



BSI Standards Publication

Accessibility requirements for ICT products and services

National foreword

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Accessibility requirements for ICT products and services



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Foreword

This Harmonised European Standard (EN) has been produced by ETSI Technical Committee Human Factors (HF), and the eAccessibility Joint Working Group (JWG) of CEN/CENELEC/ETSI.

The present document has been prepared under the Commission's standardisation request C(2017) 2585 final [i.27] to provide one voluntary means of conforming to the essential requirements of Directive 2016/2102 [i.28] on the accessibility of the websites and mobile applications of public sector bodies.

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in tables A.1 and A.2 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive and associated EFTA regulations.

The present document has been developed from ETSI EN 301 549 [i.29] V1.1.2 (2015-04). The changes are limited to those necessary to comply with the requirements of a Harmonised Standard, inclusion of requirements for mobile applications, updating to reflect the state of the art in W3C WCAG, updating of clause 6.1, and corrections of errors.

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Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**may not**", "**need**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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Introduction

The present document is developed in response to standardisation request M 554 from the European Commission to CEN, CENELEC and ETSI. It is based on the European Standard (EN) that was one of several deliverables prepared in response to Phase 2 of Mandate M 376 [i.3].

NOTE: The present document reflects the content of the W3C WCAG 2.1 Proposed Recommendation [5], which is expected to become the formal W3C WCAG 2.1 Recommendation.

The primary objective of Mandate M 376 was to produce a European Standard that sets out in a single source, detailed, practical and quantifiable functional accessibility requirements that take note of global initiatives in that field and which are applicable to all Information and Communication Technology (ICT) products and services identified in Phase I of the Mandate (ETSI TR 102 612 [i.9]) and usable in public procurement.

The European Standard prepared in response to Mandate M 376 is supported by three Technical Reports. The first (ETSI TR 101 550 [i.7]) lists the standards and technical specifications used in the creation of the compliance requirements for accessibility set out in the European Standard. The second Technical Report (ETSI TR 101 551 [i.8]) gives guidance to procurers on the award criteria relevant to each of the accessibility-related needs of ICT users in the products and services under consideration. The third Technical Report (ETSI TR 101 552 [i.30]) incorporates all information and documentation needed in the framework of the procurement process in order to allow conveying the assessment of accessibility via conformity with the functional accessibility requirements contained in the present document and with award criteria.

1 Scope

The present document specifies the functional accessibility requirements applicable to ICT products and services, together with a description of the test procedures and evaluation methodology for each accessibility requirement in a form that is suitable for use in public procurement within Europe. The present document might be useful for other purposes such as procurement in the private sector.

The relationship between the present document and the essential requirements of Directive 2016/2102 on the accessibility of the websites and mobile applications of public sector bodies [i.28] is given in Annex A.

The present document contains the necessary functional requirements and provides a reference document such that if procedures are followed by different actors, the results of testing are similar and the interpretation of those results is clear. The test descriptions and evaluation methodology included in the present document are elaborated to a level of detail compliant with ISO/IEC 17007:2009 [i.14], so that conformance testing can give conclusive results.

All clauses except those in clause 12, related to documentation and support services, are self-scoping. This means they are introduced with the phrase 'Where ICT <pre-condition>'. Compliance is achieved either when the pre-condition is true and the corresponding test (in Annex C) is passed, or when the pre-condition is false (i.e. the pre-condition is not met or not valid).

NOTE 1: Compliance issues are covered in normative clause C.1.

The inherent nature of certain situations makes it impossible to make reliable and definitive statements that accessibility requirements have been met. In those situations therefore, the requirements in the present document are not applicable:

- when the product is in a failure, repair or maintenance state where the ordinary set of input or output functions are not available;
- during those parts of start-up, shutdown, and other state transitions that can be completed without user interaction.

NOTE 2: Even in the above situations, it is best practice to apply requirements in the present document wherever it is feasible and safe to do so.

2 References

2.1 Normative references

References are specific, identified by date of publication and/or edition number or version number. Only the cited version applies.

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The following referenced documents are necessary for the application of the present document.

- | | |
|-----|--|
| [1] | ETSI ETS 300 381 (Edition 1) (December 1994): "Telephony for hearing impaired people; Inductive coupling of telephone earphones to hearing aids". |
| [2] | ETSI ES 200 381-1 (V1.2.1) (October 2012): "Telephony for hearing impaired people; Inductive coupling of telephone earphones to hearing aids Part 1: Fixed-line speech terminals". |
| [3] | ETSI ES 200 381-2 (V1.1.1) (October 2012): "Telephony for hearing impaired people; Inductive coupling of telephone earphones to hearing aids; Part 2: Cellular speech terminals". |

- [4] W3C Recommendation (December 2008) /ISO/IEC 40500:2012: "Web Content Accessibility Guidelines (WCAG) 2.0".

NOTE: Available at [WCAG 2.0](#).

- [5] W3C Proposed Recommendation (June 2018): "Web Content Accessibility Guidelines (WCAG) 2.1".

NOTE: Available at [WCAG 2.1](#).

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ANSI/IEEE C63.19 (2011): "American National Standard Method of Measurement of Compatibility between Wireless Communication Devices and Hearing Aids".
- [i.2] ANSI/TIA-4965: "Receive volume control requirements for digital and analogue wireline terminals".
- [i.3] European Commission M 376-EN: "Standardization Mandate to CEN, CENELEC and ETSI in support of European accessibility requirements for public procurement of products and services in the ICT domain".
- [i.4] ETSI EG 201 013: "Human Factors (HF); Definitions, abbreviations and symbols".
- [i.5] ETSI ES 202 975: "Human Factors (HF); Requirements for relay services".
- [i.6] ETSI ETS 300 767: "Human Factors (HF); Telephone Prepayment Cards; Tactile Identifier".
- [i.7] ETSI CEN/CENELEC/ETSI TR 101 550: "Documents relevant to EN 301 549 "Accessibility requirements suitable for public procurement of ICT products and services in Europe"".
- [i.8] ETSI CEN/CENELEC/ETSI TR 101 551: "Guidelines on the use of accessibility award criteria suitable for publicly procured ICT products and services in Europe".
- [i.9] ETSI TR 102 612: "Human Factors (HF); European accessibility requirements for public procurement of products and services in the ICT domain (European Commission Mandate M 376, Phase 1)".
- [i.10] ETSI TS 126 114: "Universal Mobile Telecommunications System (UMTS); LTE; IP Multimedia Subsystem (IMS); Multimedia telephony; Media handling and interaction (3GPP TS 26.114)".
- [i.11] ETSI TS 122 173: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; IP Multimedia Core Network Subsystem (IMS) Multimedia Telephony Service and supplementary services; Stage 1 (3GPP TS 22.173)".
- [i.12] ETSI TS 134 229: "Universal Mobile Telecommunications System (UMTS); LTE; Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); User Equipment (UE) conformance specification (3GPP TS 34.229)".
- [i.13] IETF RFC 4103 (2005): "RTP Payload for Text Conversation".

