

8.4.2 Compliance criteria

*Where a sharp edge or corner is required to be **accessible** for the function of the equipment, compliance is checked by inspection.*

*Where a sharp edge or corner is not required to be **accessible** for the function of the equipment compliance is checked by the relevant tests of Annex V. During and after the application of the force, the sharp edge or corner shall not be **accessible**.*

8.5 Safeguards against moving parts

8.5.1 Requirements

Safeguards that reduce the likelihood of injury caused by moving parts of the equipment (for example, pinch points, meshing gears and parts that may start moving due to unexpected resetting of a control device) are specified below.

Plastic fan blades are classified according to Table 35, line 3a. Other fan blades are classified according to Table 35, line 3b. Other moving parts are classified according to Table 35, line 2.

NOTE 1 The ability of a part to cause injury is not solely dependent upon the kinetic energy it possesses. Consequently, the classification used in this standard can only be based on typical experience and engineering judgement.

NOTE 2 Examples of factors influencing the energy transfer to a body part include shape of the surface that strikes the body part, elasticity, velocity and the mass of equipment and body part.

If a **safety interlock** is used as **safeguard**, it shall comply with Annex K. The movement of the part shall be reduced to MS1 before the part is **accessible**.

Unless otherwise specified, where the likelihood exists that fingers, jewellery, clothing, hair, etc., can come into contact with moving MS2 or MS3 parts, an **equipment safeguard** shall be provided to prevent entry of body parts or entanglement of such items.

If a moving MS2 part is required to be **accessible** for the function of the equipment to an **ordinary person** or a moving MS3 part to an **ordinary person** or an **instructed person**:

- any exposure shall not be life threatening; and
- the moving part shall be obvious when exposed; and
- the moving part shall be guarded as much as practicable; and
- an **instructional safeguard** as given in 8.5.2 shall be used; and
- for MS3, a manually activated stopping device shall be clearly visible and placed in a prominent position within 750 mm of the MS3 part.

Moving MS3 parts:



- that are only **accessible** to a **skilled person**; and
- where the MS3 moving part is not obvious (for example, a device having intermittent movement),

shall have an **instructional safeguard** as given in 8.5.2. Unless the moving part is arranged, located, enclosed or guarded in such a way that the possibility of contact with the moving parts is unlikely, a stopping device shall be placed in a clearly visible and prominent position within 750 mm of the MS3 part.

8.5.2 Instructional safeguard requirements

An **instructional safeguard** shall be provided to reduce the likelihood of unintentional contact with a moving part in accordance with Clause F.5, except that element 3 is optional.

The elements of the **instructional safeguard** shall be as follows:

- element 1a:  IEC 60417-6056 (2011-05) for moving fan blades or
 IEC 60417-6057 (2011-05) for other moving parts
- element 2: “Moving parts” or “Moving fan blade” as applicable, or equivalent text
- element 3: optional
- element 4: “Keep body parts away from moving parts” or “Keep body parts away from fan blades” or “Keep body parts out of the motion path” as applicable, or equivalent text

During **ordinary person** servicing conditions, where it is necessary to defeat or bypass the **equipment safeguard** preventing access to a moving part classified as MS2, an **instructional safeguard** shall be provided to:

- disconnect the power source prior to defeating or bypassing the **equipment safeguard**; and
- restore the **equipment safeguard** before restoring power.

8.5.3 Compliance criteria

The accessibility of moving parts shall be checked by inspection and, if necessary, be evaluated according to the relevant parts of Annex V.

8.5.4 Special categories of equipment comprising moving parts

8.5.4.1 Large data storage equipment

The requirements of IEC 60950-23 are additional to the relevant requirements in this standard.

Large equipment is typically of such a size that a person may enter completely. Systems may also include similar equipment having areas containing moving parts into which only a complete limb or head may enter. These requirements apply to a three dimensional envelope of 0,75 m³ or more within reach of the moving part.

The following references in IEC 60950-23 shall be treated as follows:

- replace IEC 60950-1:2005, 2.8 by Annex K;
- replace IEC 60950-1:2005, 2.8.6 by Clause K.4;
- replace "SERVICE PERSON" by "**skilled person**";
- replace "OPERATOR ACCESS AREA" by "areas **accessible** by an **ordinary person** as determined by Annex V".

