
**Information technology — Office
equipment — Accessibility guidelines
for older persons and persons with
disabilities**

*Technologies de l'information — Lignes directrices pour l'accessibilité
aux équipements de bureau par les personnes âgées et les personnes
handicapées*

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see <http://patents.iec.ch>).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 28, *Office equipment*.

This second edition cancels and replaces the first edition (ISO/IEC 10779:2008), which has been technically revised.

The main changes compared to the previous edition are as follows:

- harmonized with the US Section 508 of the Rehabilitation Act, and EN 301 549;
- defined the policies to ensure and improve accessibility.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document has been developed as guidelines to assist in the design and evaluation of office equipment for operation by persons with the widest range of capabilities, including persons with disabilities and persons with temporary disabilities.

This document specifies features to provide guidance to designers of office equipment based on ISO/IEC Guide 71 and ISO 9241-20:2008.

This document had been developed originally in 2008 to be consistent with the U.S. Section 508 Standards (2000). In 2017, the standards were revised harmonizing EN 301 549:2014. This document for designing accessible office equipment is revised to be coherent with them.

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Information technology — Office equipment — Accessibility guidelines for older persons and persons with disabilities

1 Scope

This document specifies accessibility guidelines to be considered when planning, developing and designing electrophotographic copying machines, page printers and multi-function devices. These guidelines are intended to improve accessibility required when primarily older persons, persons with disabilities and persons with temporary disabilities (hereafter referred to as older persons and persons with disabilities) use office equipment.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC Guide 71, *Guide for addressing accessibility in standards*

ISO/IEC 40500, *Information technology — W3C Web Content Accessibility Guidelines (WCAG) 2.0*

ITU-T E.161, *Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC Guide 71 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

multi-function device

device providing two or more functions, such as electrophotographic copying, facsimile, printing and scanning functions

3.2

accessibility

usability (3.6) of office equipment by persons with the widest range of capabilities, including persons with disabilities and persons with temporary disabilities

Note 1 to entry: The concept of accessibility addresses the full range of user capabilities and is not limited to *users* (3.5) who are formally recognized as having disability.

**3.3
assistive technology**

piece of equipment, product system, software or service that is used to increase, maintain or improve functional capabilities of individuals with disabilities

Note 1 to entry: This can be acquired commercially off-the-shelf, modified or customized. The term includes technical aids for persons with disabilities. Assistive devices do not eliminate an *impairment* (3.4) but can lessen the difficulty experienced by an individual in carrying out a task or activity in specific environments.

**3.4
impairment**

problem in body function or structure such as a significant deviation or loss, which can be temporary – due for example to injury – or permanent, slight or severe and can fluctuate over time, in particular deterioration due to aging

Note 1 to entry: Body function can be a physiological or physiological function of a body system; body structure refers to an anatomical part of the body such as organs, limbs and their components (as defined in the International Classification of Functioning and Disability of WHO (ICF 2001).

**3.5
user**

person who interacts with a system, product or service

[SOURCE: ISO 9241-11:2018, 3.1.8, modified — Note 1 to entry deleted.]

**3.6
usability**

extent to which a system, product or service can be used by specified *users* (3.5) to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

[SOURCE: ISO 9241-11:2018 3.1.1, modified — Notes 1 and 2 to entry deleted.]

**3.7
alternative method**

methods used as alternatives to specific functions and operations

EXAMPLE Voice-based functions used as an alternative to displaying.

**3.8
private listening**

auditory output such as voice guidance designed to be heard only by the *user* (3.5) who is operating the corresponding product can hear the sound

EXAMPLE Personal headsets, directional speakers.

**3.9
non-private listening**

auditory output designed to be heard by the *user* (3.5) who is operating the corresponding product can hear the sound, and other person around the product

**3.10
closed functionality**

characteristic that limits a function for disabled *users* (3.5) and prevents them from attaching or installing *assistive technology* (3.3)

4 Basic policies

The basic policies which shall be followed with respect to office equipment in order to ensure and improve accessibility are as follows.

