BRITISH STANDARD

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Industrial, commercial and garage doors and gates — Safety in use of power operated doors — Requirements

The European Standard EN 12453:2000 has the status of a British Standard

ICS 91.060.50

National foreword

This British Standard is the official English language version of EN 12453:2000.

The UK participation in its preparation was entrusted by Technical Committee B/538, Doors, windows, shutters, hardware and curtain walling, to Subcommittee B/538/5, Industrial, commerical and garage doors and gates, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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Summary of pages

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EUROPEAN STANDARD

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English version

Industrial, commercial and garage doors and gates - Safety in use of power operated doors - Requirements

Portes équipants les locaux industriels, commerciaux et de garage - Sécurité à l'utilisation des portes motorisées - Prescriptions

Tore - Nutzungssicherheit kraftbetätigter Tore - Anforderungen

This European Standard was approved by CEN on 27 October 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 33 "Doors, windows, shutters, building hardware and curtain walling ", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2001, and conflicting national standards shall be withdrawn at the latest by May 2001.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This standard is part of a series of European Standards for industrial, commercial and garage doors and gates that are identified in prEN 13241:1998.

No existing European Standard is superseded.

This standard covers the requirements for power operated doors, based on hazardous situations which can be encountered when a door is used normally and also hazardous situations likely to occur because of foreseeable misuse.

The requirements specified in this standard are in the form of safety objectives. Where a technical means or solution is described, this should not be considered to be the only method of meeting the requirement, but simply an example.

Annex A is normative. Annex B is informative.

1 Scope

1.1 General

This standard specifies the performance requirements in regard of the safety in use for any type of power operated doors, gates and barriers intended for installation in areas in the reach of persons, and for which the main intended uses are giving safe access for goods and vehicles accompanied or driven by persons in industrial, commercial or residential premises.

1.2 Exclusions

It does not apply to

- lock gates and dock gates;
- doors on lifts;
- doors on vehicles;
- armoured doors;
- doors mainly for the retention of animals;
- theatre textile curtains;
- horizontally moving doors < 2,5 m wide and 6,25 m² area, designed principally for pedestrian use;
- revolving doors of any size;
- doors outside the reach of people (such as crane gantry fences);
- railway barriers;
- barriers used solely for vehicles.

1.3 Specific applications

Doors, gates and barriers can be of sliding, sidefolding, tilting, pivoting, rolling, vertical lifting and other types with many variances for each type. If not specified otherwise, the word "door" refers to any of these types and variances of doors, gates and barriers.

In the following, a power-operated door is considered as a whole. Nevertheless such a door can be the result of the implementation of a drive unit onto a manual door. In that case, this standard is applicable for the completed final installation.

Requirements for specific characteristics (such as fire resistance, blast-resistance, acoustic, escape route function, burglar resistance or thermal insulation, etc.) which certain doors are required to comply with, are not specified in this standard. If the specifications of a standard on the special characteristics of such doors are in conflict with the requirements of this standard, that standard has preference.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 418, *Safety of machinery – Emergency stop equipment, functional aspects – Principles for design.*

EN 954-1, *Safety of Machinery – Safety related parts of control systems – Part 1: General principle for design*.

EN 982, *Safety of machinery – Safety requirements for fluid power systems and their components – Hydraulics*.

EN 983, *Safety of machinery – Safety requirements for fluid power systems and their components – Pneumatics*.

EN 12433-1, *Industrial, commercial and garage doors and gates – Terminology – Part 1: Types of doors*.

EN 12433-2, *Industrial, commercial and garage doors and gates – Terminology – Part 2: Parts of doors*.

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

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

prEN 12635:1996, *Industrial, Commercial and garage doors and gates – Procedures for the safe installation and use.*

prEN 12978:2000, *Industrial, commercial and garage doors and gates – Safety devices for power operated doors and gates – Requirements and test methods.*

prEN 13241:1998*, Industrial, commercial and garage doors and gates – Product standard.*

EN 50081-1, *Electromagnetic compatibility – Generic emission standard – Part 1: Residential, commercial and light industry.*

EN 50081-2, *Electromagnetic compatibility – Generic emission standard – Part 2: Industrial environment.*

EN 50082-1, *Electromagnetic compatibility – Generic immunity standard – Part 1: Residential, commercial and light industry*.

EN 50082-2, *Electromagnetic compatibility – Generic immunity standard – Part 2: Industrial environment*.

EN 55014-1, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission – Product family standard (CISPR 14-1:1993).*

EN 55014-2, *Electromagnetic compatibility – Requirements for household appliances, electronic tools and similar apparatus – Part 2: Immunity - Product family standard (CISPR 14-2:1997).*

EN 60068-2-52, *Environmental testing – Part 2: Tests - Test Kb: Salt mist, cyclic (sodium chloride solution) (IEC 60068-2-52:1996).*

EN 60204-1:1997, *Safety of Machinery – Electrical equipment of machines – Part 1: General requirements (IEC 60204-1:1997).*

EN 60335-1:1994, *Safety of household and similar electrical appliances – Part 1: General requirements (IEC 335-1:1991, modified).*

prEN 60335-2-95:1999, *Safety of household and similar electrical appliances – Part 2-95: Particular requirements for drives for vertically moving garage doors for residential use (IEC 60335-2-95:1998, modified).*

EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989).*

IEC 60245-4*, Rubber insulated cables – Rated voltage up to and including 450/750V – Part 4: Cords and flexible cables.*

3 Terms and definitions

For the purpose of this standard, the terms and definitions EN 12433-1, EN 12433-2 and prEN 12978:2000 apply, together with the following:

3.1
inherent protective equipment
protective equipment integrated into the drive system which is actuated by the variations of the input and/or the output characteristics of the drive itself, in order to provide protection against hazards

3.2
domestic garage door
door used on a domestic garage which is provided for one single household only and where the door does not protrude into a public area

4 Hazards, hazardous situations, hazardous events

4.1 General

As the main function of a door is to open up or close off an opening, the actual movement of the door can produce hazardous situations for persons, goods and vehicles in the vicinity which by nature cannot all be avoided by design.