- [i.14] ISO/IEC 17007:2009: "Conformity assessment - Guidance for drafting normative documents suitable for use for conformity assessment".
- [i.15] ISO 9241-11:1998: "Ergonomic requirements for office work with visual display terminals (VDTs) -- Part 11: Guidance on usability".
- [i.16] ISO 9241-110:2006: "Ergonomics of human-system interaction -- Part 110: Dialogue principles".
- [i.17] ISO 9241-171:2008: "Ergonomics of human-system interaction-Part 171: Guidance on software accessibility".
- [i.18] ISO 26800:2011: "Ergonomics - General approach, principles and concepts".
- [i.19] ISO/IEC 13066-1:2011: "Information technology - Interoperability with assistive technology (AT) - Part 1: Requirements and recommendations for interoperability".
- [i.20] Recommendation ITU-T E.161 (2001): "Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network".
- [i.21] Recommendation ITU-T G.722 (1988): "7 kHz audio-coding within 64 kbit/s".
- [i.22] Recommendation ITU-T G.722.2 (2003): "Wideband coding of speech at around 16 kbit/s using Adaptive Multi-Rate Wideband (AMR-WB)".
- [i.23] Recommendation ITU-T V.18 (2000): "Operational and interworking requirements for DCEs operating in the text telephone mode".
- [i.24] TIA-1083-A (2010): "Telecommunications; Telephone Terminal equipment; Handset magnetic measurement procedures and performance requirements".
- [i.25] US Department of Justice: "2010 ADA Standards for Accessible Design".
- [i.26] W3C Working Group Note 5 September 2013: "Guidance on Applying WCAG 2.0 to Non-Web Information and Communications Technologies (WCAG2ICT)".

NOTE: Available at <http://www.w3.org/TR/wcag2ict/>.

- [i.27] Commission Implementing Decision of 27.4.2017 on a standardisation request to the European standardisation organisations in support of Directive (EU) 2016/2102 of the European Parliament and of the Council on the accessibility of the websites and mobile applications of public sector bodies.
- [i.28] Directive (EU) 2016/2102 of the European Parliament and of the Council of 26 October 2016 on the accessibility of the websites and mobile applications of public sector bodies.
- [i.29] ETSI EN 301 549 (V1.1.2) (04-2015): "Accessibility requirements suitable for public procurement of ICT products and services in Europe".
- [i.30] ETSI TR 101 552: "Guidance for the application of conformity assessment to accessibility requirements for public procurement of ICT products and services in Europe".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI EG 201 013 [i.4] and the following apply:

accessibility: extent to which products, systems, services, environments and facilities can be used by people from a population with the widest range of characteristics and capabilities, to achieve a specified goal in a specified context of use (from ISO 26800 [i.18])

NOTE 1: Context of use includes direct use or use supported by assistive technologies.

NOTE 2: The context in which the ICT is used may affect its overall accessibility. This context could include other products and services with which the ICT may interact.

assistive technology: hardware or software added to or connected to a system that increases accessibility for an individual

NOTE 1: Examples are Braille displays, screen readers, screen magnification software and eye tracking devices that are added to the ICT.

NOTE 2: Where ICT does not support directly connected assistive technology, but which can be operated by a system connected over a network or other remote connection, such a separate system (with any included assistive technology) can also be considered assistive technology.

audio description: additional audible narrative, interleaved with the dialogue, which describes the significant aspects of the visual content of audio-visual media that cannot be understood from the main soundtrack alone

NOTE: This is also variously described using terms such as "video description" or variants such as "descriptive narration".

authoring tool: software that can be used to create or modify content

NOTE 1: An authoring tool may be used by a single user or multiple users working collaboratively.

NOTE 2: An authoring tool may be a single stand-alone application or be comprised of collections of applications.

NOTE 3: An authoring tool may produce content that is intended for further modification or for use by end-users.

caption: synchronized visual and/or text alternative for both speech and non-speech audio information needed to understand the media content (after WCAG 2.1 [5])

NOTE: This is also variously described using terms such as "subtitles" or variants such as "subtitles for the deaf and hard-of-hearing".

closed functionality: functionality that is limited by characteristics that prevent a user from attaching, installing or using assistive technology

content: information and sensory experience to be communicated to the user by means of software, including code or mark-up that defines the content's structure, presentation, and interactions (after WCAG2ICT [i.26])

NOTE: Content occurs in three places: web pages, documents and software. When content occurs in a web page or a document, a user agent is needed in order to communicate the content's information and sensory experience to the user. When content occurs in software, a separate user agent is not needed in order to communicate the content's information and sensory experience to the user - the software itself performs that function.

context of use: users, tasks, equipment (hardware, software and materials), and the physical and social environments in which a product is used (from ISO 9241-11 [i.15])

document: logically distinct assembly of content (such as a file, set of files, or streamed media) that functions as a single entity rather than a collection, that is not part of software and that does not include its own user agent. (after WCAG2ICT [i.26])

NOTE 1: A document always requires a user agent to present its content to the user.

NOTE 2: Letters, e-mail messages, spreadsheets, books, pictures, presentations, and movies are examples of documents.

NOTE 3: Software configuration and storage files such as databases and virus definitions, as well as computer instruction files such as source code, batch/script files, and firmware, are examples of files that function as part of software and thus are not examples of documents. If and where software retrieves "information and sensory experience to be communicated to the user" from such files, it is just another part of the content that occurs in software and is covered by WCAG2ICT like any other parts of the software. Where such files contain one or more embedded documents, the embedded documents remain documents under this definition.

NOTE 4: A collection of files zipped together into an archive, stored within a single virtual hard drive file, or stored in a single encrypted file system file, do not constitute a single document when so collected together. The software that archives/encrypts those files or manages the contents of the virtual hard drive does not function as a user agent for the individually collected files in that collection because that software is not providing a fully functioning presentation of that content.

NOTE 5: Anything that can present its own content without involving a user agent, such as a self-playing book, is not a document but is software.

NOTE 6: A single document may be composed of multiple files such as the video content, closed caption text etc. This fact is not usually apparent to the end-user consuming the document/content.

