be placed within the control panel, or failing that be connected via armoured cable or cable in conduit.

1.5.3.12.1. Post 2018 systems

Systems produced after 2018 (since publication of EN 12453:2017) are 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 EN 60335-2-103; this should include any wicket gate stop switch.

Limit switch, safe edge or non-contact presence detection 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.

1.5.3.13. Wicket gate stop circuit

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

1.5.4. Hazard safe zone

All hazards related to moving parts should be eliminated or controlled up to a height of 2.5m above ground level, or any other permanent access level, e.g. stairway, mezzanine floor or control cabinet. Hazards that are not reachable by being out of reach do not need additional control measures.

1.5.4.1. Minimum distances to prevent crushing

The gap between fixed verticals in the leaf should be assessed in terms of the likely effect and consequences of various body parts being inserted. Particular care should be taken where sharp points exist between bars at lower levels. Where children below the age of 5 are present BS 6180 prescribes a gap of less than 100mm for fixed railings and balustrades, but this cannot be universally applied as either safe or unsafe for a moving gate leaf.

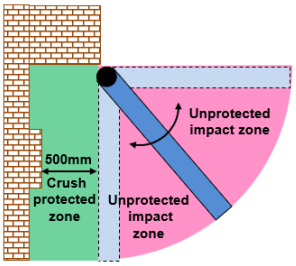
Various minimum safety distances exist (derived from EN 349 & EN 12453) to prevent injury to differing body parts.

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

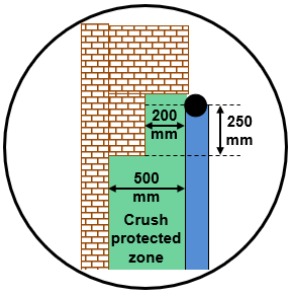
These can only be applied or utilised at points where only that size of body part could reasonably be affected. Hence use of these distances, other than 500mm, is severely restricted in most cases.

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.

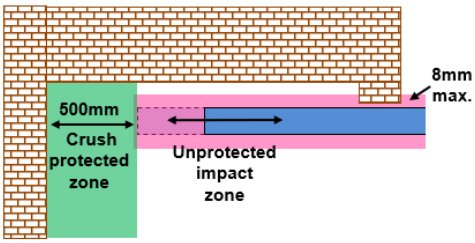
A gap greater than 500mm between a horizontally moving leaf and a fixed object eliminates the crush hazard potential at that location; this can be relaxed to 200mm within 250mm of the hinge. It should be noted however, that very few centre hung swing or folding gate hinge designs actually have 200mm of space remaining in the hinge area.



Swing gate crush zone



Relaxation to 200mm within 250mm of the hinge



Sliding gate crush zone

Regardless of any safety distance used, an impact hazard will remain across the swept area of the leaf during opening and closing movement that should be controlled by one or more of the means described in 1.5.5 to 1.5.7.

1.5.4.2. Guard to prevent access to moving parts

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

(i) be permanently fixed and only removable with a tool or key

(ii) be durable and resistant to foreseeable abuse

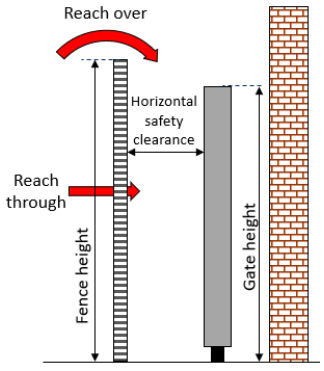
(iii) be designed to resist climbing with vertical elements on the outside and a maximum gap of 40mm between verticals and, conform with tables 1 and 2 for reach over and reach through protection.

Height of guard	Height of hazard		
	2	2.2	2.4
	Horizontal clearance		
2	350	350	100
2.2	0	250	100
2.4	0	0	100
2.5	0	0	0

Table 1 reach over

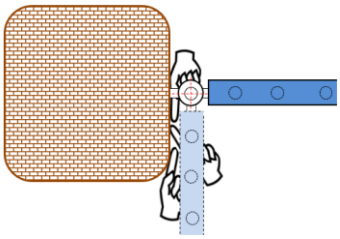
Mesh size smallest dimension mm	Horizontal clearance		
	Slot	Square	Round
4-6	20	10	10
6-8	40	30	20
8-10	80	60	60
10-12	100	80	80
12-20	[1]900	120	120
[1]Where the length of the slot is less than 40mm the safety clearance can be reduced to 120mm			
20-30	900	550	120
30-100	900	900	900

Table 2 reach through

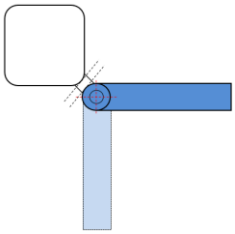


1.5.4.3. Hinge area of swing & folding gates

Reducing gaps at the hinge area can generate a 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 should be avoided by safe design wherever possible.



Examples of access to reducing gaps



Example safe design hinge area

Safe design hinge area criteria:

(i) a constant gap of less than 4mm or more than 25mm, or

(ii) a maximum gap reduction of 20% is permissible, where the overall maximum gap is less than 100mm.

Safe design hinge area criteria

When the safe design hinge area criteria is not met, one or more of the following measures should be applied such that the hazard is controlled: hold to run; safe edge; flexible guard and in some cases fine mesh to prevent access through the infill.

Flexible guards should be durable, cover the entire hazard and not fold into the reducing gap. They will also need to be removable by key or tool for inspection and maintenance of hinges with the guarded space.

1.5.4.4. Gaps under swing & folding gate lower edges

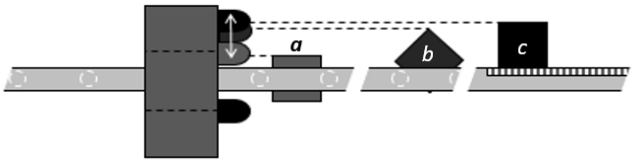
A foot crush hazard exists wherever the gap under a swing or folding gate ***exceeds 8mm*** and is ***less than 120mm***. A crush hazard also exists wherever the gate moves over sloping or otherwise uneven ground (e.g. over kerbs). These should be controlled by one of: hold to run 1.5.5, force limitation 1.5.6 or non-contact presence detection 1.5.7.

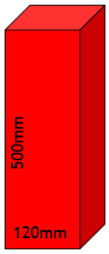
Where the gap below the gate is ***less than 8mm*** or ***greater than 120mm*** and the swept area is level, there is no foot crush hazard present, but an impact hazard remains that should still be controlled by one of: hold to run, force limitation or non-contact presence detection; higher force is permissible where there is no crush hazard, see 1.5.6.

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

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

The minimum distance allowable between the moving leaf and safe edge should be verified with a rigid rectangular test piece measuring 120mm x 120mm x 500mm. The test piece should be placed as deep as possible into the leaf infill material; the safe edge should be in close enough proximity to be activated by the test piece.





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

The nature of the gaps in the leaf infill dictate safe positioning of the safe edges.

Warning, the test must be conducted in manual mode, not under power!

1.5.5. Hold to run (safety by human visual control)

The gate or barrier should only move when pressure is being applied to the activation device and:

(i) the gate should not over travel more than 100mm on release of the activation device

(ii) sliding gates and vertically moving barriers should not over travel more than 50mm on release of the activation device in the last 500mm of horizontal movement

(iii) only trained people should use the system; the activation device should prevent unauthorised use where untrained people might be present (by use of key switch or similar)

(iv) it should 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)

(v) the activation device should be the only active activation device

(vi) the gate or barrier should 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 any reachable and visible **crush, impact, shear or draw-in** hazard.