NOTE An example of these systems is a self-contained data storage system.

8.5.4.2 Equipment having an electromechanical device for destruction of media

8.5.4.2.1 General requirements

Equipment safeguards to protect persons, including children, for equipment intended to mechanically destroy various media by means of moving parts that draw the media into the equipment are specified below. The media destruction device within this equipment is classed as MS3.

NOTE 1 Examples of this type of equipment include household use and home-office use document shredding and similar media destruction devices, as determined by the nature of their power source.

For equipment for use in locations where children are not likely to be present, see Clause F.4.


NOTE 2 This equipment design typically applies to commercial or industrial equipment expected to be installed in locations where only adults are normally present.

Equipment shall be provided with **safeguards** so that MS3 moving parts are not **accessible** to the appropriate jointed test probe of Annex V and the wedge probe of Figure V.4. Requirements for **safety interlocks** are according to Annex K, except that where a moving part cannot be reduced to the appropriate energy class within 2 s, the **safety interlock** shall continue to prevent access.

8.5.4.2.2 Instructional safeguards against moving parts

For equipment installed where children may be present, an **instructional safeguard** shall be provided in accordance with Clause F.5, except that element 3 is optional.

The elements of the **instructional safeguard** shall be as follows:

- element 1a: , IEC 60417-6057 (2011-05)
- element 2: optional
- element 3: optional
- element 4: “This equipment is not intended for use by children” and “Avoid touching the media feed opening with the hands, clothing or hair” and “Unplug this equipment when not in use for an extended period of time” or equivalent text

8.5.4.2.3 Disconnection from the supply

An isolating switch complying with Annex L shall be provided to disconnect power to MS3 moving parts. A switch with an “OFF” position, that removes all power from the MS3 moving part is acceptable. The switch shall be located where it is easily **accessible** to the user whose body part or clothes may be caught.

The “ON” and “OFF” positions of a two-position switch shall be marked in accordance with F.3.5.2.

For a multi-position switch, the “OFF” position of the switch shall be marked in accordance with F.3.5.2, and the other positions shall be marked with appropriate words or symbols.

8.5.4.2.4 Test method

The media destruction device is tested with the wedge probe of Figure V.4 applied in any direction relative to the opening:

- *with a force up to 45 N for a strip-cut type device; and*
- *with a force up to 90 N for a cross-cut type device.*

NOTE Media destruction devices are typically identified as either strip-cut type or cross-cut type. A strip-cut media destruction device shreds the media into long strips using a motor-based shredding mechanism. A cross-cut media destruction device shreds the media two or more ways into tiny particles, typically using a more powerful motor and more complex shredding mechanism.

*Any **enclosure** or guard that can be removed or opened by an **ordinary person** or an **instructed person** shall be removed or opened prior to application of the probes.*

8.5.4.2.5 Compliance criteria

Compliance is checked in accordance with V.1.2 and V.1.5. The wedge probe shall not contact any moving part.

*Where the equipment is provided with a **safety interlock**, compliance is checked according to Annex K, except where a moving part cannot be reduced to the appropriate energy class within 2 s, the **safety interlock** shall continue to prevent access.*

8.5.5 High pressure lamps

8.5.5.1 General

The containment mechanism for high pressure lamps that are considered MS3 according to Line 4 of Table 35 shall have adequate strength to contain an **explosion** of the lamp so as to reduce the likelihood of injury to an **ordinary person** or **instructed person** during normal use, or lamp assembly replacement, as appropriate.

8.5.5.2 Test method

For the protection against the effects of a high pressure lamp failure, the following test is performed as follows:

- lamp assemblies considered MS3 parts during field replacement are tested separate from the equipment;*
- lamp assemblies only considered MS3 parts during operation, may be tested separately, or as normally installed in the equipment, or both.*

*An **explosion** of the lamp is stimulated by mechanical impact, electronic pulse generator or similar method. The lamp shall operate for at least 5 min to obtain operational temperature and pressure. To evaluate the rupture results for potential debris area and particle size, a dark sticky mat (or another adequate method) of adequate size is placed near the exhaust vent of the equipment. The equipment opening shall be oriented to maximize potential for particles to be expelled from the product horizontally across the dark sticky mat. After the rupture, the glass particles generated are measured using a magnified glass piece with a 0,1 mm resolution. The test shall be conducted to simulate the worst case operating position specified in the instructions.*

NOTE It is easier for the inspection of potential glass debris if the sticky mat has a dark blue colour.