- a) The office equipment shall be planned and developed to be usable by older persons and persons with disabilities, by meeting the requirements in [Clause 6](#).
- b) The methods that shall meet the requirements in [Clause 6](#) may be the function of the office equipment itself or the software operated with connected personal computers. When the requirements are met by application software on mobile devices, the requirements provided in ISO/IEC 40500 shall be met.
- c) The methods that shall meet the requirements in [Clause 6](#) can be the standard form of office equipment, or with its option.
- d) An alternative method shall be accepted, if there is no other direct method meeting the requirements in [Clause 6](#).
- e) The essential functions and performance of office equipment shall not be interfered by the attempt to meet the requirements in [Clause 6](#).
- f) Accessibility shall be ensured and improved, within the safety of user. Extra consideration shall be needed to ensure the safety of users with disabilities, for they sometimes have to operate office equipment following different steps from people without disability, because of their impairments.
- g) The operations that are targeted in [6.7](#) are as follows. For others (from [6.1](#) to [6.6](#), and from [6.8](#) to [6.12](#)), all operations are targeted.
 - 1) Required target operations
 - power up /power down / power save / authenticate;
 - place a document on platen glass / auto document feeder, and take out;
 - select and perform a function (copy, fax, scan, and print);
 - take out printed paper;
 - perform user registration and management;
 - perform actions for security management;
 - change the settings (such as defaults) of functions (copy, fax, scan, and print).
 - 2) Recommended target operations

When the safety of older persons and persons with disabilities can be ensured, the following operations should be targeted.

 - install hardware;
 - supply paper;
 - remove a paper jam;
 - replace a consumable.
- h) The functions targeted in [Clause 6](#) shall be equivalent to the functions provided to people without disabilities.
- i) When the status of the conformity with [Clause 6](#) is provided, it shall be shown including the status of consideration each disability shown in [Clause 5](#).

5 Classification of disabilities

5.1 Classification and characteristics of disabilities

5.1.1 General rules

Disabilities targeted in the guidelines are shown from [5.1.2](#) to [5.1.11](#).

For specific requirements which office equipment is to consider can be referred in [Clause 6](#). Each disability also shall include the state of disabilities due to temporary injuries and illness.

For older persons, they shall be considered to have a mild symptom that is not included in the following targeted “disabilities”, or multiple mild symptoms, and giving consideration to each disability leads to considerations for older persons.

The classification of disabilities is classified by referring to the classification of ISO/IEC Guide 71 and harmonized with the classification of US Section 508 Standards and EN 301 549, premising the use of office equipment.

5.1.2 Blindness

A disability that represents the state of being unable to use vision. A prior learning is premised because operations and actions rely on tactile sense and hearing sense. Blind people cannot make use a mouse but can use a personal computer with a keyboard and screen reading out software. Some users use devices such as smartphones.

5.1.3 Low vision

A disability that represents the state of being able to use vision, but it is limited. The eyesight cannot be corrected to the degree to bear daily life even with eyeglasses. If vision can be corrected, it is not called low vision even if eyesight is low. Some users utilize the accessibility feature of an operating system to use a personal computer and carry a loupe with a high magnification rate. They also use assistive devices like magnifying printed papers including books. Some users move their eyes closer to about 3 cm from the device to operate it.

5.1.4 Colour blindness

A disability that is different from normal colour sensitiveness. Colour blindness includes total colour blindness, which is being completely unable to distinguish any colour, and colour weakness which is difficulty distinguishing some colours. For example, it is well known that people with colour weakness have difficulty distinguishing red and green, but there are some other combinations of colours which are not easily distinguished. They can distinguish better by adjusting to higher contrast, but that may change the colour tone of the user interface, which makes to persons with low vision, who rely on colours to see, more difficult to recognize the operational parts. Meanwhile, due to aging, it becomes difficult for people to distinguish white and yellow, and black and dark blue.

5.1.5 Deafness

A disability that represents the state of being completely unable to use hearing. Since deaf people are unable to hear the words they themselves say, speech impairment can be induced. In daily life, as they cannot hear the surrounding sound, it is sometimes difficult to avoid danger promptly. They may not recognize whether a loud sound is going on or off. So, they may not even realize a vacuum cleaner is not plugged.

5.1.6 Hearing impairment

A disability that represents the state of being partly able to use hearing by using a hearing aid or cochlear implant. However, in many cases, they do not hear as clearly as people without a hearing

disability, and consonants are especially unclear. They recognize the words by predicting through the earlier conversation, or the situation. So, if the subject of conversation suddenly changes, the persons with hearing impairment may not keep up with conversation. The ability to hear lowers due to aging, and it becomes difficult for old persons to recognize especially the higher tones.

5.1.7 Speech impairment

A disability that represents the state of being unable to speak or being able to speak partially. There are various cases, including speech impairment induced from congenital hearing impediment, or removing larynx at cancer surgery. When a person is completely unable to speak, writing messages is the main mean to communicate.

5.1.8 Impairment that limits upper limb strength and action

A disability where it is difficult to perform operations which need strength of hands and fingers, fine motor control or both hands, because of low muscle force, low control capability, prosthetic hand and finger, inability to use one hand, difficulty in simultaneous movement or involuntary movement (tremor).