The possible hazards are dependant on the condition of the door and the way the door is used.

When door and equipment are in working order and either used correctly (i.e. as specified by the manufacturer in the instruction manual) or misused in a foreseeable manner, the hazards which can be generated by a power operated door are as follows:

4.1.1 Hazards caused by crushing, shearing and drawing-in points

A hazardous point is considered to exist up to a height of 2,5 m above the floor or any other permanent access level, and when it occurs:

– between the main closing edge of any door and an opposing edge, and between secondary closing edges of hinged, folding, tilting and sliding doors and opposing edges (e.g. see type a in Annex B);

– between closing edges and obstacles within the closing area of the leaf (e.g. see type b in Annex B);

– between leaves passing each other (e.g. see type c in Annex B);

– between leaves and the perimeter of openings in leaves and fixed parts in the vicinity (e.g. see type d in Annex B);

– between gaps and openings of the leaf which change in their size during the leaf movement (e.g. see type e in Annex B);

– at parts of the leaf which project;

– at moving parts of the drive which are capable of causing injury.

4.1.2 Hazards caused when the door can lift persons

If a power operated door, which opens upwards, can lift an adult or a child, this can lead to a foreseeable misuse which may create a dangerous situation, especially when the door is located in a public area. Therefore, each time a door can give a person a lift, a danger point is considered to exist, irrespective of its height above the floor, in the following locations:

– between leaves and fixed parts in the vicinity;

– in the neighbourhood of shafts or rising spindles of rolling doors.

4.1.3 Hazards caused by impact

Impacts between the moving door and a person may be dangerous because of the impact force from the door leaf.

4.2 Hazards caused by the drive or the source of energy

The drive or the source of energy used for power operation may create hazards such as:

– electric shock;

– fire from overheating;

– bursting, due to hydraulic or pneumatic over pressure;

– failure of electrical, pneumatic and hydraulic equipment;

– over travel of the door leaf after the drive is switched off;

– safety device failure.

4.3 Manual operation

When a power operated door has to be moved manually (e.g. in case of power supply failure), hazardous situations may exist when

– power operation can occur during manual operation;

– the manual operation handle or device is not properly shaped and/or located;

– the necessary manual effort is not related to the capability of the human body.

4.4 Other hazards

In addition to the hazards described above, the following hazards are likely to create dangerous situations:

4.4.1 Pass doors

When a pass door is fitted in the main door leaf, the power operation of the main door leaf whilst the pass door is not in the closed position may lead to a dangerous situation.

4.4.2 Trapping

The hazard of being trapped in areas between power operated doors or in rooms where a power operated door is the only means of escape, may exist.

NOTE The provision of safety distances to avoid crushing may have the effect of creating a room where trapping may then occur.

4.4.3 Overrunning of leaf

When the door leaf of a power operated door can overrun its final positions, the leaf may then fall down, thus creating a dangerous situation.

4.4.4 Hazards caused when the door is not in working order but used correctly

An abnormal state of the door may lead to an unintended movement of the door leaf which can create a hazardous situation. In particular such a dangerous situation exists when

– leaves can jump out of the guides (e.g. guide-rails, slide-channel, hinges);

– a raised leaf can fall down unintentionally, even due to mechanical failure.

4.4.5 Hazards caused when the door is not in working order and not used correctly

Hazards arising from the misuse of a power operated door which is not in working order are unforeseeable and therefore not considered.

4.4.6 Hazards caused by the locking devices

Interaction of locking device and drive may result in a hazardous situation, e.g. mechanical damages, derailment.

4.5 Influence of the type of use on the level of risk

The location of the door and the type of door control can have an influence on the level of risk created by a power operated door.

This level of risk increases when

– children, infirm or elderly persons are able to use the door;

– it is not possible to instruct, train or supervise the door users;

– it is not possible to select the persons who are the only ones allowed to operate the door (authorised persons);

– the number of persons who may come in contact with the power operated door is high;

– the number of users, and/or the frequency of use is high;

– the degree of automation is high.

Conversely, the level of risk is reduced when doors are used by a limited number of users, are not equipped with any automatic function and are not opening directly onto a public area, i.e. non automatic domestic garage doors used by one household only and which do not protrude directly onto a public area.

5 Requirements

5.1 General

Hazardous situations as listed in 4.1 shall be avoided or safeguarded.

Safety measures specified in 5.1.1 to 5.1.3 to protect persons shall be considered sufficient to also protect goods and vehicles.

5.1.1 Avoiding or safeguarding hazards caused by crushing, shearing and drawing-in points

All danger points as listed in 4.1.1 shall be avoided or safeguarded.

This can be achieved by one or a combination of the following measures:

– creating safety distances;

– installing guards such as enclosures, covers, enclosing guards, fixed protection leaves;

– shaping in a proper way any leaf surfaces and parts which protrude;

– operating the door in the hold to run control mode;

– limiting the forces generated by the door leaf when meeting a person or an obstacle;

– installing sensitive protective equipment (PSPE or ESPE).

For doors with a reduced level of risk according to 4.5, it may be acceptable to safeguard only the main edge movement (see 5.5.2).

NOTE 5.5 specifies some combinations.

5.1.1.1 Safety distances

Crushing, shearing and drawing-in points are avoided if safety distances, which are related to the endangered parts of the human body, are provided.

When safety distances are dependant on the installation and the site conditions, the installation instructions shall precisely describe the method of ensuring that the safety distances are effective after the installation is completed. Safety distances cannot be applied to the safeguarding of main closing edges.

NOTE Annex C in EN 12604 contains examples for safety distances with the minimum dimensions.

