8.6.3 Non-floor standing equipment having controls that are accessed during normal use or having displays with moving images

8.6.3.1 Glass slide test

MS2 or MS3 equipment (except for floor standing equipment) likely to be used in the home or similar installation environments where they may be **accessible** to children, 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 tests, the equipment shall not slide or tip over.

8.6.3.2 Horizontal force test

8.6.3.2.1 General

This subclause addresses the risk of children being attracted to MS2 or MS3 equipment likely to be elevated above the floor with normally **accessible** controls or displays with moving images resulting in their attempt to climb onto devices that may tip over easily. This requirement does not apply to other equipment.

NOTE Equipment with front mounted user controls and moving images are considered to increase the frequency of children being attracted to displays and thereby increasing the likelihood of the child attempting to climb or move the equipment.

8.6.3.2.2 Test method

MS2 or MS3 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:

- a) an externally applied horizontal force of 13 % of the weight of the equipment or 100 N, whichever is less, is applied in a horizontal direction 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 supporting surface; or
- b) the equipment shall be moved through any angle of tilt up to and including 15° from the vertical.

During the test, the equipment shall not tip over.

8.7 Equipment mounted to a wall or ceiling

8.7.1 General

This subclause specifies how to minimise the likelihood of injury caused by equipment falling due to failure of the mounting means.

The mounting means of MS2 or MS3 equipment intended for wall or ceiling mounting shall be capable of vertically supporting four times the weight of the equipment, and also lateral stress. The mounting hardware shall either be provided with the equipment, or described in detail in the user instructions (for example, length of screws and type of mounting surface suitable for the installation, etc.). Classification of equipment for the purposes of assessing wall mounting means is to be done according to Table 40, line 6.

8.7.2 Test method

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

A downward force, in addition to the weight of the equipment, is applied downwards through the centre of gravity for 60 s. The additional force shall be equal to three times the weight of the equipment, but not less than 50 N in total. The equipment and its associated mounting means shall remain secure during the test.

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

8.7.3 Compliance

Compliance is checked by inspection of the construction and of available data or, where necessary, by the test of 8.7.2.

8.8 Handle strength test method

8.8.1 General

This subclause specifies how to reduce the likelihood of injury from a handle failure causing the equipment to fall for other than MS1 equipment having only one handle.

This subclause applies to a handle that is declared by the manufacturer for the purpose of lifting or carrying the equipment.

For the purposes of this subclause, the equipment is classified according to Table 40, line 5.

8.8.2 Compliance and test method

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;
- 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 one times 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

This subclause specifies how to reduce the likelihood of MS3 and some MS2 equipment, including carts, stands and similar carriers that support the equipment, from tipping over during movement. For the purposes of this subclause, the equipment is classified according to Table 40, 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 without being damaged or pulled free from its securing means. 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.

8.10 Carts, stands, and similar carriers

8.10.1 General

This subclause specifies how to minimise the risk of tipping, material breakdown, or mismatching of cart, stand or similar carrier relevant to the mounted equipment.

The equipment shall be stable with the cart, stand or similar carrier. For the purposes of this subclause, the MS classifications of Table 40, 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 8.6.3.2.

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 8.6.2.3 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.

Elements 2, 3 and 4 as appropriate shall include the manufacturer's name, distinctive catalogue designation of equipment to be supported, model or series, and equipment name; and the following statement or equivalent text:

CAUTION This (cart, stand or carrier) is intended for use only with (manufacturer's name), (model number or series), (equipment name). Use with other equipment may result in instability causing injury.

When it is not feasible to include a specific equipment model number or series designation on the cart, stand or similar carrier, this information shall be provided in the instructions.

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.

Elements 2, 3 and 4 as appropriate shall include:

CAUTION This (equipment name) is for use only with (manufacturer's name), (model number or series), (cart, stand or carrier). Use with other (carts, stands, or carriers) may result in instability causing injury.

8.10.3 Cart, stand or carrier loading test and compliance

A cart, stand or carrier shall be constructed so that permanent deformation or damage that is capable of resulting in injury to a person, does not occur when it is subjected to a force of 220 N applied for 1 min to any grippable or leverage point **accessible** to a child.

To determine compliance, the force is applied through the end of a 30 mm diameter circular cylinder. The force is to be applied to a shelf drawer, dowel rung support, or equivalent part that is within 750 mm from the floor and will support some or all of a child's weight. The force is to be applied for 1 min with the cart or stand at room temperature. The part shall not collapse or break so as to expose sharp edges or produce pinch points that are capable of resulting in injury.