The difficulties are not limited to the operations that need strength, but also the operation of touch panels or mouse, which need only low strength but require fine finger movements.

Some people may have no thermal nociception due to loss of sensation. Aging lowers muscle strength and control capability.

5.1.9 Impairment that limits reach ranges

A disability that limits accessible ranges, which includes persons who use a cane or a wheelchair, and impairment of upper limb and persons with low height. A wheelchair user without upper limb problem normally uses a manual wheelchair, and wheelchair user who has upper limb problem uses an electric wheelchair. In both cases, as the users have to stretch a hand out from the sitting position, the accessible ranges of the high area, the low area, and the forward area are limited. A user reaching the deep forward area may have a risk of falling. Persons who use a cane may have difficulty to crouch, and the reach range to the low area is limited. For persons with short height, reaching the high area and the area with depth is limited.

5.1.10 Photosensitive seizure

A seizure as such can be caused by continuous flickering of light. It occurs when the brain is strongly stimulated and excited by the flickering of a light or moving images. There was a famous incident in Japan that many children watching a TV animation program became sick from photosensitive seizure.

5.1.11 Cognitive, language, or learning disorders

Disabilities of recognition, memory, abstraction or description. These disabilities include intellectual disabilities, mental disorders, or developmental disorders, which often are innate disabilities, and also other acquired disabilities include higher brain dysfunction, or regression of brain function due to aging. For these disabilities, functions to compensate user's memory, intelligibility and execution of operation are helpful.

Developmental disorders include dyslexia, where a person has difficulties in reading and writing, but no problem with intelligence. A person with aphasia, a type of higher brain dysfunction, sometimes has difficulty putting thoughts into words, this disorder is often confused with speech impairment. The guidelines target the cases of persons with cognitive, language, or learning disorders using office equipment in vocational training or workplace.

6 Requirements to be considered

6.1 General

The basic requirements which shall be followed with respect to office equipment in order to ensure and improve accessibility are as specified in 6.2 to 6.13.

See Table A.2, it shows which of the requirements set out in this clause support each of the disabilities set out in Clause 5.

NOTE These requirements are in accordance with US Section 508 of Rehabilitation Act Standards, EN 301 549 and WCAG 2.1.

6.2 Closed functionality

6.2.1 General

Office equipment with closed functionality shall be operable without requiring the user to attach or install assistive technology and shall conform to the following items.

6.2.2 Speech-output enabled

6.2.2.1 General

For the operation of a screen, such as the control panel, an operation with voice guidance shall be provided.

Exception 1: Voice guidance shall not be required where office equipment has only an LED state display without a touch panel / LCD display and can be operated by touching and auditory signals.

Exception 2: Auditory signals (input confirmation signals) shall be permitted instead of voice guidance where the content of user input is not displayed as entered for security purposes, including, but not limited to, asterisks representing personal identification numbers. Basic requirements for planning, development, and designing.

6.2.2.2 Information displayed on-screen

Voice guidance shall be provided for all information displayed on-screen.

“All information” includes the following information:

- Non-text information such as an icon shall also be provided as voice guidance unless it is pure decoration.
- Where video content is provided, equivalent voice guidance shall be provided.
- Where an input error is automatically detected, voice guidance shall identify and guide the item that is in error.

6.2.2.3 Spoken languages

Voice guidance shall be output in the same human language as the displayed language.

Exception: Proper names.

6.2.2.4 Speech delivery type and coordination

Voice guidance shall be delivered in a mechanism that can be easily used by all users. Examples include, but are not limited to, direct audio output (or bundled audio output), industry standard connectors,

telephone handsets, and the like. Speech shall be recorded or digitized human or synthesized. Voice guidance shall be coordinated with information displayed on the screen.

6.2.2.5 User control

Voice guidance for any single function shall be automatically interrupted when a transaction is selected. Voice guidance shall be capable of being repeated and paused.

Where it is essential that the user hears the entire message, for example a safety instruction or warning, office equipment shall block all user action so that speech is not interrupted.

6.2.2.6 Non-interfering audio output

During voice guidance, another guidance (warning notification) or auditory signal that lasts three seconds or longer shall not be automatically played.

6.2.2.7 Tactile indication of speech output mode

Where voice guidance is provided, a tactile symbol to initiate the guidance shall be provided.

NOTE Braille is required by the U.S. Section 508 Standards and a tactile symbol is required by EN 301 549.

Exception: Office equipment for personal use is excluded.