5.1.1.2 Guards

Guards such as enclosures, covers, enclosing guards, fixed protective leaves (screens), shall be designed to fulfil the following requirements:

– the danger points are safeguarded up to a height of 2,5 m above the floor or any other permanent access level;

– they are firm and resilient in respect of their safety-related function;

– they can be loosened only by a tool;

– they do not create additional hazards

and

– they can not be easily defeated, bypassed or made ineffective.

5.1.1.3 Shaping of leaf surfaces and parts which project

Sharp edges shall be avoided in the design of the door leaf.

Protruding parts which may cause injuries should be avoided in the design of the door leaf.

NOTE Injuries caused by protruding parts may be avoided, e.g. by suitable shaping or covering.

5.1.1.4 Hold-to-run-control

Hold-to-run-controls shall be designed and installed in order to fulfil the following requirements:

– the door leaf shall stop when the manual control device is released. The overrun distance of the door leaf, after the control has been released, shall be not > 50 mm when the opening gap is ≤ 500 mm and not > 100 mm when the opening gap is > 500 mm. Alternatively the door leaf shall be fitted with a deformable closing edge where the available deformation shall be more than the stopping distance which shall result in a static force of no greater than 150 N on a 80 mm diameter test piece;

– the leaf movement shall not be initiated by manual controls other than hold to run controls;

– the person controlling the door shall be in full view of the door and in the vicinity of the door during the leaf movement and shall not be in a hazardous position himself;

  NOTE Remote control devices can be used as hold to run controls only if designed to meet the requirements specified in the 3rd indent above.

– the manual actuators shall meet the requirements of 5.2.8;

– the speed of the main edge shall be < 0,5 m/s. In case of two main edges, e.g. bi-folding doors, the speed of closing the gap shall not exceed 0,5 m/s;

– operation of the door by unauthorised persons, as specified in 5.5, shall be prevented either by technical means or specific organisation.

If these requirements are fulfilled then other safety devices for safeguarding of crushing, shearing and drawing-in points are not needed.

5.1.1.5 Limitation of forces

Forces shall be considered to be safe if the values specified in Annex A are not exceeded, when measured according to EN 12445 with an instrument incorporating a spring through a plate of 80 mm diameter. The spring shall have a spring ratio of 500 N/mm and the rising/falling time of the amplifier shall not be > 5 ms.

5.1.1.5.1 Force limiting devices

When limitation of forces is achieved through protective equipment, such equipment shall be designed to meet the requirements specified in 5.1.1.6 and in prEN 12978 : 2000.

5.1.1.5.2 Safeguarding crushing points by force limitation

Crushing points may be safeguarded by limitation of the forces.

The reversing function, if provided, can be excluded as soon as the closing gap is < 50 mm for a vertically moving door and < 25 mm for a horizontally moving door.

5.1.1.5.3 Safeguarding shearing points by force limitation

Shearing hazards occurring between secondary closing edges can be safeguarded by limitation of forces measured at the secondary closing edges to less than 150 N static and less than 400 N dynamic in addition to

– either a distance of at least 25 mm between passing edges

– or the passing edges shall be provided with round edges with radius of at least 2 mm for each edge and a combined radius (sum of the 2 radii) of at least 6 mm (e.g. at least 2 mm + 4 mm or 3 mm + 3 mm).

5.1.1.5.4 Safeguarding drawing-in points by force limitation

Drawing-in points cannot normally be safeguarded by limitation of forces only. Therefore, the values specified in Annex A cannot be considered as relevant to the safeguarding of drawing-in points.

5.1.1.6 Sensitive protective equipment

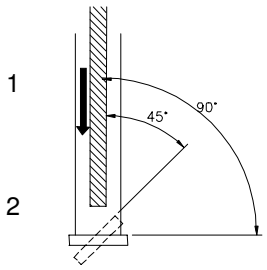
In normal operation, pressure sensitive protective equipment (PSPE), electro-sensitive protective equipment (ESPE) and inherent (built into the drive) protective equipment shall be designed so that

a) when they are in working order, they respond by giving an appropriate output signal(s)

– when part of a person is in the detection zone of the ESPE,

– or when a person applies the activating force at any point within the active area of the PSPE sensing element,

– or when closing on a test piece positioned at any angle between 90° and 45° to the direction of the motion if the signal from the sensing unit is within a specified signal range for inherent systems (see figure 1).



Key
1 Direction of motion
2 Test piece

Figure 1 — Positioning of test piece

b) the control command for stopping the hazardous leaf movement (off state of the output signal switching device) is maintained for so long as the protective device is actuated, or until a signal for reversing the direction of movement of the door leaf is given;

c) a device will prevent forces delivered at any point of main and/or secondary edges from being beyond those specified in Annex A, or will ensure that, in no circumstances, a person can be touched by the moving door leaf. For PSPE, the forces can be exceeded for the extreme 30 mm of each end, but the device shall remain active;

d) the danger points are safeguarded up to a height of 2,50 m above the floor in a way that unprotected zones of the danger points do not remain;

e) if a single fault occurs in the components between the sensing unit and the door control (i.e. interconnecting elements, control, monitoring function, OSSD), which prevents the control signal from stopping the leaf movement:

– either they maintain their protective function if according to category 3 or 4 of EN 954-1;

– or they are monitored according to category 2 of EN 954-1, with the acceptable deviation that the check of the safety function can be done at the latest at one of the final end positions of the leaf, i.e. the check need not take place before the hazardous leaf movement. If a fault is detected, an appropriate signal shall initiate a command to prevent any further endangering leaf movement, or the control shall switch over automatically to a hold-to-run control (see 5.1.1.4).

f) if a single fault occurs in the sensing unit preventing the control signal from stopping the leaf movement:

– either it maintains its protective function according to category 3 or 4 of EN 954-1

– or it is monitored according to category 2 of EN 954-1, with the acceptable deviation that the check of a signal from the sensing unit can be done at the latest at one of the final end positions of the leaf, i.e. the check need not take place before the hazardous leaf movement. If a fault is detected, an appropriate signal shall initiate a command to prevent any further endangering leaf movement, or the control shall switch over automatically to a hold-to-run control (see 5.1.1.4). If not all possible occurrence of non-active areas can be detected, periodic checks, at intervals not greater than six months, covering the whole active area shall be specified in the maintenance instructions for the door.