In addition, a cart, stand or other carrier shall be constructed so that permanent deformation or damage that is capable of resulting in injury to persons does not occur when each supporting surface is individually loaded with:

- the manufacturer's intended load plus 440 N for the surface intended to support a display with moving images; or
- four times the manufacturer's intended load or 100 N, whichever is greater but not to exceed 440 N, is applied to all applicable surfaces.

A dedicated storage area intended to accommodate specific accessories such as media tapes, discs, etc. shall be fully loaded to the rated load.

The weight is to be applied for 1 min on each supporting surface, with the other supporting surfaces unloaded.

8.10.4 Cart, stand or carrier impact test

When tested as described below, a cart, stand or carrier shall not produce a risk of injury to persons.

A single 7 J impact is to be applied to any part of the cart or stand and the test method is to be as described in Clause T.6. However, a cart, stand or carrier made of glass shall be tested instead according to T.9.1.

8.10.5 Mechanical stability

A cart, stand or carrier, including floor standing, by itself, and where applicable in combination with its intended MS2 or MS3 equipment, shall be subjected to the applicable tests described in 8.6.2.3 and 8.6.3.2.

For the purposes of these tests, the weight shall be considered as the total weight of the equipment plus the weight of the cart, stand or carrier. The equipment shall be installed according to the manufacturer's instructions and the horizontal force shall be applied to either the cart, stand or carrier or intended equipment to produce a maximum overturning moment on the equipment at a point up to a maximum height of 1,5 m above the floor level.

If during the tests of 8.6.2.3 and 8.6.3.2 the equipment starts to slide or tip relative to the cart, stand or carrier, only the horizontal force test shall be repeated by reducing the force to 13 % of the weight of the equipment alone, or 100 N, whichever is less.

The equipment and cart or stand shall not tip over.

8.10.6 Thermoplastic temperature stability

An equipment, cart, stand or carrier using thermoplastic materials in its construction shall withstand the test of Clause T.8, without any shrinkage, warpage, or other distortion of the thermoplastic materials that results in the equipment failing to comply with 8.10.3, 8.10.4 and 8.10.5.

8.11 Mounting means for rack mounted equipment

8.11.1 Requirements

This subclause applies to the mounting means of MS2 and MS3 equipment installed in a rack, that can be extended away from the rack for installation, service and the like. This requirement does not apply to equipment fixed in place, equipment subassemblies or racks having a top installation position less than 1 m in height from the supporting surface.

For the purpose of this subclause, the mechanical mounting means will be referred to as slide-rail. This subclause specifies requirements for the slide-rail to reduce the likelihood of injury by retaining the equipment in a safe position and not allowing the slide-rails to buckle, means of attachment to break, or the equipment to slide past the end of the slide-rails.

NOTE 1 Slide-rails include bearing slides, friction slides or other equivalent mounting means.

NOTE 2 Slide-rail constructions of integrated parts/units of the end product (for example, pullout paper trays in copiers/printers) are not considered to be rack mounted equipment.

Classification of products for the purposes of assessing equipment stability is to be done according to Table 40, line 5.

Such slide-rails shall have end stops that prevent the equipment from unintentionally sliding off the mounting means.

8.11.2 Mechanical strength test, variable *N*

The slide-rail shall be installed in a rack with the equipment, or equivalent setup in accordance with the manufacturer's instructions. With the equipment in its extended position, a force in addition to the weight of the equipment is to be applied downwards through the centre of gravity for 1 min by means of a suitable test apparatus providing contact over a circular plane surface 30 mm in diameter. If applying this force could damage the equipment, a metal plate or other means of distributing the force may be placed under the test apparatus. The total force shall be calculated based on the mass of the equipment plus an additional mass as determined below.

NOTE This additional force is intended to take into account other items or devices that may be stacked on top of the installed rack mounted equipment while in the extended position during installation of other equipment.

For slide-rail mounted equipment where the slide-rails are mounted horizontally on each side of the equipment, the total force applied to the slide-rails shall be equal to the greater of the following two values:

- 150 % of the equipment mass plus 330 N,
- 150 % of the equipment mass, plus an additional mass, where the additional mass is equal to the equipment mass or 530 N, whichever is less.