NOTE 7: An assembly of files that represented the video, audio, captions and timing files for a movie is an example of a document.

NOTE 8: A binder file used to bind together the various exhibits for a legal case would not be a document.

ICT network: technology and resources supporting the connection and operation of interconnected ICT

Information and Communication Technology (ICT): technology, equipment, or interconnected system or subsystem of equipment for which the principal function is the creation, conversion, duplication, automatic acquisition, storage, analysis, evaluation, manipulation, management, movement, control, display, switching, interchange, transmission, reception, or broadcast of data or information

NOTE: Examples of ICT are web pages, electronic content, telecommunications products, computers and ancillary equipment, software including mobile applications, information kiosks and transaction machines, videos, IT services, and multifunction office machines which copy, scan, and fax documents.

mechanically operable part: operable part that has a mechanical interface to activate, deactivate, or adjust the ICT

NOTE: Examples of mechanically operable parts include scanner covers, notebook docking stations and lids as well as physical switches and latches.

mechanism for private listening: auditory output designed so that only the current user can receive the sound

NOTE: Personal headsets, directional speakers and audio hoods are examples of mechanisms for private listening.

non-text content: content that is not a sequence of characters that can be programmatically determined or where the sequence is not expressing something in human language (after WCAG 2.1 [5])

non-web document: document that is not a web page, not embedded in web pages nor used in the rendering or functioning of the page

non-web software: software that is not a web page, not embedded in web pages nor used in the rendering or functioning of the page

open functionality: functionality that supports access by assistive technology

NOTE: This is the opposite of Closed Functionality.

operable part: component of ICT used to activate, deactivate, or adjust the ICT

NOTE: Operable parts can be provided in either hardware (see mechanically operable parts, above) or software. An on-screen button is an example of an operable part provided by software.

platform software: collection of software components that runs on an underlying software or hardware layer, and that provides a set of software services to other software components that allows those applications to be isolated from the underlying software or hardware layer (after ISO/IEC 13066-1 [i.19])

NOTE: A particular software component might play the role of a platform in some situations and a client in others.

programmatically determinable: able to be read by software from developer-supplied data in a way that other software, including assistive technologies, can extract and present this information to users in different modalities

NOTE: WCAG 2.1 uses "determined" where this definition uses "able to be read" (to avoid ambiguity with the word "determined").

real-time text: form of a text conversation in point to point situations or in multipoint conferencing where the text being entered is sent in such a way that the communication is perceived by the user as being continuous

satisfies a success criterion: success criterion does not evaluate to "false" when applied to the ICT (after WCAG 2.1 [5])

terminal: combination of hardware and/or software with which the end user directly interacts and that provides the user interface

NOTE 1: The hardware may consist of more than one device working together e.g. a mobile device and a computer.

NOTE 2: For some systems, the software that provides the user interface may reside on more than one device such as a telephone and a server.

user agent: software that retrieves and presents content for users (after WCAG 2.1 [5])

NOTE 1: Software that only displays the content contained within it is treated as software and not considered to be a user agent.

NOTE 2: An example of software that is not a user agent is a calculator application that does not retrieve the calculations from outside the software to present it to a user. In this case, the calculator software is not a user agent, it is simply software with a user interface.

NOTE 3: Software that only shows a preview of content such as a thumbnail or other non-fully functioning presentation is not providing user agent functionality.

user interface: all components of an interactive system (software or hardware) that provide information and/or controls for the user to accomplish specific tasks with the interactive system (from ISO 9241-110 [i.16])

user interface element: entity of the user interface that is presented to the user by the software (after ISO 9241-171 [i.17])

NOTE 1: This term is also known as "user interface component".

NOTE 2: User-interface elements can be interactive or not.

web content: content that belongs to a web page, and that is used in the rendering or that is intended to be used in the rendering of the web page

web page: non-embedded resource obtained from a single URI using HTTP plus any other resources that are used in the rendering or intended to be rendered together with it by a user agent (after WCAG 2.1 [5])

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ADA	Americans with Disabilities Act
ANSI	American National Standards Institute
AT	Assistive Technology
CIF	Common Intermediate Format
CSS	Cascading Style Sheets
DOM	Document Object Model
EU	European Union
FPS	Frames Per Second
FXML	XML-based user interface markup language
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
ICT	Information and Communication Technology
IETF	Internet Engineering Task Force
IMS	IP Multimedia System
IP	Internet Protocol
JWG	Joint Working Group (of CEN/CENELEC/ETSI)
ODF	Open Document Format
OOXML	Office Open eXtensible Markup Language
PSTN	Public Switched Telephone Network
QCIF	Quarter Common Intermediate Format
RFC	Request For Comment
RTT	Real-Time Text
SC	Success Criterion
SIP	Session Initiation Protocol
URI	Uniform Resource Identifier
USB	Universal Serial Bus
VoIP	Voice over IP
W3C	World Wide Web Consortium
WCAG	Web Content Accessibility Guidelines (of W3C)
XML	eXtensible Markup Language
XUL	XML User interface Language

4 Functional performance

4.1 Meeting functional performance statements

The statements set out in clause 4.2 are intended to describe the functional performance of ICT enabling people to locate, identify, and operate ICT functions, and to access the information provided, regardless of physical, cognitive or sensory abilities. Any ability impairments may be permanent, temporary or situational.

ICT meeting the applicable requirements of clauses 5 to 13 is deemed to have met a level of accessibility conformant with the present document and consistent with the user accessibility needs identified in clause 4.2 (Functional performance statements).

NOTE 1: The relationship between the requirements from clauses 5 to 13 and the accessibility-related user needs is set out in Annex B.

NOTE 2: The intent of clause 4.2 is to describe the users' accessibility needs in accessing the full functionality and documentation of the product or the service with or without the use of assistive technologies.

NOTE 3: The methods of meeting the accessibility needs of users with multiple impairments will depend on the specific combination of impairments. Meeting these user accessibility needs may be addressed by considering multiple clauses in clause 4.2.

NOTE 4: Several users' accessibility needs rely on ICT providing specific modes of operation. If a user is to activate, engage or switch to the mode that complies with his or her user accessibility needs, the method for activating, engaging or switching to that mode is also expected to comply with the same user accessibility needs.

4.2 Functional performance statements

4.2.1 Usage without vision

Where ICT provides visual modes of operation, some users need ICT to provide at least one mode of operation that does not require vision.

NOTE 1: A web page or application with a well formed semantic structure can allow users without vision to identify, navigate and interact with a visual user interface.

NOTE 2: Audio and tactile user interfaces may contribute towards meeting this clause.