An example of an electronic pulse generator method is given in Figure D.3.

The charge is increased in steps of 5 J until the lamp ruptures are repeatable.

8.5.5.3 Compliance criteria

Compliance is checked by physical inspection or, if necessary, by the tests of 8.5.5.2.

When tested in accordance with 8.5.5.2, inspect the dark sticky mat for glass particles, and:

- glass particles less than 0,8 mm in the longest axis shall not be found beyond 1 m of the **enclosure** opening; and*
- glass particles equal to or greater than 0,8 mm in the longest axis shall not be found.*

*For professional equipment, where it is unlikely that the particles will be within reach of an **ordinary person**, the value of 0,8 mm may be replaced with 5 mm.*

8.6 Stability of equipment

8.6.1 Requirements

Classification of products for the purposes of assessing equipment stability is to be done according to Table 35, line 5.

In case units are fixed together, the MS class is determined by the total weight of the units. If units are intended to be separated for relocation, the MS class is determined by the individual weight.

Individual units that are designed to be mechanically fixed together on site and are not used individually, or **stationary equipment**, shall be assessed by inspection after installation according to the manufacturer's instructions and, if necessary, tested according to 8.6.2.2.

Equipment shall comply with the requirements and tests given in 8.6.2, 8.6.3, 8.6.4 and 8.6.5 according to Table 36. Where an "x" is given, it means that the test is applicable.

Table 36 – Overview of requirements and tests

Equipment type		Type of test				
		Static stability	Downward force	Relocation	Glass slide	Horizontal force
		8.6.2.2	8.6.2.3	8.6.3	8.6.4	8.6.5
MS1	All equipment	No stability requirements				
MS2	Floor standing			x		
	Non-floor standing	x				
	Controls or display ^a				x	x
	Fixed ^b	No stability requirements				
MS3	Floor standing	x	x	x		
	Non-floor standing	x				
	Controls or display ^a	x			x	x
	Fixed ^b	No stability requirements				

^a Equipment with front mounted **accessible** user controls and equipment having displays with moving images likely to be used in the home or similar installation environments where the equipment may be **accessible** to children.

^b Where equipment is expected to be installed by an **ordinary person**, equipment having a screw hole or other means to secure the equipment, such as for securement to a table or for earth quake protection, is not considered to be fixed. Such securements are considered to be **supplementary safeguards**.

Where thermoplastic materials are involved in the construction, the relevant stability tests shall be conducted after the stress relief test in Clause T.8 when the equipment has cooled to room temperature.

MS2 and MS3 television sets shall have an **instructional safeguard** in accordance with Clause F.5, except that the **instructional safeguard** may be included in the installation instructions or equivalent document accompanying the equipment.

The elements of the **instructional safeguard** shall be as follows:

- element 1a: not available
- element 2: "Stability Hazard" or equivalent word
- element 3: "The television set may fall, causing serious personal injury or death" or equivalent text
- element 4: the text below or equivalent text

Never place a television set in an unstable location. A television set may fall, causing serious personal injury or death. Many injuries, particularly to children, can be avoided by taking simple precautions such as:

- Using cabinets or stands recommended by the manufacturer of the television set.
- Only using furniture that can safely support the television set.
- Ensuring the television set is not overhanging the edge of the supporting furniture.
- Not placing the television set on tall furniture (for example, cupboards or bookcases) without anchoring both the furniture and the television set to a suitable support.
- Not placing the television set on cloth or other materials that may be located between the television set and supporting furniture.
- Educating children about the dangers of climbing on furniture to reach the television set or its controls.

If the existing television set is going to be retained and relocated, the same considerations as above should be applied.