For slide-rail mounted equipment where the slide-rails are mounted vertically on the top and bottom of the equipment in the rack, the total force applied to the slide-rails shall be 150 % of the equipment mass, with a minimum force of 250 N and a maximum force of 530 N.

If the supporting surface is intended to be a shelf, then the distribution of force over a metal plate under the test apparatus does not apply. The manufacturer shall state the maximum load that is intended to be placed on the shelf in order to determine the force that needs to be applied to the shelf. An **instructional safeguard** shall be provided on the shelf to indicate the maximum weight that can be added to the shelf. The force test shall be conducted at 125 % of the maximum weight stated by the manufacturer. The force is to be applied directly by means of the test apparatus providing contact over a circular plane surface 30 mm in diameter.

8.11.3 Mechanical strength test, 250 N, including end stops

The slide-rail mounted equipment is installed in a rack in accordance with the manufacturer's instructions. A 250 N static force is applied to the slide-rail mounted equipment, in every direction except upward to include the most unfavourable position of the slide-rail mounted equipment, for a period of 1 min. The force is applied to the slide-rail mounted equipment in its fully extended (service) position as well as its normally recessed (operating) position by means of a suitable test instrument providing contact over a circular plane surface 30 mm in diameter. The force is applied with the complete flat surface of the test instrument in contact with the equipment. The test instrument need not be in full contact with uneven surfaces (for example corrugated or curved surfaces).

NOTE Additional requirements for a dynamic force test on end stops are being considered at this time.

8.11.4 Compliance

Compliance is checked by inspection and available manufacturer's data. If data is not available, then the tests according to 8.11.2 and 8.11.3 are conducted.

The equipment and its associated slide-rails shall remain secure during the tests. One complete cycle of travel on its slide-rails after completion of each test shall be performed. If the mounting means is not able to perform one complete cycle without binding, a force of 100 N shall be applied horizontally to the front of the equipment at its centre point with the intent to completely retract the equipment into the rack. Should the equipment fail to fully retract, the mounting means shall not bend or buckle to any extent that could introduce an injury. End stops shall retain the equipment in a safe position and shall not allow the equipment to slide past the end of the slide-rails.

8.12 Telescoping or rod antennas

A telescoping or rod antenna shall be provided with a minimum 6,0 mm diameter button or ball on the end. An antenna end piece and the sections of a telescoping antenna shall be secured in such a manner as to prevent removal.

Compliance is checked by inspection and the test of Clause T.10.

9 Thermal burn injury

9.1 General

This clause specifies safeguards to reduce the likelihood of skin burn injury as the result of conduction of thermal energy from parts of equipment.

9.2 Thermal energy source classifications

9.2.1 General

This subclause describes the different energy sources and defines their limits under **normal operating conditions** and **abnormal operating conditions** at normal room ambient of 25 °C. **Single fault conditions** are not considered.

9.2.2 TS1

TS1 is a thermal energy source with levels not exceeding TS1 limits in Table 42 under **normal operating conditions**, and not exceeding TS2 limits in Table 42 under **abnormal operating conditions**. If, under **abnormal operating conditions**, the equipment continues to function, TS1 does not exceed the TS2 limits specified for contact durations less than 1 s. Where the malfunction of the equipment is evident, no limits apply.

NOTE TS1 may be accessible to an ordinary person.

9.2.3 TS2

TS2 is a thermal energy source with levels exceeding TS1 limits under **normal operating conditions** but not exceeding TS2 limits in Table 42 under **normal operating conditions** and **abnormal operating conditions**. If, under **abnormal operating conditions**, the equipment continues to function, the TS2 limits specified for contact durations less than 1 s apply. Where the malfunction of the equipment is evident, no limits apply.

NOTE TS2 may be accessible to an instructed person, and under single fault conditions, to an ordinary person.

TS2 may be accessible to ordinary persons if an instructional safeguard is in place.

9.2.4 TS3

TS3 is a thermal energy source with levels exceeding the appropriate TS2 limits in Table 42 under **normal operating conditions** and **abnormal operating conditions**, or any thermal energy source declared to be TS3.

NOTE Parts and surfaces classed TS3 may be **accessible** to a **skilled person**.