6.2.3 Volume

6.2.3.1 General

Where sound such as voice guidance is delivered, volume control and output amplification conforming to [6.2.3.2](#) and [6.2.3.3](#) shall be provided.

Deliver the voice guidance as the main operation means, and when the use by the hearing impairment users is assumed,

- a) volume shall be adjusted within a range of at least 18 dB,
- b) at least one intermediate step of 12 dB above the lowest volume level shall be provided.

6.2.3.2 Private listening

Where private listening is provided, non-visual mode of operation for controlling the volume shall be provided.

6.2.3.3 Non-private listening

Where non-private listening is provided,

- a) speaker volume can be amplified up to a level of at least 65 dB (both speech and auditory signals),
- b) the volume shall be automatically reset to the default level after every use. (only speech).

For personal authentication, it may have a function not to reset.

6.2.4 Characters on display screens

At least one mode of characters displayed on the screen shall be in a sans serif font.

Where a screen enlargement feature is not provided, characters shall be 4,8 mm or higher based on the uppercase letter “I” or “H”.

NOTE EN 301 549, 2018, 5.1.4 serves as a reference as a method to decide the height of a character based on the viewing distance of a display screen in operation.

The following paragraphs in 6.2.4 and Formula (1) are reference information from EN 301 549, 2018, 5.1.4 and not a requirement of this document.

Where any functionality of office equipment is closed to the text enlargement features of platform or assistive technology, the office equipment shall provide a mode of operation where the text and images of text necessary for all functionality are displayed in such a way that a non-accented capital “H” subtends an angle of at least 0,7° at a viewing distance specified by the supplier.

The subtended angle, in degrees, may be calculated using Formula (1):

$$\psi = (180 \times H) / (\pi \times D) \quad (1)$$

where

- ψ is the subtended angle, expressed in degrees;
- H is the height of the text, expressed in millimetres;
- D is the viewing distance, expressed in millimetres.

6.3 Biometrics

Where provided, biometrics shall not be the only means for user identification or control.

Exception: Where at least two biometric options that use different biological characteristics are provided, using biometrics shall be permitted as the only means for user identification or control.

6.4 Preservation of information provided for accessibility

Where video and other contents with information added for accessibility are delivered to multi-function devices, non-proprietary information provided for accessibility shall not be removed or shall be restored upon delivery.

6.5 Privacy

6.5.1 General

The same degree of privacy of input and output shall be provided to all individuals.

6.5.2 Masked entry

Where auditory output is provided as non-visual access to closed functionality, and the characters displayed are masking characters, the auditory output shall not be a spoken version of the characters entered unless the auditory output is known to be delivered only to a mechanism for private listening, or the user explicitly chooses to allow non-private auditory output.

NOTE 1 Masking characters are usually displayed for security purposes and include, but are not limited to, asterisks representing personal identification numbers.

NOTE 2 Unmasked character output can be preferred when closed functionality is used, for example, in the privacy of the user's home. A warning highlighting privacy concerns can be appropriate to ensure that the user has made an informed choice.

6.5.3 Private access to personal data

Where auditory output is provided as non-visual access to a closed functionality, and the output contains data that is considered to be private according to the applicable privacy policy, the corresponding auditory output shall only be delivered through a mechanism for private listening that can be connected without requiring the use of vision, or through any other mechanism explicitly chosen by the user.

NOTE 1 This requirement does not apply in cases where data is not defined as being private according to the applicable privacy policy or where there is no applicable privacy policy.

NOTE 2 Non-private output can be preferred when a closed functionality is used, for example, in the privacy of the user's home. A warning highlighting privacy concerns can be appropriate to ensure that the user has made an informed choice.

6.6 Standard connections

Where data connections used for input and output are provided, at least one of each type of connection shall conform to industry standard non-proprietary formats.

NOTE 1 The intent of this requirement is to ensure compatibility with assistive technologies by requiring the use of standard connections on office equipment.

NOTE 2 The word connection applies to both physical and wireless connections.

NOTE 3 Current examples of industry standard non-proprietary formats are USB and Bluetooth.

6.7 Operable parts

6.7.1 General

Operable parts used in the normal operation of office equipment shall conform to [6.7](#).

NOTE Normal operation refers to [Clause 4 g](#)).

6.7.2 Contrast

Where operation parts such as hard keys and levers are provided, they shall ensure to contrast visually from background surfaces.

Characters and symbols printed on office equipment shall ensure to contrast visually from background surfaces with either light characters or symbols on a dark background or dark characters or symbols on a light background.

6.7.3 Input controls

6.7.3.1 General

At least one input control conforming to [6.7.3.2](#), [6.7.3.3](#), or [6.7.3.4](#) shall be provided for each function of office equipment.