8.6.2 Static stability

8.6.2.1 Test setup

The equipment shall be blocked, if necessary, by means of a stop of the smallest dimensions possible to keep it from sliding or rolling during the test. During the tests, containers, if any, are to contain the amount of substance within their rated capacity that will result in the most disadvantageous condition.

*All doors, drawers, casters, adjustable feet and other appurtenances, if used by an **ordinary person**, are arranged in any combination that results in the least stability. Equipment provided with multi-positional features shall be tested in the least favourable position based on the equipment construction. However, if the casters are intended only to transport the unit, and if the installation instructions require adjustable feet to be lowered after installation, then the adjustable feet (and not the casters) are used in this test.*

*Where equipment is subject to periodic maintenance or routinely serviced or repaired at its intended use location, the doors, drawers, etc. or any other adjustment means **accessible** to an **instructed person** or **skilled person** shall be arranged in any combination specified by the servicing instructions that results in the least stability.*

The tests of 8.6.2.2 and 8.6.2.3 shall be performed as indicated in Table 36.

8.6.2.2 Static stability test

Equipment shall not tip over when a force equal to 20 % of the weight of the unit, but not more than 250 N, is applied in any direction, except upwards, to any point on the equipment in such a way as to produce the maximum overturning moment. The test may be applied at any height not exceeding 1,5 m from the base of the equipment. The test force shall be discontinued if the equipment remains stable after being tilted 10° from vertical. Alternatively, the equipment shall be tipped at any angle from the vertical up to and including 10°.

8.6.2.3 Downward force test

Equipment shall not tip over when a constant downward force of 800 N is applied at the point of leverage for a maximum moment to any point of any surface within 10° of horizontal of at least 125 mm by at least 200 mm, at any height up to 1 m from the base of the equipment. The 800 N force is applied by means of a suitable test apparatus having a flat surface of approximately 125 mm by 200 mm. The downward force is applied with the complete flat

surface of the test apparatus in contact with the equipment, however the test apparatus need not be in full contact with uneven surfaces (for example, corrugated or curved surfaces).

Equipment having a shape or a flexibility of the surface that is not likely to be used as a step or a ladder are exempt from the test.

NOTE Examples are products in combination with a cart or stand or products with protrusion or recess where the construction is obviously not to be used as a step or ladder.

8.6.2.4 Compliance criteria

During the tests, the equipment shall not tip over.

8.6.3 Relocation stability test

8.6.3.1 Requirements

Equipment shall be stable when it is being relocated.

Compliance is checked by the test of 8.6.3.2. The equipment shall not tip over during the test. Equipment with wheels having a minimum diameter of 100 mm is considered to comply with the above requirements without test.

8.6.3.2 Test method

The equipment is tilted to an angle of 10° from its normal upright position in any direction. If the equipment is such that when it is tilted through an angle of 10° when standing on a horizontal plane, a part of the equipment not normally in contact with the supporting surface would touch the horizontal plane, the equipment is placed on the edge of the horizontal support during the test so that the contact is not made. Alternatively, the equipment may be placed on a plane and is rotated through an angle of 360° about its normal vertical axis while tilted at 10°.

*Equipment expected to be moved or relocated by **ordinary persons** shall have*

- all doors and drawers not having a positive means of retention and that can be opened inadvertently, and*
- casters, adjustable feet and the like*

arranged in any combination that results in the least stability.

*Equipment expected to be moved or relocated by an **instructed person** or a **skilled person**, shall have all doors, drawers, etc., positioned in accordance with the manufacturer's instructions.*

A unit provided with multi-positional features shall be tested in the least favourable position based on the equipment construction.

8.6.4 Glass slide test

8.6.4.1 Requirements

Equipment shall be so constructed that it will not slide or tip over on a supporting surface made of glass.

8.6.4.2 Test method and compliance criteria

The equipment is placed on a clean, dry, glass covered horizontal surface so that only the supporting feet are in contact with the glass. The glass-covered surface is then tilted in the most unfavourable direction through an angle of 10°.

During the test, the equipment shall not slide or tip over.