9.2.5 Touch temperature levels

| | | Maximum temperature (T_{max}) | | | | |
|---|--|-----------------------------------|---|------------------------------------|------|--|
| | | | °C | | | |
| | Accessible parts ^a | Metal | Glass, porcelain and vitreous material | Plastic and rubber ^ь | Wood | |
| TS1 | Handles, knobs, grips, etc., and external surfaces held in normal use (>1 min) $^\circ$ | 48 | 48 | 48 | 48 | |
| TS1 | Handles, knobs, grips, etc., and external surfaces held for short periods of time or touched occasionally (>10 s and <1 min) $^{\rm c}$ | 51 | 56 | 60 | 60 | |
| TS1 | Handle, knobs, grips etc., and external surfaces touched occasionally for very short periods (>1 s and <10 s) $^{\circ}$ | 60 | 71 | 77 | 107 | |
| TS1 | External surfaces that need not be touched to operate the equipment (<1 s) $^{\circ}$ | 70 ^d | 80 ^d | 94 ^d | 140 | |
| The limits for TS2 are 10 K higher than the TS1 limits. | | | | | | |
| 9.4.2): – a part that does not need to be touched to operate the equipment and if unintentional contact with the part is unlikely; – internal parts of the equipment requiring heat for the intended function (for example, a document laminator, thermal print head, fuser heater, etc.) provided the parts are unlikely to be touched by an ordinary person under normal operating conditions. ^b For each material, account shall be taken of the data for that material to determine the appropriate maximum | | | | | | |
| temperature. | | | | | | |
| F | For outside parts of metal that are covered with plastic material of at least 0,3 mm thick, a temperature rise which corresponds to the permissible temperature limit of the plastic and rubber is allowed. | | | | | |
| ^d F | For the following areas and external surfaces, the temperature limit is 100 °C unless a higher limit is specified | | | | | |
| - | an area on the external surface of the equipment that has no dimension exceeding 50 mm, and that is not likely to be touched in normal use; or | | | | | |
| - | accessible surfaces of the equipment requiring heat for the intended function (for example, equipment that contains a document laminator, thermal print head, fuser heater, etc.), and that are not likely to be touched in normal use; or | | | | | |
| - | heatsinks and metallic parts directly covering heatsinks, except those on surfaces incorporating switches or controls handled during normal use. | | | | | |
| For these areas and parts, an instructional safeguard in accordance with Clause F.5 shall be provided on or near the hot part. | | | | | | |
| 9.3 Protection against thermal energy sources | | | | | | |

Table 42 – Touch temperature limits

9.3.1 General

This subclause specifies protection requirements for parts **accessible** to **ordinary persons**, **instructed persons**, and **skilled persons**.

9.3.2 Protection of an ordinary person

9.3.2.1 Protection of an ordinary person against TS1

No safeguard need be interposed between TS1 and an ordinary person.

9.3.2.2 Protection of an ordinary person against TS2

At least one **safeguard** shall be interposed between TS2 and an **ordinary person**. This **safeguard** may be:

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- an equipment safeguard such as thermal insulation; or
- an **instructional safeguard** in accordance with Clause F.5.

For use of **instructional safeguards**, see 9.4.2.

9.3.2.3 **Protection of an ordinary person against TS3**

At least one equipment **basic safeguard** and one **supplementary safeguard** shall be interposed between TS3 and an **ordinary person**.

NOTE The supplementary safeguard may be an instructional safeguard.

9.3.2.4 Compliance

Compliance is checked by inspection.

9.3.3 **Protection of an instructed person**

9.3.3.1 Protection of an instructed person against TS2

No equipment safeguard need be interposed between TS2 and an instructed person.

9.3.3.2 Protection of an instructed person against TS3

At least one equipment **basic safeguard** and one **supplementary safeguard** shall be interposed between TS3 and an **instructed person**.

NOTE The supplementary safeguard may be an instructional safeguard.

Compliance is checked by inspection.

9.3.4 Protection of a skilled person

Parts and surfaces classed TS3 shall be provided with an **equipment safeguard** or provided with an **instructional safeguard** so that unintentional contact with such parts and surfaces during service operations is unlikely to cause the **skilled person** to recoil into other class 3 energy sources (see Figure 19).

Compliance is checked by inspection.

9.4 Requirements for safeguards

9.4.1 Equipment safeguard

9.4.1.1 Requirements

An **equipment safeguard** shall limit the transfer of thermal energy (source temperature) under **normal operating conditions** and **abnormal operating conditions** or limit accessibility to a thermal energy source to a touch temperature as specified by the TS classification according to Table 42.