4.2.2 Usage with limited vision

Where ICT provides visual modes of operation, some users will need the ICT to provide features that enable users to make better use of their limited vision.

NOTE 1: Magnification, reduction of required field of vision and control of contrast, brightness and intensity can contribute towards meeting this clause.

NOTE 2: Where significant features of the user interface are dependent on depth perception, the provision of additional methods of distinguishing between the features may contribute towards meeting this clause.

NOTE 3: Users with limited vision may also benefit from non-visual access (see clause 4.2.1).

4.2.3 Usage without perception of colour

Where ICT provides visual modes of operation, some users will need the ICT to provide a visual mode of operation that does not require user perception of colour.

NOTE: Where significant features of the user interface are colour-coded, the provision of additional methods of distinguishing between the features may contribute towards meeting this clause.

4.2.4 Usage without hearing

Where ICT provides auditory modes of operation, some users need ICT to provide at least one mode of operation that does not require hearing.

NOTE: Visual and tactile user interfaces may contribute towards meeting this clause.

4.2.5 Usage with limited hearing

Where ICT provides auditory modes of operation, some users will need the ICT to provide enhanced audio features.

NOTE 1: Enhancement of the audio clarity, reduction of background noise, increased range of volume and greater volume in the higher frequency range can contribute towards meeting this clause.

NOTE 2: Users with limited hearing may also benefit from non-hearing access (see clause 4.2.4).

4.2.6 Usage without vocal capability

Where ICT requires vocal input from users, some users will need the ICT to provide at least one mode of operation that does not require them to generate vocal output.

NOTE 1: This clause covers the alternatives to the use of orally-generated sounds, including speech, whistles, clicks, etc.

NOTE 2: Keyboard, pen or touch user interfaces may contribute towards meeting this clause.

4.2.7 Usage with limited manipulation or strength

Where ICT requires manual actions, some users will need the ICT to provide features that enable users to make use of the ICT through alternative actions not requiring manipulation or hand strength.

NOTE 1: Examples of operations that users may not be able to perform include those that require fine motor control, path dependant gestures, pinching, twisting of the wrist, tight grasping, or simultaneous manual actions.

NOTE 2: One-handed operation, sequential key entry and speech user interfaces may contribute towards meeting this clause.

NOTE 3: Some users have limited hand strength and may not be able to achieve the level of strength to perform an operation. Alternative user interface solutions that do not require hand strength may contribute towards meeting this clause.

4.2.8 Usage with limited reach

Where ICT products are free-standing or installed, the operational elements will need to be within reach of all users.

NOTE: Considering the needs of wheelchair users and the range of user statures in the placing of operational elements of the user interface may contribute towards meeting this clause.

4.2.9 Minimize photosensitive seizure triggers

Where ICT provides visual modes of operation, some users need ICT to provide at least one mode of operation that minimizes the potential for triggering photosensitive seizures.

NOTE: Limiting the area and number of flashes per second may contribute towards meeting this clause.

4.2.10 Usage with limited cognition

Some users will need the ICT to provide features that make it simpler and easier to use.

NOTE 1: This clause is intended to include the needs of persons with limited cognitive, language and learning abilities.

NOTE 2: Adjustable timings, error indication and suggestion, and a logical focus order are examples of design features that may contribute towards meeting this clause.

4.2.11 Privacy

Where ICT provides features that are provided for accessibility, some users will need their privacy to be maintained when using those ICT features that are provided for accessibility.

NOTE: Enabling the connection of personal headsets for private listening, not providing a spoken version of characters being masked and enabling user control of legal, financial and personal data are examples of design features that may contribute towards meeting this clause.

5 Generic requirements

5.1 Closed functionality

5.1.1 Introduction (informative)

ICT has closed functionality for many reasons, including design or policy. Some of the functionality of products can be closed because the product is self-contained and users are precluded from adding peripherals or software in order to access that functionality.

ICT may have closed functionality in practice even though the ICT was not designed, developed or supplied to be closed.

Computers that do not allow end-users to adjust settings or install software are functionally closed.

5.1.2 General

5.1.2.1 Closed functionality

Where ICT has closed functionality, it shall meet the requirements set out in clauses 5.2 to 13, as applicable.

NOTE 1: ICT may close some, but not all, of its functionalities. Only the closed functionalities have to conform to the requirements of clause 5.1.

NOTE 2: The provisions within this clause are requirements for the closed functionality of ICT that replace those requirements in clauses 5.2 to 13 that specifically state that they do not apply to closed functionality. This may be because they relate to compatibility with assistive technology or to the ability for the user to adjust system accessibility settings in products with closed functionality (e.g. products that prevent access to the system settings control panel).

5.1.2.2 Assistive technology

Where ICT has closed functionality, that closed functionality shall be operable without requiring the user to attach, connect or install assistive technology and shall conform to the generic requirements of clauses 5.1.3 to 5.1.6 as applicable. Personal headsets and induction loops shall not be classed as assistive technology for the purpose of this clause.

5.1.3 Non-visual access

5.1.3.1 General

Where visual information is needed to enable the use of those functions of ICT that are closed to assistive technologies for screen reading, ICT shall provide at least one mode of operation using non-visual access to enable the use of those functions.

NOTE 1: Non-visual access may be in an audio form, including speech, or a tactile form.

NOTE 2: The visual information needed to enable use of some functions may include operating instructions and orientation, transaction prompts, user input verification, error messages and non-text content.

5.1.3.2 Auditory output delivery including speech

Where auditory output is provided as non-visual access to closed functionality, the auditory output shall be delivered:

- a) either directly by a mechanism included in or provided with the ICT; or

- b) by a personal headset that can be connected through a 3,5 mm audio jack, or an industry standard connection, without requiring the use of vision.

NOTE 1: Mechanisms included in or provided with ICT may be, but are not limited to, a loudspeaker, a built-in handset/headset, or other industry standard coupled peripheral.

NOTE 2: An industry standard connection could be a wireless connection.

NOTE 3: Some users may benefit from the provision of an inductive loop.

5.1.3.3 Auditory output correlation

Where auditory output is provided as non-visual access to closed functionality, and where information is displayed on the screen, the ICT should provide auditory information that allows the user to correlate the audio with the information displayed on the screen.

NOTE 1: Many people who are legally blind still have visual ability, and use aspects of the visual display even if it cannot be fully comprehended. An audio alternative that is both complete and complementary includes all visual information such as focus or highlighting, so that the audio can be correlated with information that is visible on the screen at any point in time.

NOTE 2: Examples of auditory information that allows the user to correlate the audio with the information displayed on the screen include structure and relationships conveyed through presentation.