1.5.6. Force limitation (safety by safe contact)

The maximum allowable forces and durations are as follows:

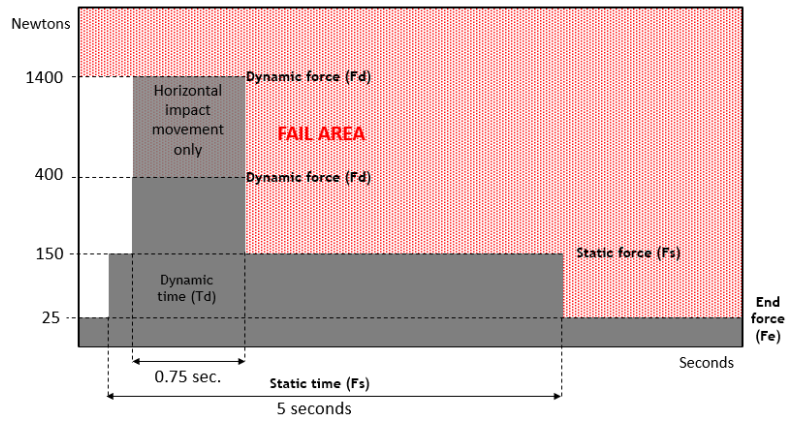
(i) 400N at crush, shear and draw-in hazards; all vertically reducing gaps below 2.5m and horizontally reducing gaps of 500mm or less

(ii) 1400N at horizontal impact hazards; contact with a horizontally moving leaf outside of a crush, shear or draw-in zone

(iii) the maximum time force can remain above 150N in all cases is 0.75 seconds

(iv) the maximum time force can remain above 25N in all cases is 5 seconds

(v) the maximum time a force can exist at or below 25N in all cases is infinite.



On a force tester		
Fd	1400N	Max
Fd	400N	Max
Td	0.75s	Max
Fs	150N	Max
Fe	25N	Max

Force limitation maximum values

1.5.6.1. Supplementary photo beam

Force limitation should 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) should 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 should 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 to either side of the arm centre line. DHF *recommends inner and outer beams, particularly on sliding gates.*

1.5.6.1.1. Post 2018 systems

Systems produced after 2018 (post publication of EN 12453:2017) 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:

(i) the device must be supported by the manufacturer's Machinery Directive Declaration of Conformity

(ii) the safe edge and any associated control device should conform to EN 12978

(iii) the safe edge should provide force limitation and reduction in accordance with clause 1.5.6

(iv) the safe edge should protect the full height/width of the crush/impact zone with the exception that the edge does not need to be sensitive in the final 30mm of each end

(v) the control circuit should meet the requirements of clause 1.5.3.11/12.

The required safe edge specification is based on: the speed & weight of the gate or barrier, the reversal torque of the operator and the time the gate or arm takes to reverse. All of these affect the amount of overtravel required in the safe edge profile.

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

1.5.6.3. Inherent force limitation

Force limitation at some hazards can be provided by sensitive drive units. The system should 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 hazards, as follows:

(i) inherent force limitation should not be used to control draw-in hazards on sliding gates; by implication this will also apply to any associated shear hazards at these locations

(ii) inherent force limitation is unlikely to be able to provide safe force in the hinge area of swing and folding gates, particularly in reducing gaps at:

- the hinge area or at the lower edge in the hinge area, or
- the leaf junctions/hinges of folding gates.

These areas will commonly need safe edges to provide force limitation. If inherent force limitation is to be relied upon to provide force limitation in these areas, the resulting crush force should be measured directly in that location.

(iii) inherent force limitation systems are unlikely to provide safe force on swing and folding gates when subject to high winds. It will usually be necessary to rely on safe edges for force limitation on such gates, given that the gate should be safe in all conditions. If inherent force limitation is to be relied upon for such a gate, evidence should be provided that safe force is achieved in high winds.

1.5.6.4. Force measurements

Testing should be carried out with an annually calibrated instrument that complies with EN 12445:2000 or EN 12453:2017.

1.5.6.5. Type testing new designs for CE marking

Companies or persons who are involved in serial production of automated systems that utilise force limitation should type test their product strictly in accordance with EN 12453:2017.

1.5.6.6. Force measurement of new pre-CE marked systems

Installation companies commissioning new pre-CE marked systems that utilise force limitation should conduct testing in accordance with the installation and commissioning instructions supplied with the gate or barrier or use the methods in 1.5.6.7.

1.5.6.7. Force measurement of all other systems

Installation and maintenance companies testing gates and barriers that utilise force limitation 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 should 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 should be used are as follows:

(i) 360N (400N maximum) for crush hazards

(ii) 1260N (1400N maximum) for horizontal pure impact hazards

(iii) 0.68 seconds (0.75 second maximum) for force to remain above 150N

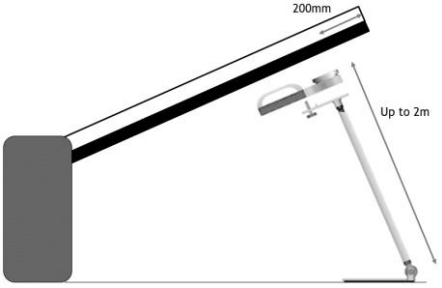
(iv) 4.5 seconds (5 second maximum) for force to remain above 25N.

1.5.6.7.1. Force measurement points on traffic barriers

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

(i) 200mm in from the tip of the arm, and

(ii) 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 should result in a 400N maximum and achieve the force reductions in 1.5.6.

1.5.6.7.2. Linkage connected skirt

Linkage connected skirts should be assessed both in terms of the lower edge and in terms of reachable reducing gaps in the skirt during the opening/closing phases. Appropriate control measures should be applied in compliance with clauses 1.5.5 to 1.5.7.

1.5.6.7.3. Force measurement points on horizontally moving gates

Test 1. At 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 one is only necessary where slow down occurs outside of the final 500mm of closing

Test 2. Then at three heights with a 500mm extension on the test meter:

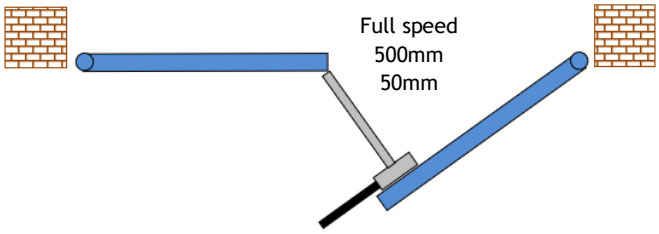
2.1. 300mm from the top of the gate (or for gates taller than 2800mm high at 2500mm above ground)

2.2. at the mid height or 1.5m, whichever is the lower

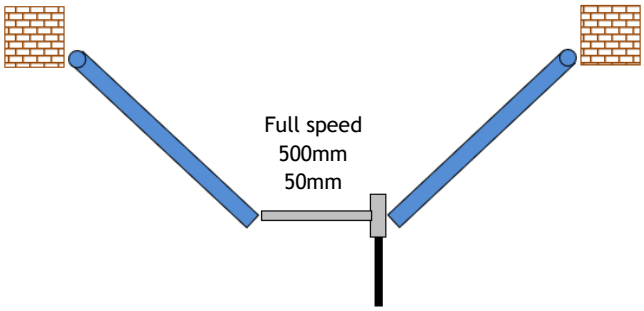
2.3. 50mm up from the base of the gate

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

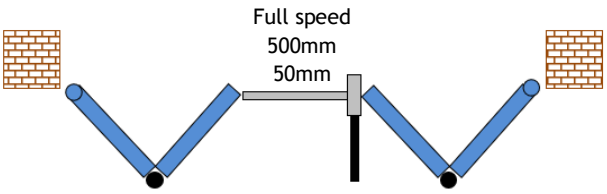
The gate should be tested in the mode in which it is to be used. If a leaf delay is used, it should be tested with that same delay; if no delay is used, the leaves should be tested as they converge.