8.6.5 Horizontal force test and compliance criteria

The equipment is to be placed on a horizontal non-skid surface with all doors, drawers, casters, adjustable feet and other movable parts arranged in any combination that results in the least stable condition. The equipment shall be blocked, if necessary, by means of a stop of the smallest dimensions possible, to keep it from sliding or rolling when subjected to one of the following tests:

- *an external horizontal force of 13 % of the weight of the equipment or 100 N, whichever is less, is applied to that point on the equipment that will result in the least stability. The force shall not be applied more than 1,5 m above the supporting surface; or*
- *the equipment shall be moved through any angle of tilt up to and including 15° from the vertical; or*
- *the equipment is placed on a plane and is rotated through an angle of 360° about its normal vertical axis while tilted at an angle of 15°.*

During the test, the equipment shall not tip over.

8.7 Equipment mounted to a wall or ceiling

8.7.1 Requirements

Classification of equipment for the purposes of assessing wall mounting means is done according to Table 35, line 6.

For MS2 or MS3 equipment:

- If the manufacturer specifies a specific wall or ceiling mount, the combination of the mount and the equipment shall comply with 8.7.2, Test 1. The hardware used to fix the mounting means to the equipment shall either be provided with the equipment, or described in detail in the user instructions (for example, length of screws, diameter of the screws, etc.).
- If the manufacturer does not specify a specific wall or ceiling mount, but the equipment is provided with any part (for example, a hook or threaded hole) which facilitates attaching such a mount to the equipment, such parts shall comply with 8.7.2, Test 2, as appropriate. The user instruction shall advise on the safe use of such parts (for example, screw size including thread size and length, number of screws, etc.).
- If the equipment is provided with threaded parts for attachment of the mounting means, the threaded parts without the mounting means shall additionally comply with 8.7.2, Test 3.

NOTE The tests are meant to test the fixing of the mounting means to the equipment and not to test the fixing to the wall or ceiling.

8.7.2 Test methods

If the construction involves polymeric materials, the tests shall be performed after the stress relief test of Clause T.8.

Test 1

The equipment is mounted in accordance with the manufacturer's instructions and the mounting means positioned, when possible, to represent the most severe stress on the supports.

A force in addition to the weight of the equipment is applied downwards through the centre of gravity of the equipment, for 1 min. The additional force shall be:

- three times the weight of the equipment; or*
- the weight of the equipment plus 880 N,*

whichever is less.

In addition, for wall mounted equipment, a horizontal force of 50 N is applied laterally for 60 s.

Test 2

The test force shall be equivalent to the least of the following divided by the number of attachment points in the mounting system:

- four times the weight of the equipment; or*
- two times the weight of the equipment plus 880 N.*

Each point in the mounting system shall be subjected to a shear force perpendicular to its centre axis for 1 min. The force shall be applied in four directions, one direction at a time, separated by 90°.

Each point in the mounting system, one at a time, shall be subjected to an inward directed push force parallel to its centre axis for 1 min.

Each point in the mounting system, one at a time, shall be subjected to an outward directed pull force parallel to its centre axis for 1 min.

Test 3

If the mounting system design relies upon threaded parts, a torque according to Table 37 shall be applied to each threaded part, one at a time. If a corresponding screw fastener is supplied by the manufacturer, it shall be used for the test. If no corresponding screw fastener is supplied by the manufacturer, even though a screw type may be recommended in the user instructions, any screw with the same diameter shall be used for the test.

Table 37 – Torque to be applied to screws

Nominal diameter of screw mm	Torque Nm
up to and including 2,8	0,4
over 2,8 up to and including 3,0	0,5
over 3,0 up to and including 3,2	0,6
over 3,2 up to and including 3,6	0,8
over 3,6 up to and including 4,1	1,2
over 4,1 up to and including 4,7	1,8
over 4,7 up to and including 5,3	2,0
over 5,3 up to and including 6,0	2,5

8.7.3 Compliance criteria

Compliance is checked by inspection and by the tests of 8.7.2, as applicable. The equipment or its associated mounting means shall not become dislodged and shall remain mechanically intact and secure during the test.

8.8 Handle strength

8.8.1 General

A handle that is declared by the manufacturer for the purpose of lifting or carrying the equipment shall comply with the tests as specified in 8.8.2.