5.1.3.4 Speech output user control

Where speech output is provided as non-visual access to closed functionality, the speech output shall be capable of being interrupted and repeated when requested by the user, where permitted by security requirements.

NOTE 1: It is best practice to allow the user to pause speech output rather than just allowing them to interrupt it.

NOTE 2: It is best practice to allow the user to repeat only the most recent portion rather than requiring play to start from the beginning.

5.1.3.5 Speech output automatic interruption

Where speech output is provided as non-visual access to closed functionality, the ICT shall interrupt current speech output when a user action occurs and when new speech output begins.

NOTE: Where it is essential that the user hears the entire message, e.g. a safety instruction or warning, the ICT may need to block all user action so that speech is not interrupted.

5.1.3.6 Speech output for non-text content

Where ICT presents non-text content, the alternative for non-text content shall be presented to users via speech output unless the non-text content is pure decoration or is used only for visual formatting. The speech output for non-text content shall follow the guidance for "text alternative" described in WCAG 2.1 [5] Success Criterion 1.1.1.

5.1.3.7 Speech output for video information

Where pre-recorded video content is needed to enable the use of closed functions of ICT and where speech output is provided as non-visual access to closed functionality, the speech output shall present equivalent information for the pre-recorded video content.

NOTE: This speech output can take the form of an audio description or an auditory transcript of the video content.

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

5.1.3.9 Private access to personal data

Where auditory output is provided as non-visual access to 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 might be preferred when closed functionality is used, for example, in the privacy of the user's home. A warning highlighting privacy concerns might be appropriate to ensure that the user has made an informed choice.

5.1.3.10 Non-interfering audio output

Where auditory output is provided as non-visual access to closed functionality, the ICT shall not automatically play, at the same time, any interfering audible output that lasts longer than three seconds.

5.1.3.11 Private listening volume

Where auditory output is provided as non-visual access to closed functionality and is delivered through a mechanism for private listening, ICT shall provide at least one non-visual mode of operation for controlling the volume.

5.1.3.12 Speaker volume

Where auditory output is provided as non-visual access to closed functionality and is delivered through speakers on ICT, a non-visual incremental volume control shall be provided with output amplification up to a level of at least 65 dBA (-29 dBPaA).

NOTE: For noisy environments, 65 dBA may not be sufficient.

5.1.3.13 Volume reset

Where auditory output is provided as non-visual access to closed functionality, a function that resets the volume to be at a level of 65 dBA or less after every use, shall be provided, unless the ICT is dedicated to a single user.

NOTE: A feature to disable the volume reset function may be provided in order to enable the single-user exception to be met.

5.1.3.14 Spoken languages

Where speech output is provided as non-visual access to closed functionality, speech output shall be in the same human language as the displayed content provided, except:

- a) for proper names, technical terms, words of indeterminate language, and words or phrases that have become part of the vernacular of the immediately surrounding text;
- b) where the content is generated externally and not under the control of the ICT vendor, clause 5.1.3.14 shall not be required to apply for languages not supported by the ICT's speech synthesizer;
- c) for displayed languages that cannot be selected using non-visual access;
- d) where the user explicitly selects a speech language that is different from the language of the displayed content.

5.1.3.15 Non-visual error identification

Where speech output is provided as non-visual access to closed functionality and an input error is automatically detected, speech output shall identify and describe the item that is in error.

5.1.3.16 Receipts, tickets, and transactional outputs

Where ICT is closed to visual access and provides receipts, tickets or other outputs as a result of a self-service transaction, speech output shall be provided which shall include all information necessary to complete or verify the transaction. In the case of ticketing machines, printed copies of itineraries and maps shall not be required to be audible.

NOTE: The speech output may be provided by any element of the total ICT system.

5.1.4 Functionality closed to text enlargement

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

The subtended angle, in degrees, may be calculated from:

$$\Psi = (180 \times H) / (\pi \times D)$$

Where:

- ψ is the subtended angle in degrees
- H is the height of the text
- D is the viewing distance
- D and H are expressed in the same units

NOTE 1: The intent is to provide a mode of operation where text is large enough to be used by most users with low vision.

NOTE 2: Table 5.1 and Figure 1 illustrate the relationship between the maximum viewing distance and minimum character height at the specified minimum subtended angle.

Table 5.1: Relationship between maximum design viewing distance and minimum character height at the limit of subtended angle

Minimum subtended angle	Maximum design viewing distance	Minimum character height
0,7 degrees	100 mm	1,2 mm
	200 mm	2,4 mm
	250 mm	3,1 mm
	300 mm	3,7 mm
	350 mm	4,3 mm
	400 mm	4,9 mm
	450 mm	5,5 mm
	500 mm	6,1 mm
	550 mm	6,7 mm
	600 mm	7,3 mm



Figure 1: Relationship between minimum character height and maximum design viewing distance

5.1.5 Visual output for auditory information

Where pre-recorded auditory information is needed to enable the use of closed functions of ICT, the ICT shall provide visual information that is equivalent to the pre-recorded auditory output.

NOTE: This visual information can take the form of captions or text transcripts.

5.1.6 Operation without keyboard interface

5.1.6.1 Closed functionality

Where ICT functionality is closed to keyboards or keyboard interfaces, all functionality shall be operable without vision as required by clause 5.1.3.

5.1.6.2 Input focus

Where ICT functionality is closed to keyboards or keyboard interfaces and where input focus can be moved to a user interface element, it shall be possible to move the input focus away from that element using the same mechanism, in order to avoid trapping the input focus.

5.2 Activation of accessibility features

Where ICT has documented accessibility features, it shall be possible to activate those documented accessibility features that are required to meet a specific need without relying on a method that does not support that need.

5.3 Biometrics

Where ICT uses biological characteristics, it shall not rely on the use of a particular biological characteristic as the only means of user identification or for control of ICT.

NOTE 1: Alternative means of user identification or for control of ICT could be non-biometric or biometric.

NOTE 2: Biometric methods based on dissimilar biological characteristics increase the likelihood that individuals with disabilities possess at least one of the specified biological characteristics. Examples of dissimilar biological characteristics are fingerprints, eye retinal patterns, voice, and face.

5.4 Preservation of accessibility information during conversion

Where ICT converts information or communication it shall preserve all documented non-proprietary information that is provided for accessibility, to the extent that such information can be contained in or supported by the destination format.

5.5 Operable parts

5.5.1 Means of operation

Where ICT has operable parts that require grasping, pinching, or twisting of the wrist to operate, an accessible alternative means of operation that does not require these actions shall be provided.