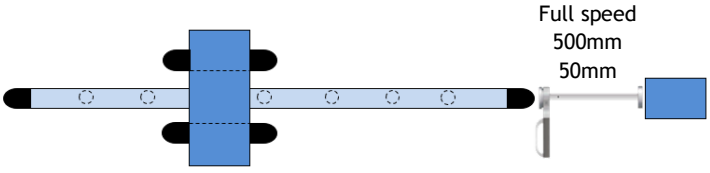
Swing gate test positions (with leaf delay)



Swing gate test positions (without leaf delay)



Folding gate test positions



Sliding gate test positions

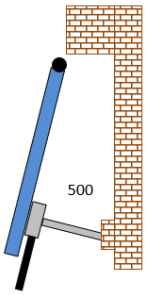
Single leaf systems should be tested at the closing post instead of being tested against the other leaf.

Test 4. Open crush hazard measurements.

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

(i) at the most outstanding feature in the crush zone up to 2m above ground, or

(ii) in the absence of any outstanding features, 1m up from the ground and 1m out from the hinge.



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

Sliding gate open crush hazards can be measured by repeating any of tests in 2 & 3 that are possible during the open cycle, e.g. just the lower tests on tapered tail gates.

1.5.6.7.4. Results assessment for other horizontally moving gate hazards

The full speed test can be used to assess safe force across the width of the swept area of swing and folding gates as follows:

(i) where the swept area does create crush hazards - *where there is **more than 8mm** and **less than 120mm** under the gate, **or** where the swept area has varying ground levels (sloping ground or kerbs etc)* – the full speed test should result in a 400N maximum

(ii) where the swept area does not create any crush hazards - *where there is **less than 8mm** or **more than 120mm** under the gate **and** the swept area is level* – the full speed test should result in a 1400N maximum.

Comparing the full speed test result with the protection used on the leading edge and lower edges can indicate the required action as follows.

Full speed result at the leading edge	Leading edge protection	Lower edge protection	Lower edge *Crush or Impact only*	Test 1 result assessment outcome and required action at the lower edges.
Up to 400N	Safe edge	Safe edge	Crush	OK – no further testing/action required
Up to 1400N	Safe edge	Safe edge	Impact only	OK – no further testing/action required
Up to 400N	Safe edge	Inherent	Crush	Not verified – safe edges needed in the hinge area or verify the inherent force limitation directly in the hinge area
Up to 1400N	Safe edge	Inherent	Impact only	Not verified – Test inherent at the leading edge (off the safe edge)
Up to 400N	Inherent	Inherent	Crush	Not OK – safe edges needed in the hinge area or verify the inherent force limitation directly in the hinge area
Up to 1400N	Inherent	Inherent	Impact only	OK – no further testing required

The full speed test can be used to assess safe force at safe edges protecting shear and draw-in at points where the moving leaf crosses a fixed structure.

Full speed result at the leading edge	Leading edge protection	Shear/draw-in safe edge	Test 1 result assessment outcome and required action at the draw-in point
Up to 400N	Safe edge	Same	OK – no further testing/action required
Up to 1400N	Safe edge	Larger	Not verified - test sample of the larger safe edge on the leading edge
Up to 400N	Safe edge	Smaller	Not OK – fit equal size safe edge
Up to 1400N	Safe edge	Same/smaller	Not OK – fit larger safe edge
Up to 400N	Inherent	Safe edge	Not verified - test sample safe edge on the leading edge
Up to 1400N	Inherent	None	Not OK – inherent force limitation not suitable for draw-in

Do not attempt to measure force directly at a shear or draw in point; serious damage or injury is possible!

The full speed test should result in a 1400N or 400N maximum as per the tables above. Test 2, 3 & 4 should result in a 400N maximum, all tests should result in force reduction in line with 1.5.6. Account should be taken of point (i) and (ii) of clause 1.5.6.3 in relation to inherent force limitation.

1.5.7. Non-contact presence detection (safety by non-contact)

Non-contact presence detection technology that can prevent all possible contact with hazardous movement:

(i) the device must be supported by the manufacturer's Machinery Directive Declaration of Conformity

(ii) the device should be compliant with EN 12978

(iii) 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 arm

(iv) any background field auto adjust time should be at least 30 seconds

(v) microwave activation devices are not included in this category

(vi) the control circuit should meet the requirements of clause 1.5.3.11/12.

Non-contact presence detection can be used to control any reachable **crush, impact, shear or draw-in** hazard.

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 the underside of a traffic barrier arm) or set up an exclusion zone to either side of the movement plane of the leaf (eg sliding gates) or set up exclusion zones that move with the leaf (eg swing and folding gates) such that access to hazardous movement is not possible.

If the hazard is to be adequately protected, the leaf should stop quickly enough to prevent hazardous contact and hence the device should 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.

Be aware that these systems can be subject to nuisance tripping due to adverse environment and weather conditions (heavy rain, snow, wind-blown debris or animals and birds). Where systems can be de-sensitised to accommodate these effects, they should still pass the tests set out below and will require re-testing following any adjustments.

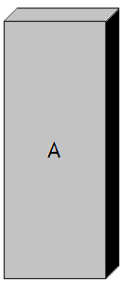
1.5.7.1. Testing non-contact presence detection systems

Hazards protected by non-contact presence detection should be tested by means of rigid material test pieces as follows.

Test piece A

Impact & whole-body detection.

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



Test piece B

Arm, hand & foot crush detection.

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

The test pieces should be presented to the moving leaf at all hazard locations. It should 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 should 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 should be assessed on its individual merit.

1.5.7.2. Type testing of new designs for type testing

Companies or persons who are involved in serial production of automated systems utilising non-contact presence detection should type test their product strictly in accordance with EN 12453:2017.

1.5.7.3. Testing new pre-CE marked systems on site for commissioning

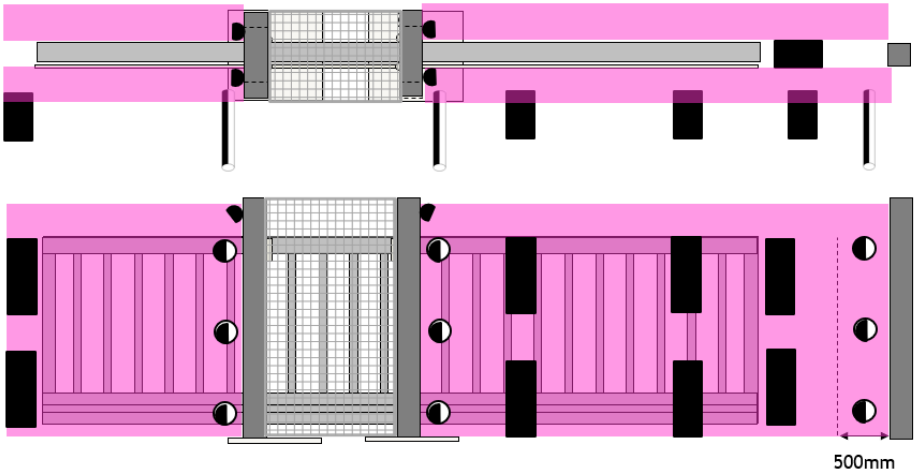
Installation companies commissioning new pre-CE marked systems utilising non-contact presence detection systems should conduct testing in accordance with the installation and commissioning instructions supplied with the gate or barrier or use the methods in 1.5.7.4.

1.5.7.4. Testing all other systems on site

Maintenance contractors testing existing systems utilising non-contact presence detection systems in service should use the following methods.