The equipment is classified according to Table 35, line 5.

If equipment having handles is designed, or provided with instructions, for lifting or carrying multiple units together, the class is determined taking into account the weight that may be carried.

8.8.2 Test method and compliance criteria

The equipment shall pass the following test:

A weight shall be uniformly applied over a 75 mm width at the centre of the handle, without clamping.

The weight shall be the equipment weight plus an additional weight as specified below:

- *for MS1 equipment with two or more handles, a weight that exerts a force of three times the weight of the equipment;*

NOTE No tests apply to MS1 equipment having only one handle.

- *for MS2 equipment, a weight that exerts a force of three times the weight of the equipment;*
- *for MS3 equipment with a mass 50 kg or less, a weight that exerts a force of two times the weight of the equipment or 75 kg, whichever is greater;*
- *for MS3 equipment with a mass greater than 50 kg, a weight that exerts a force of the weight of the equipment or 100 kg, whichever is greater.*

The additional weight shall be started at zero and gradually increased so that the test value is attained in 5 s to 10 s and maintained for 60 s. When more than one handle is provided, the force shall be distributed between the handles. The distribution of the forces shall be determined by measuring the percentage of the equipment's weight sustained by each handle with the equipment in the intended carrying position. When MS2 equipment is furnished with more than one handle, and it can be considered capable of being carried by only one handle, each handle shall be capable of sustaining the total force.

*As a result of the test, the handle, its securing means, or that portion of the **enclosure** to which it is secured, shall not break, crack, or detach from the equipment.*

8.9 Wheels or casters attachment requirements

8.9.1 General

The likelihood of MS3 and some MS2 equipment, including carts, stands and similar carriers that support the equipment, from tipping over during movement shall be reduced. The equipment is classified according to Table 35, line 5.

8.9.2 Test method

*Wheels or casters on MS3 equipment, or their supporting cart, stand or similar carrier, intended to be moved as part of its **normal operating conditions**, shall be capable of withstanding a pull of 20 N. The pull force is to be applied by a weight, or a steady pull, to the wheel or caster for a period of 1 min in any direction made possible by the construction.*

During the test, the wheels or casters shall not be damaged or pull free from its securing means.

8.10 Carts, stands, and similar carriers

8.10.1 General

The equipment shall be stable with the cart, stand or similar carrier. The classifications of Table 35, line 5 are applied using the combined mass of both the equipment and the carts or stands specified with the equipment.

All carts and stands specified for use with the equipment shall be subjected to the applicable tests described in the following subclauses. A cart, stand or carrier shall be subjected to the applicable tests alone and again with the equipment specified by the manufacturer placed on the cart or stand.

MS3 equipment, including their supporting carts, stands and similar carriers that support the equipment, that are not moved as part of its **normal operating conditions**, shall comply with the horizontal force test of 8.6.5.

MS2 or MS3 equipment more than 1 m in height, including equipment mounted on their specified cart, stand or carrier, shall comply with the relocation stability test in 8.6.3 except that the tip angle becomes 15°. If equipment is provided with wheels or casters that allow the equipment to only move in limited directions, the test is only applied in those directions (for example, an electronic white board).

8.10.2 Marking and instructions

A cart, stand or similar carrier that is specified by the manufacturer for use with specific equipment, but is packaged and marketed separately from the equipment, shall be provided with an **instructional safeguard** in accordance with Clause F.5.

The elements of the **instructional safeguard** shall be as follows:

- element 1a: not available
- element 2: “Caution” or equivalent text
- element 4: “This (cart, stand, or carrier) is intended for use only with (manufacturer's name), (model number or series), (equipment name).” or equivalent text
- element 3: “Use with other equipment may result in instability causing injury” or equivalent text

The elements shall be in the order 2, 4, and 3.

The **instructional safeguard** shall be affixed to the cart, stand or carrier, or included in the installation instructions or equivalent document accompanying the equipment.

Equipment only intended and shipped for use with a specific cart, stand or similar carrier, shall be provided with an **instructional safeguard** in accordance with Clause F.5 and be comprised of:

- element 1a: not available