NOTE The periodic checks specified in the instructions may be carried out by the user or any other organisation.

g) they meet the requirements of prEN 12978:2000.

5.1.2 Safeguarding against hazards caused when doors can lift persons

Hazardous situations listed in 4.1.2 for vertically moving doors, shall be avoided by either:

– limiting the force available at the door leaf

or

– preventing anyone from travelling with or being lifted by the door

or

– installing hold to run control in combination with a key switch or similar

or

– stopping the door movement by a protective equipment when any person is lifted and before any part of the person reaches any hazardous locations, e.g. at the lintel or other fixed parts of the building or parts of the mechanism of the door.

5.1.3 Safeguarding against impact hazard

Injuries to persons generated by impact of the moving door leaf, for doors not operated under the hold to run control mode, as described in 4.1.3, shall be avoided by:

– limiting the dynamic force developed by the door leaf to the values as specified in Annex A, when measured according to EN 12445

or

– ensuring that in no circumstances can a person be touched by the moving door leaf.

NOTE Vehicles moving at a too high speed compared with the speed and position of the door leaf, can still come in contact with the moving door, thus creating damages to the door itself. Though it is foreseeable that this may occur with any automatically controlled door, such a situation cannot be avoided nor safeguarded by standardised solutions. Depending on site conditions, the following may be helpful, in particular for automatic and remote controlled doors:

a) to provide adequate lighting of the area where the door is installed in order to prevent it from moving in the dark;

b) to install signs in order to inform the users about the automatic operation;

c) to give advanced warning signals in order to inform when the door is moving or going to move, like flashing lights with or without preflashing;

d) to install traffic lights in order to regulate vehicular traffic whenever this is needed;

e) to incorporate in the door construction a break-away function in order to decrease the level of damage to the door which could result from an impact;

f) to install additional devices to provide an advanced detection of vehicles thus giving time for the door leaf to reverse.

Because these warnings or functions are not increasing the safety of the door but only decreasing the risk of occurrence of some foreseeable possibly dangerous situations due to external factors, they are not required as safety measures for the door itself. Should they be required by the door user or be required by specific national regulations, they should not interfere with the other safety requirements.

5.2 Drive systems and power supply

All hazards, listed in 4.2, shall be avoided or safeguarded.

5.2.1 Electrical drive units

Electric drive units for all kind of doors and gates shall meet the requirements of EN 60335-1:1994 which applies with the following exceptions and additions:

– Clause 1 is applicable except the first indent of NOTE 3;

– Clause 4 is applicable except:

> – 4.2 which is replaced by the following: "When a test has to be carried out with a door, that door, specified as suitable for installation with the drive, which gives the most unfavourable condition, is used and adjusted in accordance with the instruction for installation for that test";
>
> – 4.7 which is modified as follows: "The tests are made in a draught free location, and in general at a temperature of +20 °C ± 5 °C. If temperature has influence on the performance, the safety related test shall be performed at the most unfavourable temperature within the temperature range specified by the manufacturer";
>
> – 4.101 which is added: "Where it is indicated that a test can be carried out without a door, it means that the test can be carried out with a plate or similar device at the most unfavourable size and load within the specifications of the manufacturer, to simulate the door".

– Clause 6 is applicable with the following addition in 6.2: "Drives or parts of drives which can be exposed to outdoor conditions shall be at least IPX4";

– Clause 7 is applicable with the following amendments:

  – in 7.1 is added: "The rated output force or torque shall be marked";

  – 7.12 is not applicable;

  NOTE 7.12 is replaced by prEN 12635.

  – 7.13 is not applicable.

– Clause 8 is applicable with the following addition in 8.2: « Parts separated from live parts by basic insulation only may be touched during adjustment if a tool is needed to gain access to the adjustment means »;

– Clause 9 is not applicable;

– Clause 10 is applicable except as follows:

  – 10.1 is modified as: "Instead of determining the mean value, the power input is determined as the maximum value, the effect of inrush currents being ignored";

  – 10.2 is modified as: "Instead of determining the mean value, the current is determined as the maximum value, inrush current being ignored".

– Clause 11 is applicable except 11.7 which is replaced by: "Drives which are designed for continuous operation are operated for consecutive operating cycles, until steady state conditions are reached. Other drives are operated for five cycles of opening and closing or the rated number of operating cycles, whichever is the greater, by simulating the operation of the most unfavourable door in size and weight according to the manufacturers specification, without rest periods";

– Clause 18 is not applicable;

– Clause 19 is applicable except as follows:

  – in 19.13 is added the following: "After each test, if the drive can still be operated, it shall comply with 5.1.1.5 of prEN 12453 : 2000".

– Clause 20 is not applicable;

– Clause 22 is applicable except 22.22 which is modified as: "Asbestos shall not be used in the construction of the drive";

– Clause 24 is applicable with the following addition in subclause 24.1.3: "The number of cycles of operation for switches which disconnect the appliance when the manual release is operated is 300";

– Clause 25 is applicable with the following addition in 25.7*:* "The supply cord of drives for outdoor use shall not be lighter than ordinary polychloroprene sheathed flexible cord (code designation 245 IEC 57 according to IEC 60245-4";

– Clause 30 is applicable except 30.2.2;

– Clause 31 is applicable with the following addition:

  "For parts intended to be installed outdoors, compliance is checked by the salt mist test of EN 60068-2-52, severity 2 being applicable.