1.5.7.4.1. Testing non-contact presence detection on a sliding gate

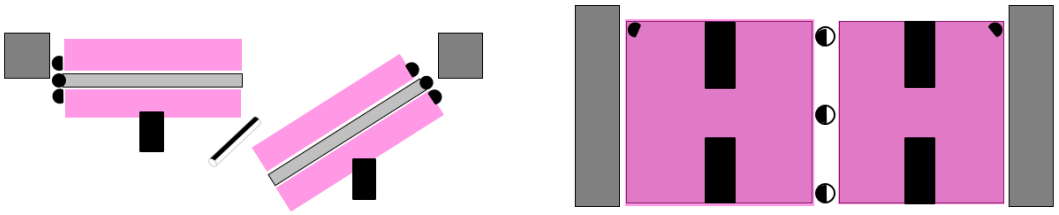
Test pieces A & B should be presented towards the moving leaf at all hazard areas up to 2.5m above ground or any other permanent access level from both sides; test piece A should be used at all impact hazards and test piece B should be used at all crush, shear and draw-in hazards.



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

1.5.7.4.2. Testing non-contact presence detection on swing gates

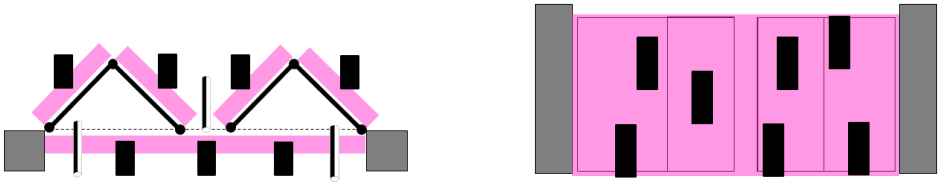
Test pieces A & B should be presented towards the moving leaf at all hazard areas up to 2.5m above ground or any other permanent access level from both sides. Test piece A should be used at all impact hazards and test piece B should be used at all crush hazards.



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

1.5.7.4.3. Testing non-contact presence detection on folding gates

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



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

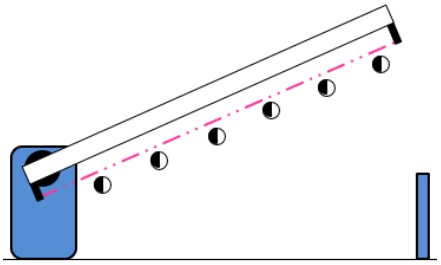
1.5.7.4.4. Testing non-contact presence detection on barriers

Test pieces A & B should be presented towards the moving barrier at all hazard areas up to 2.5m above ground or any other permanent access level; the tests should be conducted from both sides.

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

Test piece B should be offered under the arm at all points below 2.5m during closing.

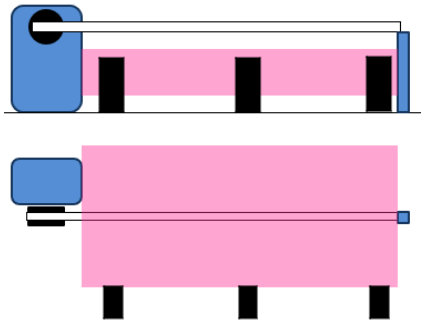
Hazardous movement should cease or retract contact with hazardous movement occurs.



(ii) In this example, a single laser scanner is providing a complete arms-width exclusion zone either side of the arm to prevent contact with hazardous movement.

Test piece A should be offered to all points at the periphery of the protection zone, from both sides.

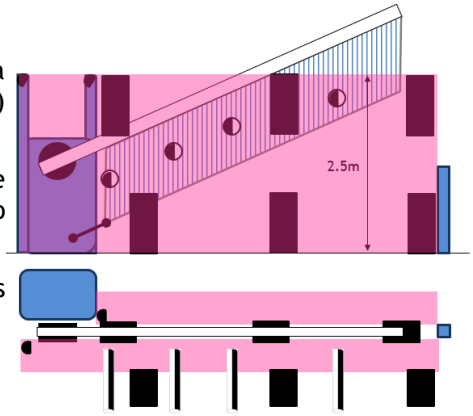
Hazardous movement should cease or retract before contact with hazardous movement occurs.



(iii) In this example, two laser scanners or light grids are 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.

Test piece A should be offered to all points at the periphery of the protection zone from both sides. Test piece B should be offered to reducing gaps associated with the skirt.

Hazardous movement should cease before contact with hazardous movement 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 should 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 1.5.6.3 (iii).

1.5.9. Imprisonment control

Imprisonment hazards should not be confused with entrapment hazards, entrapment hazards only occur where crush, shear and draw-in hazards are not adequately protected, the solution should be to provide effective crush, shear or draw-in protection.

Imprisonment hazards and the inconvenience caused when powered gates suffer faults or during power cuts can be controlled by providing a manual release in the potential imprisonment area. The gate or barrier should remain safe when being used in manual mode and also when power is restored unexpectedly. Where untrained users might need to use a manual release, instructions on its use should be provided in the immediate vicinity.

Depending on the location and use, fire safety regulations may require additional escape means that are less restrictive to use – eg push bar swing doors. Very few powered gate systems could achieve the ease of use required of an emergency escape route in a multi occupancy building. Consult Approved Document "B" for more accurate escape routes requirements: https://www.gov.uk/government/publications/fire-safety-approved-document-b

1.5.10. Manual use (powered gates/barriers in manual mode)

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

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

Swing and folding leaves should be securable against wind effects in the fully open and fully closed position.

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 1.5.10), 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 should attempt to reduce the degree of harm possible where a high-risk level exists (eg at a school) by selecting non-contact solutions over force limitation or reducing operating force even further. Protection of vehicles should be considered and provided for as the state-of-the-art is primarily concerned with the safety of people not vehicles.

Residual hazards should be addressed by applying suitable measures, eg one or a combination of the following, in order of merit for the protection of vulnerable users:

1. non-contact presence detection
2. even lower force than 1.5.6 allows
3. additional photo beams
4. warning lamps
5. LED warning strips
6. audible warning devices
7. activation devices
8. pedestrian railings
9. signage
10. zone lighting
11. hazard tape
12. ground markings
13. reflective materials
14. traffic lights
15. ground loop (vehicle detection)
16. traffic calming
17. written user warnings
18. safe use instructions
19. user training.

Selection of appropriate residual hazard controls should be arrived at based on a local risk assessment. Unlike the main body of hazards dealt with by the state-of-the-art (1.5 – 1.5.10) where the focus is on the potential degree of harm, the control of residual hazards can be based on likelihood of occurrence.

The need for additional protection systems and warning devices reduces as the likelihood of contact with a residual hazard diminishes on a given site. Great care is required none the less, as 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 should be provided and are an important aspect of residual hazard control.

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. 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.

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. The state-of-the-art represents the minimum level of safety permitted by the Directive. The state-of-the-art also reflects the "reasonable and practicable measures" required by health and safety legislation.

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 should 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, environment and users

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 significant hazards associated with the system, including those arising from foreseeable misuse

Make a list of all 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 should not be confused with describing specific "faults" with a given gate or barrier; it is simply a list of potential hazards that should be controlled.

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

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

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

Consider all remaining hazards and apply (or propose) control measures that conform to the state-of-the-art, eg hold-to-run, inherent force limitation, safe edge force limitation, non-contact presence detection, electrical safety measures, monitoring of safety devices, in accordance with the requirements for safety part of this code. In all cases, the state-of-the-art is the absolute minimum acceptable level of safety.

2.5. Identify the remaining minor residual hazards

Residual hazards should be very minor with a 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 should be, rather than be treated as residual.

Identify and list all remaining residual hazards, consider user vulnerability (eg high numbers of children, persons with mobility/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. Provide appropriate residual hazard controls

Apply appropriate residual hazard control measures based on likelihood of occurrence and user vulnerability.