Temperature limits are applied only for those **abnormal operating conditions** where the equipment continues to function and the **abnormal operating condition** is not obvious. If the equipment stops functioning, then the limits are not applicable.

9.4.1.2 Test method and compliance

This test is run with the room ambient conditions as defined in B.1.7, except that the room ambient temperature shall be 25 $^{\circ}$ C.

The equipment shall be operated in a manner the manufacturer determines likely to result in elevated thermal conditions of **accessible** surfaces and parts.

NOTE This may not be the condition of maximum input current or wattage but the condition that delivers the highest thermal level to the part in question.

Compliance is checked by measuring the steady state temperature of **accessible** surfaces.

9.4.2 Instructional safeguard

An **instructional safeguard** shall be provided in accordance with Clause F.5 and be comprised of

- the symbol **1**, IEC 60417-5041 (2002); or

- the following statement or equivalent text:

| CAUTION | | | | | |
|----------------------------|--|--|--|--|--|
| Hot surface. Do not touch. | | | | | |

Compliance is checked by inspection.

10 Radiation

10.1 General

This clause specifies how to reduce the likelihood of exposure of persons to injurious levels of both ionising and non-ionising electromagnetic radiation. This clause also provides protection against hearing impairment from excessive sound levels that may be produced by electronic equipment.

10.2 Radiation energy source classifications

10.2.1 RS1

RS1 has levels not exceeding RS1 limits under **normal operating conditions** and **abnormal operating conditions** and not exceeding RS2 limits under **single fault conditions**. When a person is exposed to RS1, the energy is undetectable to detectable but not painful.

NOTE An ordinary person may be exposed to RS1.

10.2.2 RS2

RS2 has levels not exceeding RS2 limits under **normal operating conditions**, **abnormal operating conditions** and under **single fault conditions**, but is not RS1. When a person is exposed to RS2, the energy may be detectable to painful. Exposure to RS2 is acceptable within given exposure limits and related short time periods (dose rates).

NOTE An instructed person may be exposed to RS2. Under single fault conditions, an ordinary person may also be exposed to RS2.

10.2.3 RS3

RS3 has levels exceeding RS2 limits, or any energy source declared to be RS3. When a person is exposed to RS3, the energy, even at short exposure (instantaneous power or power density), is considered injurious.

NOTE A skilled person may have access to RS3 with appropriate instructional safeguards and skill safeguards in place. National regulations limit the radiation level and exposure time where a skilled person is working live where RS3 may be present.

10.3 Requirements for electromagnetic radiation

10.3.1 Protection of persons from non-ionising radiation

10.3.1.1 General

This subclause specifies safeguards to reduce the risk of harmful effects of non-ionising radiation to all persons.

NOTE Diodes emitting coherent light (such as super luminescent diodes) should be treated as a laser.

10.3.1.2 Non-ionising radiaton from lasers

10.3.1.2.1 Requirements

Equipment containing one or more lasers (including laser diodes) shall comply with IEC 60825-1, IEC 60825-2 or IEC 60825-12 as applicable.

Where a laser of class 3R, 3B or 4 is present, a **tool** shall be required to gain access.

10.3.1.2.2 Compliance

Radiation energy classification is determined by

- measuring according to the IEC 60825 series, or
- checking the available manufacturer's data sheet.

Compliance is checked to the applicable standard(s) within the IEC 60825 series.

NOTE 1 As of the date of this standard, the applicable standards are IEC 60825-1, IEC 60825-2 and IEC 60825-12.

Equipment that does not exceed the accessible emission limit for Class 1 under all conditions of operation, maintenance and failure is not required to have a laser warning **instructional safeguard** or laser explanatory label. Such equipment is exempt (see Clause 1 of IEC 60825-1:2007).

NOTE 2 Accessible emission limit is defined in IEC 60825-1:2007, 3.3.

10.3.1.3 Non-ionising optical radiation from lamps and lamp systems (including LEDs)

10.3.1.3.1 General

Equipment containing lamps or lamp systems that produce optical radiation in excess of the limits specified in IEC 62471 in the wavelength range 200 nm to 3 000 nm, as specified by the lamp manufacturer, shall be provided with **safeguards** to eliminate unnecessary optical radiation exceeding the limits specified in IEC 62471. Low power applications of LEDs need not comply with IEC 62471.

NOTE 1 General purpose incandescent and fluorescent lamps, with ordinary glass envelopes, are not considered to emit significant UV radiation.