Exception: Office equipment for personal use with input controls that are audibly discernible without activation and operable by touch shall not be required to conform to [6.7.3](#).

6.7.3.2 Tactilely discernible

Where office equipment has operable parts by hand, it shall provide a means to tactilely discern each operable part. It shall also be discernible by touch without activation.

6.7.3.3 Alphabetic keys

Where provided, individual alphabetic keys shall be arranged in a QWERTY-based keyboard layout and the “F” and “J” keys shall be tactilely distinct from the other keys.

6.7.3.4 Numeric keys

Where provided, numeric keys shall be arranged in a 12-key ascending or descending keypad layout.

The number five key shall be tactilely distinct from the other keys.

Where the office equipment provides an alphabetic overlay on numeric keys, the relationships between letters and digits shall conform to ITU-T E.161. (See [Figure 1](#))



Figure 1 — Keypad with clear relationship between letters and digits

6.7.4 Key repeat

Where a keyboard with key repeat is provided and the key repeat cannot be turned off, the time before the key repeat is activated shall be fixed at 2 s, or adjustable to 2 or more seconds.

The key repeat rate shall be adjustable to 2 or more seconds per character.

6.7.5 Double-strike key

Where a keyboard or keypad is provided and the same operation as the previous keystroke was performed, the time during which the next keystroke will not be accepted shall be adjustable 0,5 s or more.

6.7.6 Timed response

Where a timed response is required, and the timed response function cannot be turned off, the user shall be alerted visually, as well as by touch or sound, and shall be given the opportunity to indicate that more time is needed.

6.7.7 Simultaneous user actions

Where office equipment requires simultaneous user actions for the user, office equipment shall provide at least one action that does not require simultaneous user actions.

NOTE Having to press two or more keys at the same time or having to touch a surface with more than one finger are examples of simultaneous user actions.

6.7.8 Physical operation

At least one mode of operation shall be operable with one hand and the operation shall not require tight grasping, pinching, or twisting of the wrist.

The operation shall require a maximum force of 22,2 N.

6.7.9 Fare cards and key cards

Where operation of office equipment requires fare cards or key cards and orientation is important to use, orientation shall be tactilely discernible.

6.7.10 Reach height and depth

6.7.10.1 General

At least one of each type of operable part of floor type office equipment shall be at a height conforming to [6.7.10.3](#) or [6.7.10.4](#) according to its position established by the vertical reference plane specified in [6.7.10.2](#) for a side reach or a forward reach. Operable parts used with speech output required by [6.2.2](#) shall not be the only type of operable part complying with [6.7.10](#) unless that part is the only operable part of its type.