2.7. Provide/review operation and maintenance instructions & user training

Provide a (or review the existing) detailed operation, maintenance and user training manual. It should explain the residual hazards, provide user instructions & training, including how to isolate and use the gate or barrier in manual and what to do in the event of a fault.

Planned preventative maintenance instructions should be included that will enable the gate or barrier to be kept in a safe condition in future service.

The PPM instructions should describe the: inspections; cleaning; lubrication; adjustment; parts replacements; and testing necessary for the various maintenance tasks.

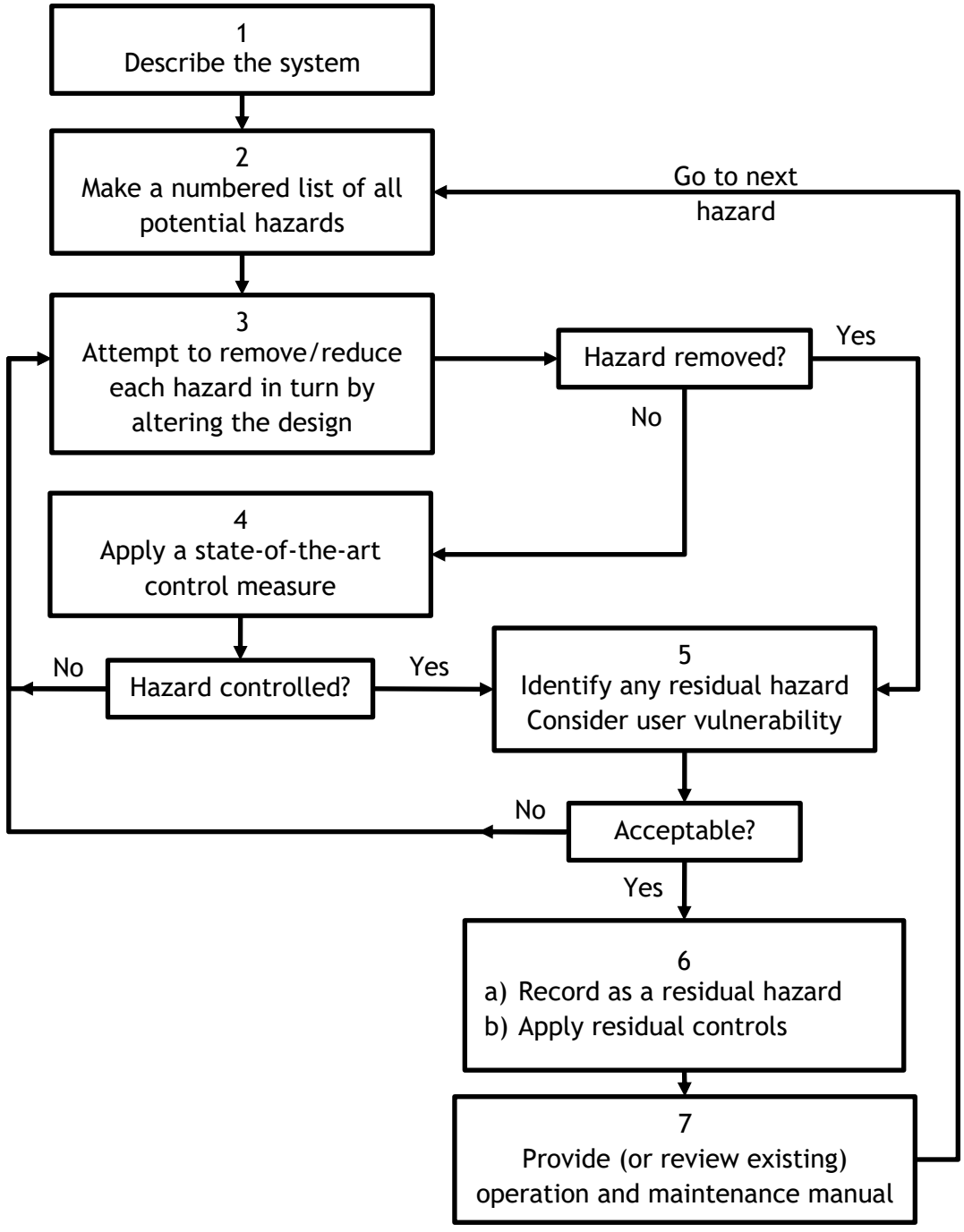
They should also prescribe the frequency, skills, qualification and experience necessary for each task.

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 recording this process. If this system is not used, any alternative method should achieve the same level of safety and clearly document all seven steps.

2.9. Risk assessment process flow diagram



3. Commissioning process

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 should in any case ensure it is safe before leaving in service.

The commissioning process is a combination of following manufacturer's 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 commissioning process should ensure that the requirements for safety outlined in section 1 of this COP are achieved.

The process should cover at the very least the following areas:

(i) structural integrity

(ii) electrical safety

(iii) control system and safety function checks

(iv) safety system performance tests

(v) warning devices, signage and markings

(vi) user handover training & documentation

(vii) confirm that the risk assessment is suitable and sufficient.

4. Legal compliance - new and extensively modified powered gates and barriers

4.1. Machinery Directive

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

(i) Supply of Machinery (Safety) Regulations 2008 in the UK, and

(ii) the 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 safety requirements.

4.1.1. Responsibility for compliance

The company or person responsible for compliance is whoever first creates a powered gate or barrier within the European Economic Area, or who first imports it into the European Economic Area (EEA) if in has not been CE marked by the manufacturer.

The following activities create a responsibility for legal compliance:

(i) importing a complete automated gate or barrier, not already CE marked by the manufacturer, into the EEA from outside the EEA (importer)

(ii) manufacturing a complete automated gate or barrier within the EEA (manufacturer)

(iii) adding an electric operator to an existing manually-operated gate or barrier (manufacturer)

(iv) modify a complete powered gate or barrier prior to or during installation in a way not permitted in the manufacturer's instructions (manufacturer)

(v) make an extensive modification to an existing powered gate or barrier (manufacturer) that alters the way it operates, for example:

- changing to ram operated from underground operated or vice versa
- changing the rolling gear design from tracked to cantilever or vice versa
- changing the overall dimensions eg wider/heavier or vice versa

(vi) assembling components from more than one manufacturer to make a complete gate or barrier (assembler), either on site or in your own workshop:

- construct a gate or barrier and install an operator from a 3rd party supplier (assembler)
- install a gate or barrier supplied by one manufacturer with an operator from another (assembler)
- buy a collection of components from a supplier not certified by them as a complete automated gate or barrier (assembler).

4.1.2. 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. At the time of writing this code, the current Machinery Directive harmonised standard for systems covered by this code is EN 13241. This standard is currently listed on the European Commission official journal with a warning that it does not currently achieve full harmonised status despite recent improvements.

The long-term intention for products covered by this code is for EN 12453 to become the MD harmonised standard. This standard has recently been improved but still not to a standard that would allow harmonisation. The UK version of EN 12453, BS EN 12453:2017, is published in the UK with a warning not to rely on it entirely for MD compliance. Please also note the warning in the foreword on page 2 of this code; primarily that EN 13241 and its referenced standards (eg EN 12453 and EN 12604) do not currently fully achieve the levels of safety required for Machinery Directive. For this reason, in some areas the requirements for safety in DHF TS 011:2019 go beyond the requirements of the current harmonised standard.

4.1.3. Essential Health and Safety Requirements and the state-of-the-art

A new or extensively modified powered gate or barrier must conform to the Essential Health and Safety Requirements (EH&SR) set out in Annex 1 of the Directive, taking into account the current "state-of-the-art" (via recital 14). This will mean achieving or in some cases exceeding the level of safety prescribed in current product specific standards (**EN 12453/EN12604**) when satisfying the EH&SR. 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. See also the warnings in relation to the state-of-the-art and current standards on page 2. The applicable EH&SR from Annex 1 of the Directive, together with likely control measures are set out below:

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: safe design used wherever possible to eliminate hazards; safety systems/devices must be applied for hazards that cannot be designed out; warnings must be provided for the 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 "supply only" complete systems must provide a lifting plan for the installer.