Before the test, coatings are scratched by means of a hardened steel pin, the end of which has the form of a cone with an angle of 40°. Its tip is rounded with a radius of 0,25 mm ± 0,02 mm. The pin is loaded so that the force exerted along its axis is 10 N ± 0,5 N. The scratches are made by drawing the pin along the surface of the coating at a speed of approximately 20 mm/s. Five scratches are made at least 5 mm apart and at least 5 mm from the edges.

After the test, the appliance shall not have deteriorated to such an extent that compliance with this standard, in particular with clauses 8 and 27, is impaired. The coating shall not be broken and shall not have loosened from the metal surface".

5.2.2 Electrical equipment

The electrical equipment outside the drive unit has to be designed and constructed in reference to EN 60204-1:1997 with the following exceptions or additions:

– 4.4.3: Special agreement between the supplier and the client may be necessary in applications where the temperature deviates from the range +5 °C to + 40°C;

– 9.2.3 is not applicable in cases where an automatic switching to dead man control, due to a detected fault within a protective equipment, has taken place;

– 9.2.4: Limitation of motion speed or power or limitation of the range of motion are not allowed in cases where it is necessary to suspend one or more safeguards;

– 9.2.5.2 is replaced by the following: “The start of an hazardous operation, in any other mode than hold-to-run control, shall be possible only where all of the safeguards are in place and no fault has been detected according to 5.1.1 of prEN 12453:2000. Suitable interlocks shall be provided to ensure correct sequential starting”;

– 9.2.5.3 is not applicable;

– 9.2.5.4 is not applicable;

– 9.2.5.5 is not applicable;

– Addition to 9.2.7.1: Cable less control functions shall not be operational under dead-man control mode of operation, unless the control is capable of operation only when in direct sight of the door;

– 9.2.7.3, 9.2.7.4 and 9.2.7.5 are not applicable;

– 9.3.2 is not applicable;

– 9.4.2.2 and 9.4.2.3 are not applicable in safety related circuits;

– 9.4.2.4 is not applicable;

– 10.7.1 is not applicable;

NOTE Emergency stop devices at each operator control station may cause inconveniences since they may be misused and therefore preventing the door from normal operation.

– Addition to 11.3.3: This clause is only applicable on equipment where it is possible to change the software on site

– 14.5.9 need not be applied since the motor may form an integrated part of the door drive mechanism;

– Modification to 15.4: Motors may be an integrated part of the door construction, (e.g. tubular drives used in roller shutters) and need therefore not be accessible for inspection and maintenance.

5.2.3 Hydraulic drive units

Hydraulic drive units shall especially meet the requirements of EN 982.

Hydraulic drive systems shall be equipped with a means to protect them against over pressure and a means which makes provision for the connection of a measuring gauge.

The drive systems shall be able to resist three times the working pressure.

When a total loss of pressure occurs in the system, the construction shall be such that the door stops in accordance with 5.2.7 or continues to operate at normal speed until it reaches a final end position where the fault is detected and further movement shall be prevented.

Vertically moving doors shall be safeguarded against falling down in accordance with EN 12604.

The design of the system should discourage the entrapment of air.

NOTE As air is compressible, any mixture of air with the hydraulic fluid will affect the compressibility of the fluid resulting in a dangerous hydraulic action.

In any case of power interruption, the hydraulic system shall not create any hazardous situation.

5.2.4 Pneumatic drive units

Pneumatic drive units shall especially meet the requirements of EN 983.

Pneumatic drive units are not allowed to be operated at a working pressure $>$ 1,2 MPa.

Pneumatic drive units shall be equipped with a means to adjust the working pressure, to protect them against over pressure and a means which makes provision for the connection of a measuring gauge.

Pneumatic drive units shall be able to stand three times the working pressure.

Drive systems shall be constructed so that uncontrolled hazardous movements because of air compressibility are avoided.

5.2.5 Controls

Users and other persons shall be protected from the hazards arising from failures or faults in controls, control systems and control functions.

The parts of door controls which are also part of safety devices such as

– control devices for limitation of forces;

– control units and output signal switching devices of protective equipment;

– control devices for limiting the leaf travel

shall be designed so that they comply with the requirements of the safety category required for safety devices in respect of their behaviour in case of a fault (see 5.1.1.5, 5.1.1.6, 5.4.3).

5.2.6 Switching on of the drive

The drive shall be switched on by manual activation devices which are designed for impulse and/or automatic and/or remote-controlled and/or programmed control operation, only if the danger points of the door are avoided or safeguarded in accordance with the requirements of 5.1.

When danger points are eliminated by safety distances, fixed guards and/or proper shaping, the above requirement does not apply.

Under the automatic mode of operation, the door leaf may move to the fully open position and stop, or the door leaf may automatically move to the closed position after a period of time at the fully open position.

NOTE The application of impulse, automatic and remote-control as well as a reversal of the leaf movement have been made possible by this requirement.

5.2.7 Switching off of the drive

There shall be devices which bring the leaf movement to a standstill after switching off of the drive or after interruption of power supply if this can result in a hazardous leaf movement (e.g. brakes or self stopping gear).

The stop functions shall normally function as category "0" stop (see EN 418).

The overrun distance of the door leaf after the stop command has been activated, shall not be $>$ 50 mm when the opening gap is 500 mm and not $>$ 100 mm when the opening gap is $>$ 500 mm. Alternatively the door leaf shall be fitted with a deformable closing edge where the available deformation shall be more than the stopping distance which shall result in a static force not greater than 150 N.

5.2.7.1 Stop command

The leaf movement shall stop and the drive shall be switched off as soon as a stop-command is given by one of the following:

– releasing hold-to-run controls;

– a stop control device;

– an emergency stop command device in accordance with EN 418;

– devices which operate if a fault occurs within the leaf travel limiting device;

– devices which detect slackness in the suspension system e.g. wire rope, chain, strap;

– switches of anti-drop devices;

– interlocking switches of the manual operation.