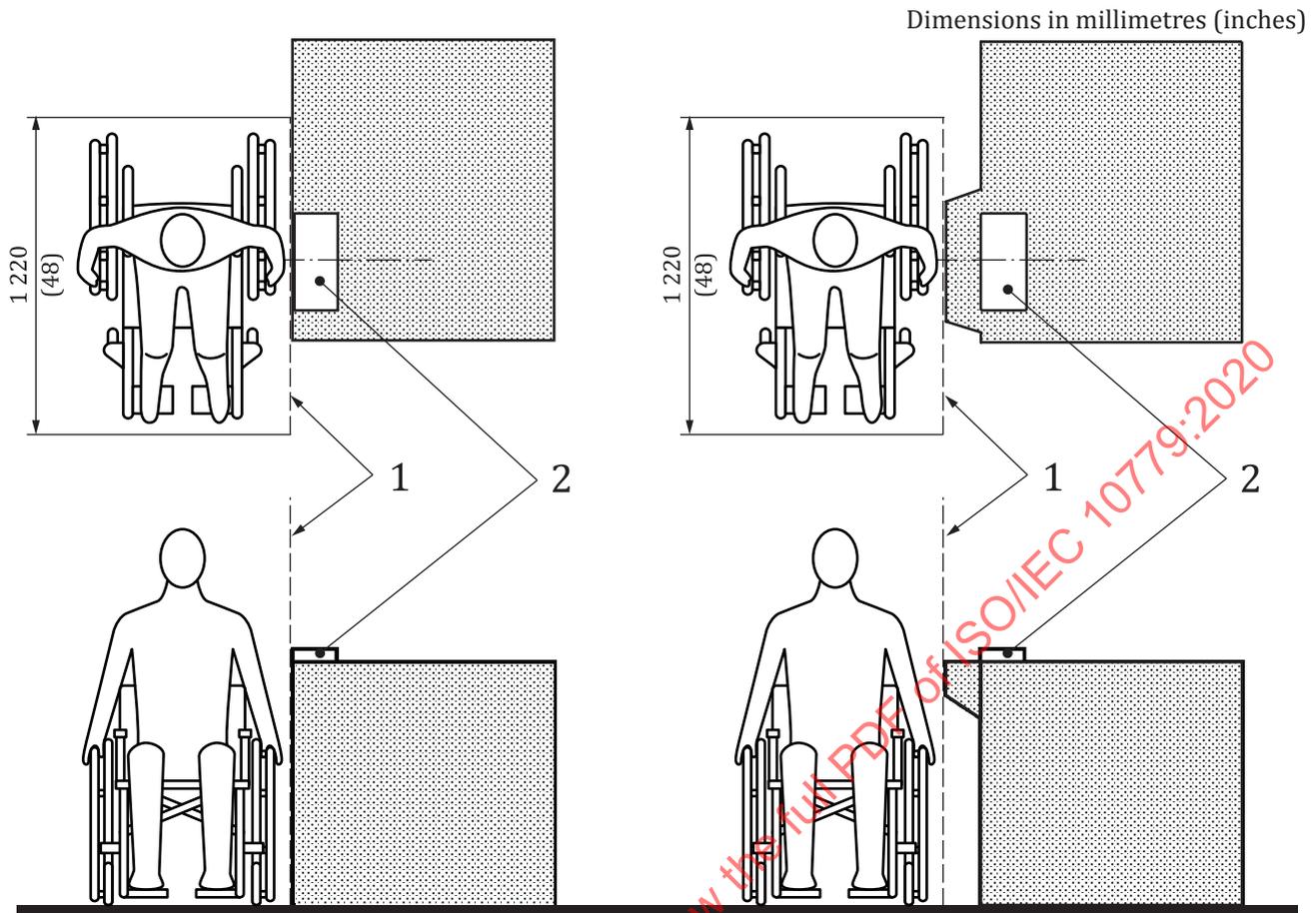
6.7.10.2 Vertical reference plane

6.7.10.2.1 General

Operable parts shall be positioned for a side reach or a forward reach determined with respect to a vertical reference plane. The vertical reference plane shall be located in conformance to [6.7.10.2.2](#) or [6.7.10.2.3](#).

6.7.10.2.2 Vertical plane for side reach

Where a side reach is provided, the vertical reference plane shall be 1 220 mm (48 inches) long minimum. (See [Figure 2](#)).



Key

- 1 vertical reference plane
- 2 operable part

Figure 2 — Vertical reference plane for side reach

6.7.10.2.3 Vertical plane for forward reach

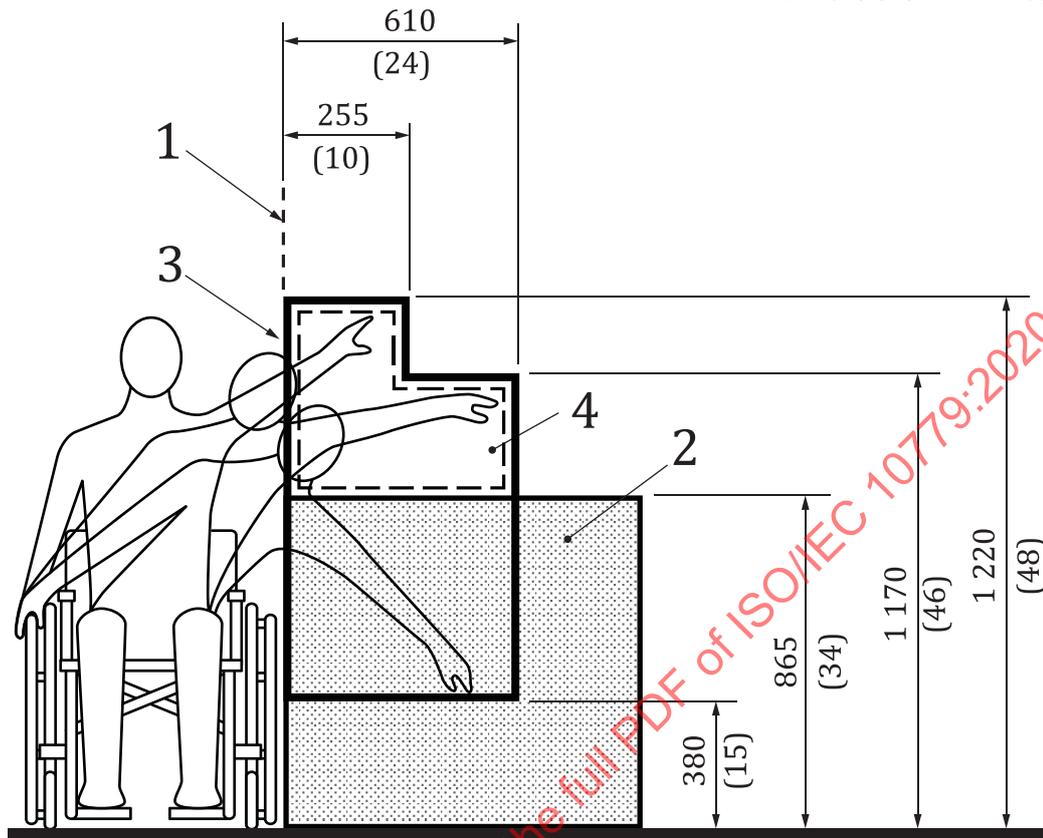
Where a forward reach is provided, the vertical reference plane shall be 760 mm (30 inches) long minimum.