1.2.1. Safety & reliability of control systems
Control system manufacturers must supply a DoI. The relevant installation manual must be followed. Manufacturers must type test any self-manufactured system.

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

1.2.3. Starting
Should not be possible when a safety device is activated, if 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.

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, tracks, stops, hinges etc should be designed to withstand 2 x their actual load without permanent distortion.

1.3.2. Risks of break up during operation
Foundations, supporting structures, fixings, leaves, guides, rollers, tracks, stops, hinges, etc should be designed to withstand 3.5 x actual loading without failure.

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

1.3.5. Risks related to combined machinery
Control system integrity must be maintained when combining systems (eg gate and rising bollard systems) from differing manufacturers.

1.3.6. Risks related to variations in operating conditions
Gates & barriers must be able to withstand their expected wind load.

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

1.3.8. Choice of protection against moving parts hazards
All hazards identified 1.3.7. must be controlled in line with the state-of-the-art.

1.3.9. Risks of uncontrolled movements
Any single spring, rope, chain or gear failure should not allow a sliding gate on a slope to fall back.

1.4.1. General requirements of guards
Mesh size and horizontal clearances should 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
Safety component manufacturers must supply a DoC. The relevant installation manual must be followed. The device must only fail to safe, sensitive devices should be in conformity with EN 12978 and achieve category 2/3 as installed.

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

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

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

1.4.15. Risk of slipping, tripping or falling
Should 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 possible.

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 & markings must be provided as appropriate to the residual risk.

1.7.1.2. Warning devices
Flashing lights, traffic lights and sounders etc should be provided as appropriate to the residual risk.

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: business name and full address of the manufacturer; CE mark and 2006/42/EC; serial number; year of manufacture/installation.

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

Finer detail on how to achieve these requirements in accordance with the state-of-the-art are described in section 1 of this code.

4.1.4. Risk assessment

Key to Machinery Directive conformity is hazard identification and control:

(i) the nature of the gate or barrier, its environment and its intended use must be assessed

(ii) an assessment must be conducted identify and lists all potential hazards present and identifies which of the Essential Health and Safety Requirements are applicable

(iii) 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 hazard wherever possible

(iv) 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

(v) minor residual hazards must then be identified and listed; hazards that can be eliminated or controlled by state-of the-art means cannot be declared as residual hazards

(vi) residual hazard controls must then be put in place based on the needs of vulnerable users and the likelihood of occurrence, eg non-contact solutions, even lower force, signage, warning device etc

(vii) detailed installation (supply only systems), operation and maintenance instructions must then be compiled to explain the residual hazards, how to use the system and the steps needed to maintain it.

An example risk assessment document can be seen in Annex A.

4.1.5. 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 completed machinery must CE mark their component under all applicable safety Directives, except the Machinery Directive, eg Low Voltage, Electro Magnetic Compatibility and Radio Equipment Directives. Components in this category are primarily drive unit & control panel combinations. It is not possible to supply a complete machine minus safety components under a Declaration of Incorporation to avoid full compliance; such a machine would in fact be a complete machine without adequate safety. PCM manufacturers should consult Article 13 of the Machinery Directive, the EC Guide to the Machinery Directive, and all applicable product specific standards such that the finished machinery can achieve the state-of-the-art.

The manufacturer of partly complete machinery must supply it with a Declaration of Incorporation (DoI) under the Machinery Directive and comprehensive installation and maintenance instructions (for the PCM only). The instructions must be detailed enough that the manufacturer/assembler incorporating the PCM into a finished gate or barrier can achieve overall compliance with the Machinery Directive Essential Health & Safety Requirements and applicable standards to meet the state-of-the-art and produce an adequate operation and maintenance manual for the finished system.

Assemblers and manufacturers using 3rd party supplied PCMs should ensure that they are receiving a DoI under the Machinery Directive and that they follow the installation manual.

4.1.6. Safety component

The Directive defines a safety component 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 component must CE mark the device under the Machinery Directive and ensure that it is in full conformity with all 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. Further guidance is available in article 12 (3 or 4) of the Machinery Directive and in the EC Guide to the Machinery Directive.

Components in this category are: safe edges and non-contact presence detection devices. As sensitive components for the detection of persons are listed in Annex iv of the Directive, they must either be manufactured in full conformity with the relevant type C harmonised standard (EN 12978) or be subject to type testing by a test laboratory, notified by the European Commission to test safety components under the Machinery Directive.

The manufacturer of the safety component must supply it with a Declaration of Conformity (DOC) with the Machinery Directive and installation and maintenance instructions (for the safety component only).

Assemblers and manufacturers using 3rd party supplied safety components should ensure that they are supplied with a DOC under the Machinery Directive and that they follow the installation manual.

4.1.7. Instruction manuals

The gate or barrier must be supplied with detailed installation instructions (supply only systems), and a comprehensive O & M manual; drawn up by the manufacturer or assembler of the system.

The operation part of the manual must identify and explain the residual hazards and how to safely use the system. In particular the manual must explain: how to electrically isolate the system; how to use the manual release; what to do in the event of power failure; how to identify when a safety system has activated; what to do in the event of a fault; and when professional technical support is required. It must also explain what user training is required on site.

The maintenance section of the manual must describe in detail the steps necessary to keep the system in a safe condition:

(i) inspections, and

(ii) cleaning & lubrication, and

(iii) adjustments & parts replacements, and

(iv) safety testing (eg force or non-contact presence detection testing).

The maintenance instructions must specify the qualifications, skills and experience needed to execute the various maintenance tasks and set out the required frequency for each element. A log book must be provided to the client so that they can record the completed maintenance tasks.

4.1.8. Technical file

The company or person responsible for compliance of a new or extensively modified powered gate or barrier must compile a technical file document the entire compliance process and retain it unchanged for at least 10 years after manufacture, or manufacture of the last unit in serial production. The file must be assembled and provided, upon reasoned request from the relevant national 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:

(i) technical drawings and specifications for the structure, foundations and safety critical elements such as hinges, guides, wheels, stops and fixings and calculations for loadings

(ii) the risk assessment including:

- the list of hazards and a description of the measures implemented to either eliminate the hazard or reduce the risk to acceptable levels
- and the list of residual hazards, and the measures implemented to control or reduce them

(iii) a copy of the Declaration of Incorporation for any partly complete machine components used

(iv) a copy of the Declaration of Conformity for any safety components used

(v) a copy of the installation manuals for all components used

(vi) force test report (where force limitation is used), presence detection test report (where presence detection is used)

(vii) electrical test certificates and reports

(viii) a copy of the user warnings, safe use instructions and planned preventative maintenance instructions (O & M)

(ix) the Declaration of Conformity

(x) detailed instructions for installation and commissioning, including the testing required (where others will install the system).

The person who assembles the technical file should also be the person who signs the Declaration of Conformity because overall legal compliance cannot legally be declared until the file is complete.

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 F.

4.1.9. Declaration of conformity (see Annex D)

The client must be supplied with a Declaration of Conformity (DoC) that declares conformity with the Machinery Directive, and all other relevant Directives. The DoC must include the name and business address of the responsible person, who must be the person responsible for assembling the technical file and hence completing the overall compliance process.

4.1.10. CE mark (see Annex D)

The system must bear a CE plate that includes: the manufacturer's or assembler's name and address; a product designation or serial number; 2006/42/EC; the year of manufacture; mounted visibly and indelibly on the system.

4.2. National statutes applicable to new gates & barriers

4.2.1. 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 the 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.