5.2.7.2 Power supply interruption

In case of failure or interruption of the power supply during movement of the door, restart shall not lead to a dangerous situation.

5.2.8 Manual actuators

Manual actuators shall be designed so that

– when fixed, the person who operates the actuators is not in a hazardous position,

– unintended operation of the manual actuators is prevented.

5.2.9 Supply disconnection

Each door with an electrical drive unit shall be equipped with a supply disconnecting device which will disconnect all incoming sources of supply. If the electrical drive unit is connected via a plug-in system, another supply disconnecting device is not necessary insofar as the plug-in system can be used for isolation purposes in accordance with the generally accepted standards of engineering.

The supply disconnecting device including plug-in systems shall be designed or safeguarded against unintentional and unauthorised reconnection of the supply.

For domestic use, the supply disconnecting device including plug-in systems need not be designed to be safeguarded when they are located in vicinity of and in direct view from the drive unit. The supply disconnecting device shall be protected against possible misuse by children.

5.2.10 Electromagnetic compatibility (EMC)

Doors shall fulfil the requirements for emission in EN 50081-2 and for immunity in EN 50082-2.

Doors intended to be installed only in commercial or residential areas shall fulfil the requirements for emission in EN 50081-1 and for immunity in EN 50082-1.

Domestic garage doors, designed exclusively for single household use, need only fulfil the requirements for emission in EN 55014-1 and for immunity in EN 55014-2.

5.3 Manual operation

If a manual operation is possible on a power operated door, it shall be designed so that the manual operation can be carried out without risk.

5.3.1 Interlocking of manual and power operation

If power operated door leaves are designed so that they can be moved manually, the manual and power operated system shall be equipped with a disconnection or interlocking device when the power operated mechanism has a dangerous influence over the manually operated mechanism.

5.3.2 Devices for manual operation

If doors are designed to permit manual operation by direct operation of the leaf, then handles, ledges, handplates or similar devices shall be provided to enable the leaf to be operated manually without risk.

5.3.3 Position of devices for manual operation

Devices for manual operation shall not be located in the immediate neighbourhood of crushing, shearing and drawing-in points and shall not form crushing and shearing points with fixed or movable parts of the surroundings or of the door, e.g. with walls or counter closing edges.

5.3.4 Crank handles as devices for manual operation

Crank handles provided as devices for manual operation shall not be able to fly back. They shall be safeguarded against slipping off and unintentional removal. They shall be permanently stored in direct vicinity of the door.

5.3.5 Human physical strength for manual operation of the door leaf

In case of drive failure, and if the door is designed for manual operation, the human physical effort which is needed to operate the door may exceed the values stated in EN 12604 by not more than 50 %.

5.4 Additional hazards

Hazardous situations listed in 4.4 shall be avoided or safeguarded.

5.4.1 Pass doors

If a pass door is fitted in the leaf of a power-operated door it shall be provided with a device which prevents movement of the drive when the pass door is not fully closed and stops the door movement if the pass door is opened.

NOTE This can be achieved by e. g. a force operated switch with respect to both its function and its mechanical actuator, or an electronic terminal limit control which in case of failure, either maintains its protective function or is monitored according to category 2 of EN 954-1, or any other similar device.

5.4.2 Trapping hazard

It shall not be possible for persons to be trapped in areas between power operated doors e.g. lobbies, sluices, nor in rooms where a power operated door is the only means of escape, e.g. one-car garage.

In case of a failure of the drive or of the power supply, and when the door is the only possible means of exit, the trapped person shall be able to move the door manually either by decoupling the drive from the door leaf or by actuation of the drive by easily accessible means.

NOTE 1 This is not applicable to any emergency exit situation which is covered by specific rules.

NOTE 2 Trapping hazards can be eliminated by either installation of an alternative exit or by a pass-door.

5.4.3 Leaf travel limiting devices

The door leaf shall stop automatically and safely at its terminal travel positions. In these terminal positions, the door leaf shall remain in a safe state and shall not create any hazard.

NOTE This requirement can be fulfilled e.g. by

- either a mechanical fixed stop e.g. buffers, which can withstand the maximum force or torque of the drive unit plus the energy of the moving door leaf together with an electrical or electronic terminal limit control
- or by a drive unit with a fixed length of mechanical stroke, such as a linear motor or pneumatic or hydraulic drive unit with internal ramp stops
- or by a drive unit combined with an electrical or electronic terminal limit control plus an ultimate limit control, which in case of a fault of the terminal position control, is arranged to disconnect the power supply of the drive unit and stop the leaf movement, requiring the door to be manually reset
- or by an electronic terminal limit control which, in case of failure, either maintains its protective function, or is monitored according to category 2 of EN 954-1.

5.4.4 Unintended movement of the door leaf

Hazardous situations listed in 4.4.4 shall be avoided or safeguarded in accordance with EN 12604.

In particular, vertically moving doors shall be safeguarded against falling back following activation of the manual release, if available, after a failure has occurred in the balancing or suspension system.

5.4.5 Locking device

When a locking device is fitted on a power operated door, the interaction of this device with the power operation shall not cause any dangerous situation.

5.5 Minimum level of safeguarding

The level of safeguarding at the main closing edge of a power operated door shall be related to the expected level of hazard as described in 4.5.

These minimum levels may be increased by the addition of extra safety features in order to meet either specific national regulations or particular site risk analysis.

The levels are based on three different types of use specified as follows:

– Type 1: A limited group of persons are trained to operate the door and the door is out of public area;

– Type 2: A limited group of persons are trained to operate the door and the door is located in a public area;

– Type 3: Any person is free to operate the door and the door is in contact with the general public.