5.5.2 Operable parts discernibility

Where ICT has operable parts, it shall provide a means to discern each operable part, without requiring vision and without performing the action associated with the operable part.

NOTE: One way of meeting this requirement is by making the operable parts tactilely discernible.

5.6 Locking or toggle controls

5.6.1 Tactile or auditory status

Where ICT has a locking or toggle control and that control is visually presented to the user, the ICT shall provide at least one mode of operation where the status of the control can be determined either through touch or sound without operating the control.

NOTE 1: Locking or toggle controls are those controls that can only have two or three states and that keep their state while being used.

NOTE 2: An example of a locking or toggle control is the "Caps Lock" key found on most keyboards. Another example is the volume button on a pay telephone, which can be set at normal, loud, or extra loud volume.

5.6.2 Visual status

Where ICT has a locking or toggle control and the control is non-visually presented to the user, the ICT shall provide at least one mode of operation where the status of the control can be visually determined when the control is presented.

NOTE 1: Locking or toggle controls are those controls that can only have two or three states and that keep their state while being used.

NOTE 2: An example of a locking or toggle control is the "Caps Lock" key found on most keyboards. An example of making the status of a control determinable is a visual status indicator on a keyboard.

5.7 Key repeat

Where ICT has a key repeat function that cannot be turned off:

- a) the delay before the key repeat shall be adjustable to at least 2 seconds; and
- b) the key repeat rate shall be adjustable down to one character per 2 seconds.

5.8 Double-strike key acceptance

Where ICT has a keyboard or keypad, the delay after any keystroke, during which an additional key-press will not be accepted if it is identical to the previous keystroke, shall be adjustable up to at least 0,5 seconds.

5.9 Simultaneous user actions

Where ICT uses simultaneous user actions for its operation, such ICT shall provide at least one mode of operation that does not require simultaneous user actions to operate the ICT.

NOTE: Having to use both hands to open the lid of a laptop, 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 ICT with two-way voice communication

6.1 Audio bandwidth for speech

Where ICT provides two-way voice communication, in order to provide good audio quality, that ICT shall be able to encode and decode two-way voice communication with a frequency range with an upper limit of at least 7 000 Hz.

NOTE 1: For the purposes of interoperability, support of Recommendation ITU-T G.722 [i.21] is widely used.

NOTE 2: Where codec negotiation is implemented, other standardized codecs such as Recommendation ITU-T G.722.2 [i.22] are sometimes used so as to avoid transcoding.

6.2 Real-time text (RTT) functionality

6.2.1 RTT provision

6.2.1.1 RTT communication

Where ICT supports two-way voice communication in a specified context of use, the ICT shall allow a user to communicate with another user by RTT.

NOTE 1: The RTT capability can be provided as a factory default or added later.

NOTE 2: Provision of RTT may require additional service provision, additional hardware and/or software which may be provided separately or together.

6.2.1.2 Concurrent voice and text

Where ICT supports two-way voice communication in a specified context of use, and enables a user to communicate with another user by RTT, it shall provide a mechanism to select a mode of operation which allows concurrent voice and text.

NOTE: The availability of voice and RTT running concurrently can allow the RTT to replace or support voice and transfer additional information such as numbers, currency amounts and spelling of names.

6.2.2 Display of Real-time Text

6.2.2.1 Visually distinguishable display

Where ICT has RTT send and receive capabilities, displayed sent text shall be visually differentiated from and separated from received text.

6.2.2.2 Programmatically determinable send and receive direction

Where ICT has RTT send and receive capabilities, the send/receive direction of transmitted text shall be programmatically determinable, unless the RTT has closed functionality.

NOTE: The intent of this clause is to enable screen readers to be able to distinguish between incoming text and outgoing text when used with RTT functionality.

6.2.3 Interoperability

Where ICT with RTT functionality interoperates with other ICT with RTT functionality (as required by clause 6.2.1.1) they shall support at least one of the four RTT interoperability mechanisms described below:

- a) ICT interoperating over the Public Switched Telephone Network (PSTN), with other ICT that directly connects to the PSTN as described in Recommendation ITU-T V.18 [i.23] or any of its annexes for text telephony signals at the PSTN interface;
- b) ICT interoperating with other ICT using VOIP with Session Initiation Protocol (SIP) and using real-time text that conforms to IETF RFC 4103 [i.13];
- c) ICT interoperating with other ICT using RTT that conforms with the IP Multimedia Sub-System (IMS) set of protocols specified in ETSI TS 126 114 [i.10], ETSI TS 122 173 [i.11] and ETSI TS 134 229 [i.12];
- d) ICT interoperating with other ICT using a relevant and applicable common specification for RTT exchange that is published and available. This common specification shall include a method for indicating loss or corruption of characters.

6.2.4 Real-time text responsiveness

Where ICT utilises RTT input, that RTT input shall be transmitted to the ICT network supporting RTT within 1 second of the input entry.

NOTE 1: Input entry is considered to have occurred when sufficient user input has occurred for the ICT to establish which character(s) to send.

NOTE 2: Input entry will differ between systems where text is entered on a word-by-word basis (e.g. speech-to-text and predictive-text based systems) and systems where each character is separately generated.

6.3 Caller ID

Where ICT provides caller identification or similar telecommunications functions are provided, the caller identification and similar telecommunications functions shall be available in text form and in at least one other modality.

6.4 Alternatives to voice-based services

Where ICT provides real-time voice-based communication and also provides voice mail, auto-attendant, or interactive voice response facilities, the ICT should offer users a means to access the information and carry out the tasks provided by the ICT without the use of hearing or speech.

NOTE: Solutions capable of handling audio, real-time text and video media could satisfy the above requirement.

6.5 Video communication

6.5.1 General (informative)

Clause 6.5 (Video communications) provides performance requirements that support users who communicate using sign language and lip-reading. For these users, good usability is achieved with Common Intermediate Format (CIF) resolution, a frame rate of 20 frames per second and over, with a time difference between speech audio and video that does not exceed 100 ms.

When the resolution is reduced to Quarter Common Intermediate Format (QCIF) and the frame rate drops to 12 frames per second the communication is still usable with some restrictions.

A lower resolution causes less disturbance to the perception of sign language and lip-reading than that caused by a lower frame rate.

Delay can be a problem in video communication. Overall delay values below 0,4 s are preferred, with an increase in preference down to 0,1 s. Values over 0,8 s are felt to hinder a good sign conversation. Overall delay depends on multiple factors, including e.g. network delay and video processing. For this reason a testable requirement on minimum values for overall delay cannot be produced.