4.2.2. 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.

4.2.3. 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 – *continued over page*.

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.

4.3. 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.

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:

(i) maintenance contractors; this group includes any company or person maintaining, repairing or modifying an existing system

(ii) owners and managers, this group include; owners; workplace managers; landlords; managing agents; facilities managers; consultants; who are generally the client in any maintenance contract.

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. Please note that although private domestic owners have no responsibilities under criminal safety legislation, they do have considerable responsibilities and liabilities under civil law. More to the point however, maintenance contractors working on their systems do have very clear criminal responsibilities.

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 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.

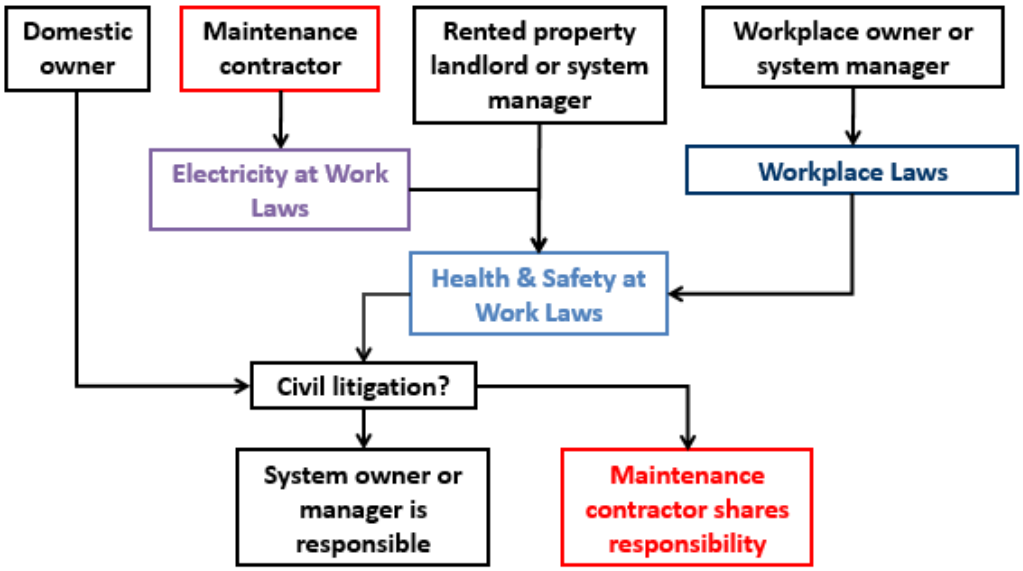
In appropriate cases, a charge of reckless endangerment under the Non-Fatal Offences Against the Person Act 1997 may be considered.

5.4. All areas of UK and Ireland

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.

Any person, maintenance contractor, owner, manager or landlord 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?



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 a 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 persons with a range of sensory or mobility limitations might encounter them. The current range of standards and codes of practice covering powered 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:

(i) where a hazard is classified as “safety critical”, the system should not be returned to service by a maintenance contractor or, for that matter, by a system manager

(ii) where a hazard is classified as “requiring improvement”, the system could possibly be left in service at the discretion of the maintenance contractor and the system manager.

Examples of hazards classified as “safety critical” or “requiring attention” are listed in 5.5.11.

Continued over page.

In either case, the client must be fully informed, and an unsafe system notice (see Annex C.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 should explain to the client that:

(i) as a duty of care to themselves, the system will need to be taken out of service for initial electrical and structural safety checks prior to the actual work or assessment process

(ii) if during maintenance or assessment work the system proves to have safety critical defects, it will not be able put back into service in that condition.

5.5.2. Step 2 - Assess the work

Upon arrival at the worksite:

(i) the maintenance contractor should assess the system for safety before starting work, insofar as is possible in its current condition

(ii) the maintenance contractor should also assess the extent of work requested to be done by the client in terms of its likely impact on the safety of the system

(iii) if assessment is not possible in safety due to lack of access, a System Safety Unknown (see Annex C.2) notice should be issued.

If steps (i) & (ii) reveal 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 apparent during the work that the system will have safety critical defects on completion, the maintenance contractor should not put the system back into service.

Where step (ii) reveals that the proposed work will not result in a safe system:

(iv) the maintenance contractor should explain to the client what diagnostic work (if any) might be necessary to properly assess the hazards; it may prove necessary to replace or adjust drive units, control boards or other components, before a thorough assessment is possible

(v) the maintenance contractor should also explain all the uncontrolled hazards to the client (and the users on site where appropriate) and explain what steps will be necessary to address them.

The maintenance contractor should then request clearance from the client to complete both the contracted work and the required safety upgrade work.

5.5.3. Step 3 - Complete the work

If the client requires that the maintenance contractor only completes the diagnostic or contracted work (some client organisational, procurement, tendering or contractual issues may dictate this), then the maintenance contractor should proceed as requested by the client. In this case, it would be reasonable for the contractor to assume that the outstanding safety upgrade work is intended to be undertaken later.

The maintenance contractor should not however leave a system with "safety critical" defects in service, and only leave a system with "requiring improvement" defects in service with written permission from the client. The maintenance contractor must explain to the client (and the users on site where appropriate) how the system has been isolated or secured (eg explain where the switch is or how it has been secured against collapse).

The maintenance contractor should inform the client in writing (using the Unsafe System Notice) about the outstanding safety defects and 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. It is strongly advised that the unsafe system notice is delivered in a traceable and recordable manner, eg by email with delivery and read receipt requests, regardless of whether or not it is appropriate or even possible to issue a paper copy on site.

As the users of the gate or barrier on site are very often not the client, it will be helpful in many cases to place a warning sign on the affected system to inform users. Where a warning sign is used, it should bear the contact details of the maintenance contractor who places it.

DHF advises making a photographic record of the isolation, securing and warning signs employed on site.

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 client re-informed in writing of the hazards present and of the potential consequences, using the unsafe system notice. The maintenance contractor should 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 should 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 should be just that, and not be ambiguous in any way.

It should 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, DHF would advise that if at the third or fourth 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 DHF 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 should be taken to avoid any confusion between the two records.

The maintenance file should include the following:

(i) a copy of the maintenance contract or service agreement.

(ii) a copy of the current Planned Preventative Maintenance instructions (where PPM is contracted).

(iii) the risk assessment for initial take-over of maintenance or reactive first visit.

(iv) a risk assessment for any subsequent alteration.

(v) the maintenance log (or a copy of it where it is retained by the system manager).

(vi) Declarations of Conformity or Incorporation for safety device or partly complete machine replacements.

(vii) a copy of installation manuals for parts replacements (where they differ from the original).

(viii) a copy of updated user instructions issued as a result of alterations.

(ix) a copy of unsafe system notices issued.

(x) a copy of the certificate of compliance.

(xi) 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.

5.5.9. Maintenance frequency and content

Maintenance frequency and content should in the first instance be specified by the manufacturer or assembler of the system. In the absence of a specified frequency and content or if the specified schedule of maintenance proves inadequate, the maintenance contractor should design a maintenance schedule that is judged suitable to keep the system in a safe condition, planned maintenance should check at least the following:

(i) structural integrity

(ii) adjustments, cleaning and lubrication

(iii) electrical safety

(iv) control system and safety function checks

(v) safety system performance tests

(vi) warning devices, signage and markings

(vii) user documentation

(viii) confirm that the risk assessment was suitable and sufficient.

Where the system manager disputes or refuses a revised schedule, this should be treated as a “requires improvement” hazard and notified to the system manager with an unsafe system notice.