6.7.10.3 Side reach

6.7.10.3.1 General

Operable parts of office equipment providing a side reach shall conform to [6.7.10.3.2](#) or [6.7.10.3.3](#). The vertical reference plane shall be centred on the operable part and placed at the leading edge of the maximum protrusion of the office equipment within the length of the vertical reference plane. Where a side reach requires a reach over a portion of the office equipment, the height of that portion of the office equipment shall be 865 mm (34 inches) maximum. (See [Figure 3](#)).

Dimensions in millimetres (inches)

**Key**

- 1 vertical reference plane
- 2 obstacle
- 3 operable range
- 4 area A

Where area A is an operable range within the operable range, the height of the obstacle shall be 865 mm or less.

Figure 3 — Operable range for side reach

6.7.10.3.2 Unobstructed side reach

Where the operable part is located 255 mm (10 inches) or less beyond the vertical reference plane, the operable part shall be 1 220 mm (48 inches) high maximum and 380 mm (15 inches) high minimum above the floor.

6.7.10.3.3 Obstructed side reach

Where the operable part is located more than 255 mm (10 inches), but not more than 610 mm (24 inches), beyond the vertical reference plane, the height of the operable part shall be 1 170 mm (46 inches) high maximum and 380 mm (15 inches) high minimum above the floor. The operable part shall not be located more than 610 mm (24 inches) beyond the vertical reference plane.

6.7.10.4 Forward reach

6.7.10.4.1 General

Operable parts of office equipment providing a forward reach shall conform to [6.7.10.4.2](#) or [6.7.10.4.3](#). The vertical reference plane shall be centred, and intersect with, the operable part. Where a forward

reach allows a reach over a portion of the office equipment, the height of that portion of the office equipment shall be 865 mm (34 inches) maximum.

6.7.10.4.2 Unobstructed forward reach

Where the operable part is located at the leading edge of the maximum protrusion within the length of the vertical reference plane of the office equipment, the operable part shall be 1 220 mm (48 inches) high maximum and more than 380 mm (15 inches) high minimum above the floor.

6.7.10.4.3 Obstructed forward reach

6.7.10.4.3.1 General

Where the operable part is located beyond the leading edge of the maximum protrusion within the length of the vertical reference plane, the operable part shall conform to [6.7.10.4.3.2](#) and [6.7.10.4.3.3](#). The maximum allowable forward reach to an operable part shall be 635 mm (25 inches).

6.7.10.4.3.2 Operable part height for office equipment with obstructed forward reach

The height of the operable part shall conform to [Table 1](#).

Table 1 — Operable part height for office equipment with obstructed forward reach

Reach depth	Operable part height
510 mm (20 inches) or less	1 220 mm (48 inches) maximum
More than 510 mm (20 inches) to 635 mm (25 inches) or less	1 120 mm (44 inches) maximum

6.7.10.4.3.3 Knee and toe space under office equipment with obstructed forward reach

Knee and toe space under the office equipment shall be 685 mm (27 inches) high minimum, 635 mm (25 inches) deep maximum, and 760 mm (30 inches) wide minimum and shall be clear of obstructions.

Exception 1: Toe clearance.

Where an obstacle is integral to the office equipment, a space under the obstacle that is less than 230 mm (9 inches) above the floor is considered toe clearance and should:

- a) extend 635 mm (25 inches) maximum under the whole obstacle;
- b) provide a space at least 430 mm (17 inches) deep and 230 mm (9 inches) above the floor under the obstacle;
- c) extend no more than 150 mm (6 inches) beyond any obstruction at 230 mm (9 inches) above the floor.