6.5.2 Resolution

Where ICT that provides two-way voice communication includes real-time video functionality, the ICT:

- a) shall support at least QCIF resolution;
- b) should preferably support at least CIF resolution.

6.5.3 Frame rate

Where ICT that provides two-way voice communication includes real-time video functionality, the ICT:

- a) shall support a frame rate of at least 12 frames per second (FPS);
- b) should preferably support a frame rate of at least 20 frames per second (FPS) with or without sign language in the video stream.

6.5.4 Synchronization between audio and video

Where ICT that provides two-way voice communication includes real-time video functionality, the ICT should ensure a maximum time difference of 100 ms between the speech and video presented to the user.

6.6 Alternatives to video-based services

Where ICT provides real-time video-based communication and also provides answering machine, auto attendant or interactive response facilities, the ICT should offer users a means to access the information and carry out the tasks related to these facilities:

- a) for audible information, without the use of hearing;
- b) for spoken commands, without the use of speech;
- c) for visual information, without the use of vision.

NOTE: Solutions capable of generating real-time captions or handling real-time text could satisfy the above requirement.

7 ICT with video capabilities

7.1 Caption processing technology

7.1.1 Captioning playback

Where ICT displays video with synchronized audio, it shall have a mode of operation to display the available captions. Where closed captions are provided as part of the content, the ICT shall allow the user to choose to display the captions.

NOTE: Captions may contain information about timing, colour and positioning. This caption data is important for caption users. Timing is used for caption synchronization. Colour can be used for speaker identification. Position can be used to avoid obscuring important information.

7.1.2 Captioning synchronization

Where ICT displays captions, the mechanism to display captions shall preserve synchronization between the audio and the corresponding captions.

7.1.3 Preservation of captioning

Where ICT transmits, converts or records video with synchronized audio, it shall preserve caption data such that it can be displayed in a manner consistent with clauses 7.1.1 and 7.1.2.

Additional presentational aspects of the text such as screen position, text colours, text style and text fonts may convey meaning, based on regional conventions. Altering these presentational aspects could change the meaning and should be avoided wherever possible.

7.2 Audio description technology

7.2.1 Audio description playback

Where ICT displays video with synchronized audio, it shall provide a mechanism to select and play available audio description to the default audio channel.

Where video technologies do not have explicit and separate mechanisms for audio description, an ICT is deemed to satisfy this requirement if the ICT enables the user to select and play several audio tracks.

NOTE 1: In such cases, the video content can include the audio description as one of the available audio tracks.

NOTE 2: Audio descriptions in digital media sometimes include information to allow descriptions that are longer than the gaps between dialogue. Support in digital media players for this "extended audio description" feature is useful, especially for digital media that is viewed personally.

7.2.2 Audio description synchronization

Where ICT has a mechanism to play audio description, it shall preserve the synchronization between the audio/visual content and the corresponding audio description.

7.2.3 Preservation of audio description

Where ICT transmits, converts, or records video with synchronized audio, it shall preserve audio description data such that it can be played in a manner consistent with clauses 7.2.1 and 7.2.2.

7.3 User controls for captions and audio description

Where ICT primarily displays materials containing video with associated audio content, user controls to activate subtitling and audio description shall be provided to the user at the same level of interaction (i.e. the number of steps to complete the task) as the primary media controls.

NOTE 1: Primary media controls are the set of controls that the user most commonly uses to control media.

NOTE 2: Products that have a general hardware volume control, such as a telephone, or a laptop which can be configured to display video through software but which is not its primary purpose, would not need dedicated hardware controls for captions and descriptions; however software controls, or hardware controls mapped through software, would need to be at the same level of interaction.

NOTE 3: It is best practice for ICT to include additional controls enabling the user to select whether captions and audio description are turned on or off by default.

8 Hardware

8.1 General

8.1.1 Generic requirements

The "generic requirements" of clause 5 also apply to ICT that is hardware.

8.1.2 Standard connections

Where an ICT provides user input or output device connection points, the ICT shall provide at least one input and/or output connection that conforms to an industry standard non-proprietary format, directly or through the use of commercially available adapters.

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

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.

8.1.3 Colour

Where the ICT has hardware aspects that use colour, colour shall not be used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.

8.2 Hardware products with speech output

8.2.1 Speech volume gain

8.2.1.1 Speech volume range

Where ICT hardware has speech output, it shall provide a means to adjust the speech output volume level over a range of at least 18 dB.

NOTE: Fixed-line handsets and headsets fulfilling the requirements of ANSI/TIA-4965 [i.2] are deemed to comply with this requirement.

8.2.1.2 Incremental volume control

Where ICT hardware has speech output and its volume control is incremental, it shall provide at least one intermediate step of 12 dB gain above the lowest volume setting.

8.2.2 Magnetic coupling

8.2.2.1 Fixed-line devices

Where ICT hardware is a fixed-line communication device with speech output and which is normally held to the ear and which carries the "T" symbol specified in ETSI ETS 300 381 [1], it shall provide a means of magnetic coupling which meets the requirements of ETSI ES 200 381-1 [2].

NOTE: ICT fulfilling the requirements of TIA-1083-A [i.24] is deemed to comply with the requirements of this clause.

8.2.2.2 Wireless communication devices

Where ICT hardware is a wireless communication device with speech output which is normally held to the ear, it shall provide a means of magnetic coupling to hearing technologies which meets the requirements of ETSI ES 200 381-2 [3].

NOTE: ICT fulfilling the requirements of ANSI/IEEE C63.19 [i.1] is deemed to comply with the requirements of this clause.

8.3 Physical access to ICT

8.3.1 General (informative)

Clauses 8.3.2 to 8.3.4 describe recommendations on those dimensions that are integral to the ICT (e.g. integral shelves, or integral cabins that may restrict access to the operable parts of the ICT).

When ICT is installed, the dimensions of the surrounding space combined with the dimensions of the ICT might affect the physical access to the ICT. Accessible physical access of the ICT would be achieved if the installation instructions referred to in clause 8.3.5 are followed.

It may not be possible to apply all recommendations of clause 8.3 to all aspects of maintenance, repair, or occasional monitoring of equipment in all circumstances. Nevertheless, it is best practice to apply the recommendations in clause 8.3, where feasible and safe to do so.

NOTE 1: The dimensions set out in clause 8.3 are identical to those given in the American 2010 ADA standards for accessible design [i.25].

NOTE 2: Physical access to ICT is dependent on the dimensions of both the ICT and the environment in which it is installed and operated. Clause 8.3 does not apply to the accessibility of the physical environment external to the ICT.