Hold-to-run, force limitation and non-contact presence detection should be performance tested at least annually but need not be tested at every maintenance visit throughout the year (providing that function is checked), unless changes are made that might alter performance, for example:

(i) when safety devices are replaced with a different type or size

(ii) when a drive unit or control panel that has torque or speed adjustment is replaced

(iii) when non-contact presence detection device is replaced

(iv) when changes are made that could affect performance or alignment.

5.5.10. Certificate of compliance

When repair, modification or maintenance is complete, and the gate or barrier is deemed to be safe and in compliance with DHF TS 011:2019, a certificate of compliance should be issued to the client. An example of the TS 011 certificate can be found in Annex B. A certificate of compliance is a DHF inspired document to inform the client that the gate or barrier is safe in situations where a Declaration of Conformity and CE mark are not appropriate, primarily where the maintenance company have not created the system.

5.5.11. 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 probable	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	Hold-to-run, safe edge, non-contact presence detection device(s) 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, non-contact presence detection 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 gate without adequate travel stops	Swing gate without travel stops
Structural failure due to wind probable	Wind strength unknown but appears safe
Safety fence provided but easy to reach over or through	Safety fence mesh size/clearance not correct 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	

This list is not exhaustive; other hazards may well be present, they must be assessed and classified using a similar ethos to those listed in the tables.

Annex A. Example powered gate or barrier risk assessment document

Step 1 – describe the system, environment and users

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 gust 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 .....

Step 2 - make a 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, users of the document should edit the fields as required.

No.	**Hazard description** (generic hazards affecting all systems shown in bold, edit as appropriate)
1	**Foundation 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 arm 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 powered use)
5	**Wind load induced failure** (derailment or collapse due to wind load)
6	**Electrical faults** (earthing, cable and wiring faults etc)
7	**Control system faults causing loss of safety** (safe edge, light grid, laser scanner, 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	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Step 3&4 - Improve/check the design & apply/check control measures

Use the hazard numbers from the hazard list and describe how the hazard has been eliminated or reduced (safe design) or controlled by state-of-the-art means, giving priority where possible to safe design.

Safe design = S Control measure = C

No.	Measure applied to achieve the state-of-the-art	S	C
1		☐	☐
2		☐	☐
3		☐	☐
4		☐	☐
5		☐	☐
6		☐	☐
7		☐	☐
8		☐	☐
9		☐	☐
10		☐	☐
11		☐	☐
12		☐	☐
13		☐	☐
14		☐	☐
15		☐	☐
16		☐	☐
17		☐	☐
18		☐	☐
19		☐	☐
20		☐	☐

Step 5&6 - List the residual hazards & apply/check control measures

No.	**Residual hazard description** *(edit as appropriate)*	**Control measure** *(edit as appropriate)*
1	**The system will become unsafe if not correctly maintained.**	*Provide/check the suitability of the existing, operation and maintenance manual.*
2	**Users may not be aware of residual hazards and may not know how to use the system safely.**	*Provide/check the suitability of existing, operation and maintenance manual.*
3		
4		
5		
6		
7		
8		
9		
10		

Step 7 - Provide/check suitable operation and maintenance manual

☐ **User warnings and instructions suitable**

☐ **Maintenance instructions suitable**

Declaration

Machinery Directive Essential Health and Safety Requirements complied with

This section only needs to be included where the Machinery Directive applies (new or extensively modified systems), an explanation of the EH&SRs can be found in 4.1.3 *(edit as appropriate)*.

☐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
☐1.7.4. Instructions

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

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

MS Word versions of this document are available from the DHF website.

Annex B. Example certificate of compliance

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

☐ Non-contact presence detection 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 011:2019, is safe and at that time satisfied the legal obligations of both the owner and the maintaining company.

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

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

MS Word versions of this document are available from the DHF website.

Annex C.1. Example unsafe system notice

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: .....

MS Word versions of this document are available from the DHF website.

Annex C.2. Example system safety unknown notice

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.

MS Word versions of this document are available from the DHF website.

Annex D.1. Machinery Directive Declaration of Conformity

New and extensively modified systems

Declaration of Conformity

Company name: .....

Company address: .....

Description & unique identification: .....

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

- 2006/42/EC – Machinery Directive

The company additionally declares under its own authority that the system is also 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. Machinery Directive CE mark - new and extensively modified systems

<table>
<tr><td colspan="2">Company: .....</td><td>Address: .....</td></tr>
<tr><td rowspan="3">CE
2006/42/EC</td><td colspan="2">Year: .....</td></tr>
<tr><td colspan="2">Description: .....</td></tr>
<tr><td colspan="2">Unique identification no: .....</td></tr>
</table>

MS Word versions of these document are available from the DHF website.

Annex E. Example residual hazard control signs

Gate moves without warning

Keep clear
(Gate move towards you)

Trip hazard

Dangerous voltage within

Hazard tape

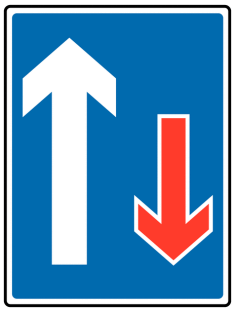
Hazard area

Stop

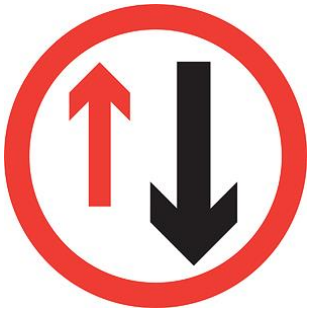
No entry

One way

Pedestrians



Priority over oncoming vehicles



Oncoming vehicles have priority

Annex F. 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 G. Training and competency

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

Unsupervised installer:

(i) basic health and safety, CSCS or similar

(ii) manual handling certificate

(iii) DHF Automated Gate Safety Diploma

(iv) locating underground services (where ground is broken) certificate

(v) asbestos awareness certificate (when working in buildings)

(vi) work at height training certificate (when working at height)

(vii) manufacturer's product training or company in-house product training certificates.

Supervised installer:

(i) basic health and safety, CSCS or similar

(ii) DHF Automated Gate Safety Certificate/Award

(iii) asbestos awareness (where asbestos might be encountered) - certificate

(iv) manual handling certificate

(v) locating underground services (where ground is broken) certificate

(vi) work at height training (where work at height is required) certificate

(vii) 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 and sign off all test reports, risk assessments and certificates of compliance.

Provision of electrical supply:

(i) BS 7671 C&G or ET 101 Irish equivalent

(ii) NVQ 2 (UK) or NFQ 4 (Republic of Ireland).

Welding:

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

Surveyor:

(i) basic health and safety - CSCS or similar

(ii) DHF Automated Gate Safety Certificate

(iii) product awareness in-house proof

(iv) work at height training (where work at height is required) certificate.

Specifier:

(i) DHF Automated Gate Safety Certificate

(ii) product awareness in-house proof.

In addition, many main construction sites will require that people working on site hold an appropriate CSCS card for the work they are undertaking. To achieve this, it will increasingly be necessary to achieve the appropriate NVQ 2 qualification. For gate and barrier installation and maintenance duties this will be the Door and Gate System Engineer NVQ with a gate and barrier endorsement to enable the issue of a Skilled Worker CSCS card.

DHF can arrange for NVQ delivery to member companies, non-members should contact NSAC (CITB - National Specialist Accredited Centre).

Annex H. 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 powered 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):

(i) the supplier of the complete system is responsible for compliance

(ii) the installation contractor must follow the supplier's installation instructions

(iii) 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

(iv) 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

(v) 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 powered 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:

(i) contact the supplier in writing explaining the apparent non-compliance, listing the exposed hazards and requesting a state-of-the-art solution

(ii) 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

(iii) where this action does not result in an acceptable solution the installation contractor has three remaining options:

- resolve the hazards with state-of-the-art modifications themselves and take over responsibility for compliance
- 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)
- 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.

Contact us for more information

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