NOTE 1 Persons can be considered as “trained” if the employer, the premises supervisor or the premises owner has allowed them to use the door and has advised them how to use the door.

NOTE 2 A group of persons can be considered to be "limited" if the group consists of identified employees of a company, identified members of a family, or identified persons sharing a block of flats.

5.5.1 General requirements

The minimum levels of safeguarding of the main edge related to the way the door is used, are listed in Table 1 according to the following abbreviations:

– A: Hold-to-run push button control;

– B: Hold-to-run control with key switch or similar;

– C: Limitation of forces according to Annex A, either by force limiting devices according to 5.1.1.5 or by safeguarding devices according to 5.1.1.6;

– D: A means for detection of presence of a person or an obstacle standing on the floor at one side of the door. When combining two safeguarding systems, e.g. C and D, the D-means shall not necessarily fulfil 5.1.1.6; in this case, periodic checks of the D-device, at intervals which may not exceed six months, shall be specifed in the maintenance instructions of the door;

– E: A means for detection of presence which is designed and installed in a way that in no circumstances can a person be touched by the moving door leaf. Such a means has to fulfil 5.1.1.6.

Table 1 — Minimum levels of safeguarding at main edge

Type of door activation	**Types of use**		
	Trained users (no public) Type 1	Trained users (public) Type 2	Untrained users Type 3
Hold to run control	A	B	not possible
Impulse activation in sight of the door	C or E	C or E	C and D, or E
Impulse activation out of sight of the door	C or E	C and D, or E	C and D, or E
Automatic control	C and D, or E	C and D, or E	C and D, or E

NOTE In cases where contact with the moving door leaf does not create any risks of injury or damage, the D-type means may not be necessary.

5.5.2 Power operated domestic garage doors for one household only

With reference to 5.1.1, non automatic one single household vertically moving domestic garage doors, excluding those which open onto public access areas, may deviate from 5.1.1 to 5.3.5 if these doors are driven by drives which fulfil all requirements of prEN 60335-2-95:1999.

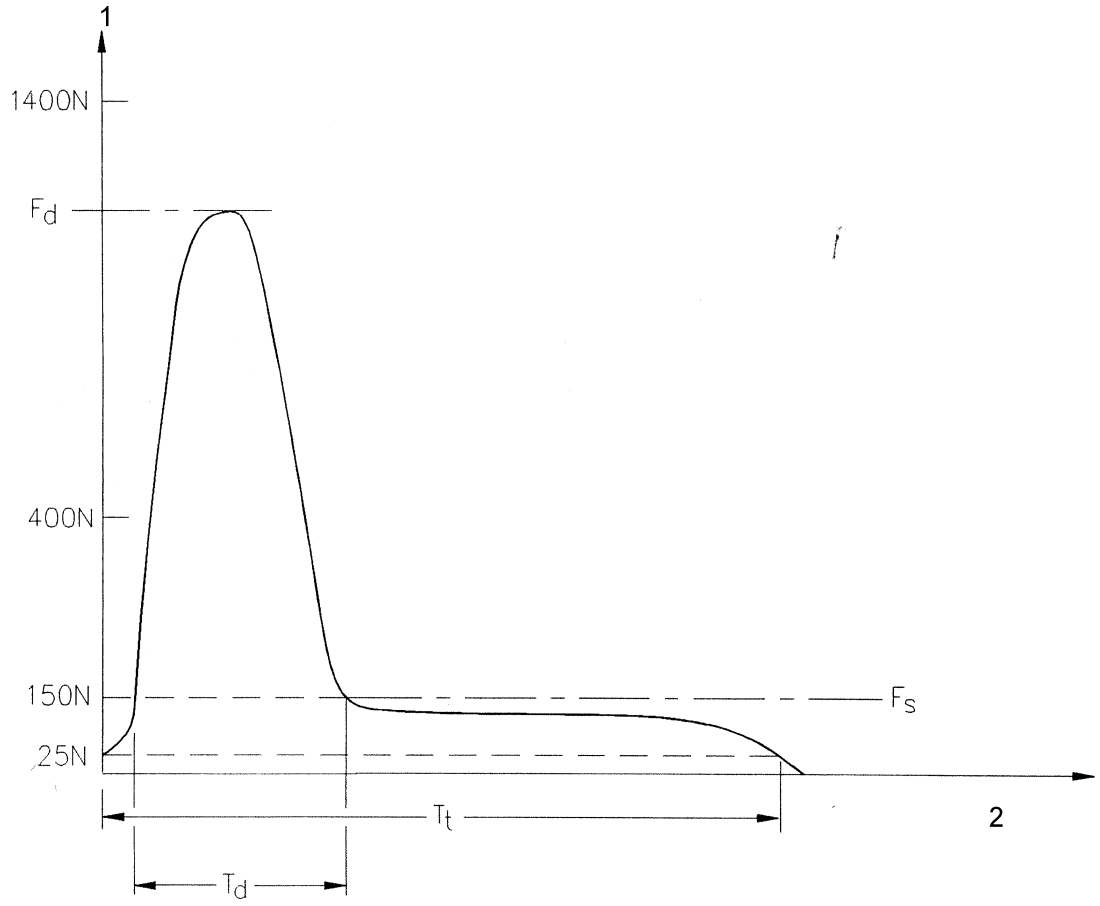
When domestic garage doors for one household are operated in the hold to run mode of operation, the actuator shall be of type B only (see 5.5.1).

Annex A
(normative)

Limitation of forces

A.1 Specifications

The admissible values in reference to the requirements specified in 5.1.1.5 are according to the following specifications:



Key
1 Force
2 Time

Figure A.1 — Force versus time

Fd Maximum force measured with the instrument as specified in 5.1.1.5, during the dynamic period Td

Fs Maximum force measured with the instrument as specified in 5.1.1.5, outside the dynamic period Td

Td Period of time during which the measured force exceeds 150 N

Tt Period of time during which the measured force exceeds 25 N

NOTE The forces shown relate to measurements made in accordance with the testing method specified in EN 12445.