Exception 2: Knee clearance.

Where an obstacle is integral to the office equipment, the space under the obstacle that is between 230 mm (9 inches) and 685 mm (27 inches) above the floor is considered knee clearance and should:

- a) extend no more than 635 mm (25 inches) under the obstacle at a height of 230 mm (9 inches) above the floor;
- b) extend at least 280 mm (11 inches) under the obstacle at a height of 230 mm (9 inches) above the floor;
- c) extend at least 205 mm (8 inches) under the obstacle at a height of 685 mm (27 inches) above the floor;

- d) be between 230 mm (9 inches) and 685 mm (27 inches) above the floor be permitted to be reduced in depth at a rate of 25 mm (1 inch) for each 150 mm (6 inches) in height.

6.8 Visibility of display screens

Where office equipment provides one or more display screens, at least one of each type of display screen shall be visible from a point located 1 015 mm (40 inches) above the floor.

6.9 Flashing

Where office equipment emits lights in flashes, there shall be no more than three flashes in any one-second period.

Exception: Flashes that do not exceed the general flash and red flash thresholds defined in WCAG 2.1 are not required to conform to [6.9](#).

Flashing which was derived from frame rate of display shall conform to [6.9](#).

6.10 Status indicators

Where provided, status indicators shall be discernible visually and by touch or sound.

6.11 Colour coding

Where provided, colour coding shall not be used as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.

EXAMPLE Visual elements can be labels, operable parts, status indicators, and elements on screens, etc.

6.12 Audible signals

Where provided, audible signals or cues shall not be used as the only means of conveying information, indicating an action, or prompting a response.

6.13 Software requirements for closed functionality

6.13.1 General

Office equipment with software closed to assistive technologies shall conform to [6.13.2](#) to [6.13.12](#).

NOTE The following requirements are premised the use of office equipment, harmonizing with the related requirements of WCAG 2.1, as EN 301 549 requires to satisfy WCAG 2.1.

6.13.2 Sensory characteristics

Instructions provided for understanding and operating content do not rely solely on sensory characteristic of components such as shape, colour, size, visual location, orientation, or sound (WCAG 2.1:2018, 1.3.3).

6.13.3 Audio control

If any audio on an office equipment plays automatically for more than 3 s, either a mechanism is available to pause or stop the audio, or a mechanism is available to control audio volume independently from the overall system volume level (WCAG 2.1:2018, 1.4.2).

6.13.4 Text contrast

The visual presentation of text and images of text has a contrast ratio of at least 4.5:1, except for the following (WCAG 2.1:2018, 1.4.3):

- large text: large-scale text and images of large-scale text have a contrast ratio of at least 3:1;
- incidental: text or images of text that are part of an inactive user interface component, that are pure decoration, that are not visible to anyone, or that are part of a picture that contains significant other visual content, have no contrast requirement.
- logotypes: text that is part of a logo or brand name has no contrast requirement.

6.13.5 Non-text contrast

The visual presentation of the following has a contrast ratio of at least 3:1 against adjacent colour(s) (WCAG 2.1:2018, 1.4.11):

- user interface components: visual information required to identify user interface components and states, except for inactive components or where the appearance of the component is determined by the user agent and not modified by the author;
- graphical objects: parts of graphics required to understand the content, except when a particular presentation of graphics is essential to the information being conveyed.

6.13.6 No-key trap

If focus can be moved between components using a key interface, then focus can be moved away from that component using only a key interface, and, if it requires more than usual methods, the user is advised of the method for moving focus away (WCAG 2.1:2018, 2.1.2).

6.13.7 Pause, stop, hide

For moving, blinking, scrolling, or auto-updating information, all of the following are true (WCAG 2.1:2018, 2.2.2):

- moving, blinking, scrolling: for any moving, blinking or scrolling information that (1) starts automatically, (2) lasts more than five seconds, and (3) is presented in parallel with other content, there is a mechanism for the user to pause, stop, or hide it unless the movement, blinking, or scrolling is part of an activity where it is essential; and
- auto-updating: for any auto-updating information that (1) starts automatically and (2) is presented in parallel with other content, there is a mechanism for the user to pause, stop, or hide it or to control the frequency of the update unless the auto-updating is part of an activity where it is essential.

6.13.8 Focus order

If a display can be navigated sequentially and the navigation sequences affect meaning or operation, focusable components receive focus in an order that preserves meaning and operability (WCAG 2.1:2018, 2.4.3)

6.13.9 Focus visible

Any key-operable user interface has a mode of operation where the focus indicator is visible (WCAG 2.1:2018, 2.4.7).