A.2 Admissible dynamic forces

A.2.1 Admissible dynamic force

The maximum dynamic force Fd, is defined in A1.

The values of dynamic force, when force measurements are made at any point using the test method specified in EN 12445 shall not exceed the values specified in Table A.2.1.

Table A.2.1 — Admissible dynamic forces

Admissible dynamic forces	between closing edges and counterclosing edges		between flat areas other than closing edges and counterclosing edges, > 0,1 m² with no side < 100 mm
	in gaps from 50 mm to 500 mm	in gaps > 500 mm	
horizontally moving door	**400 N**	**1400 N**	**1400 N**
door rotating around an axis perpendicular to the floor	**400 N**	**1400 N**	**1400 N**
vertically moving door	**400 N**	**400 N**	**1400 N**
door rotating around an axis parallel to the floor - barriers	**400 N**	**400 N**	**1400 N**

The values specified in Table A.2.1 are maximum values allowed within a period of time of maximum 0,75 s (Td ≤0,75 s).

A.2.2 Admissible static force

After Td has elapsed, no static force > 150 N is allowed. This static force shall come down to < 25 N after a total time Tt of maximum 5 s.

This limitation of Tt to 5 s can be disregarded under the condition that the force never reaches 50 N provided that the door can be pushed back to a distance of at least 50 mm with a force < 50 N.

However, after Td, peaks will be accepted, if

– they are decreasing from one to the other

and

– the period of oscillation is 1 s

and

– the average force calculated over the "static" period is 150 N.

Annex B
(informative)

Examples of hazardous locations

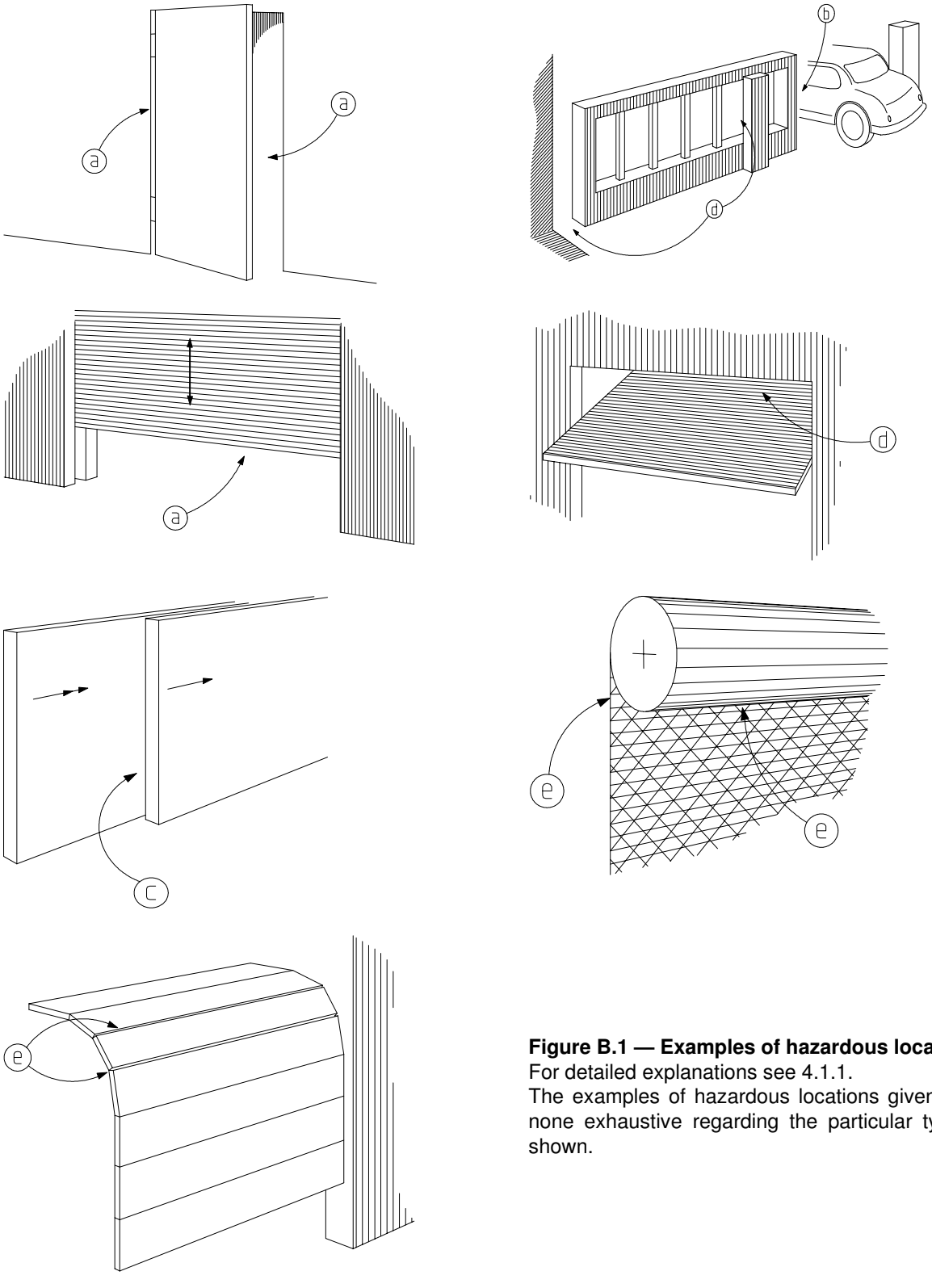


Figure B.1 — Examples of hazardous locations
For detailed explanations see 4.1.1.
The examples of hazardous locations given above are none exhaustive regarding the particular type of door shown.

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