8.3.2 Clear floor or ground space

8.3.2.1 Change in level

Where there is a change in floor level that is integral to the ICT then it should be ramped with a slope no steeper than 1:48.

Exceptions:

- If the change in floor level is less than or equal to 6,4 mm ($\frac{1}{4}$ inch) the change may be vertical as shown in Figure 2.
- If the change in floor level is less than or equal to 13 mm ($\frac{1}{2}$ inch) the change may have a slope not steeper than 1:2 as shown in Figure 3.

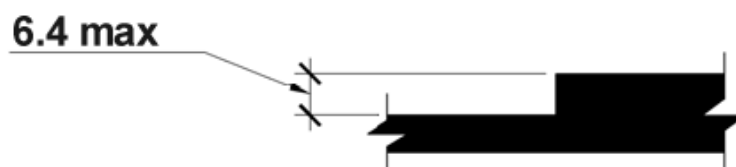


Figure 2: Vertical change in level

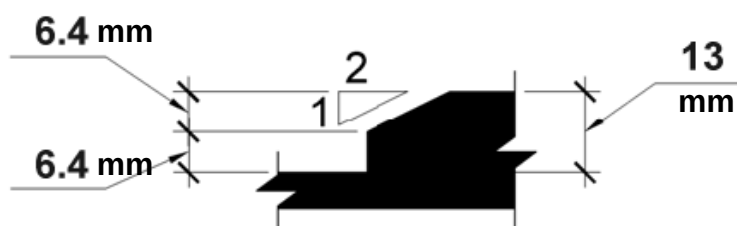


Figure 3: Bevelled change in level

8.3.2.2 Clear floor or ground space

Where the operating area is integral to the ICT, it should provide a clear floor area that has the minimum dimensions of 760 mm (30 inches) by 1 220 mm (48 inches) from which to operate the ICT. This is shown in Figure 4.

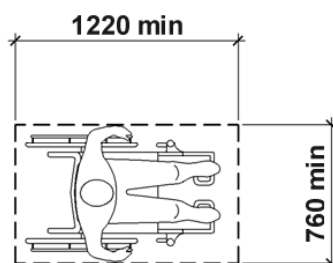


Figure 4: Clear floor or ground space

8.3.2.3 Approach

8.3.2.3.1 General

Where the access space is integral to the ICT, at least one full side of the space should be unobstructed.

8.3.2.3.2 Forward approach

Where the operating area is inside an alcove integral to the ICT, the alcove is deeper than 610 mm (24 inches), and where a forward approach is necessary, the dimension of the access space should be a minimum of 915 mm (36 inches) wide. This is shown in Figure 5.

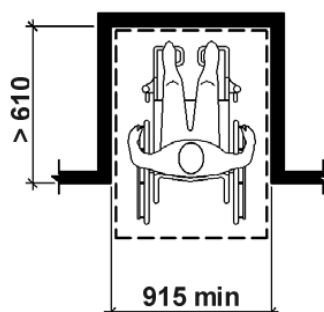


Figure 5: Manoeuvring Clearance in an Alcove, Forward Approach

8.3.2.3.3 Parallel approach

Where the operating area is inside an alcove integral to the ICT, the alcove is deeper than 380 mm (15 inches), and where a parallel approach is possible, the dimension of the access space should be a minimum of 1 525 mm (60 inches) wide. This is shown in Figure 6.

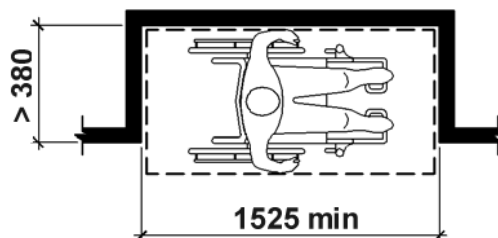


Figure 6: Manoeuvring Clearance in an Alcove, Parallel Approach

8.3.2.4 Knee and toe clearance width

Where the space under an obstacle that is integral to the ICT is part of access space, the clearance should be at least 760 mm (30 inches) wide.

8.3.2.5 Toe clearance

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

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

This is shown in Figure 7.

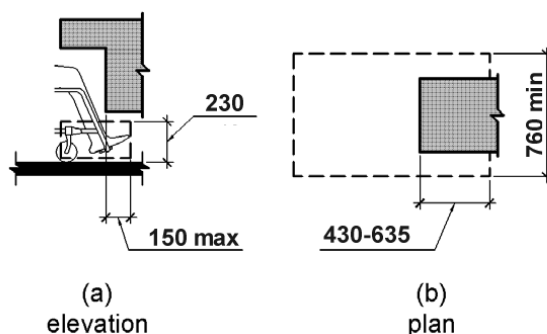


Figure 7: Toe clearance

8.3.2.6 Knee clearance

Where an obstacle is integral to the ICT, the space under the obstacle that is between 230 mm and 685 mm above the floor is considered knee clearance and should:

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

- d) be permitted to be reduced in depth at a rate of 25 mm (1 inch) for each 150 mm (6 inches) in height.

This is shown in Figure 8.

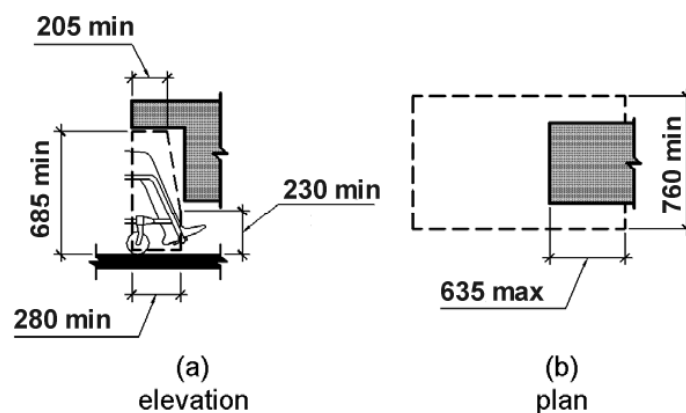


Figure 8: Knee clearance

8.3.3 Reach range for ICT

8.3.3.1 Forward reach

8.3.3.1.1 Unobstructed high forward reach

Where the access space is integral to the ICT and the forward reach is unobstructed, the essential controls should be located no higher than 1 220 mm (48 inches) above the floor of the access space. This is shown in Figure 9.

8.3.3.1.2 Unobstructed low forward reach

Where the access space is integral to the ICT and the forward reach is unobstructed, the essential controls should be located no lower than 380 mm (15 inches) above the floor of the access space. This is shown in Figure 9.

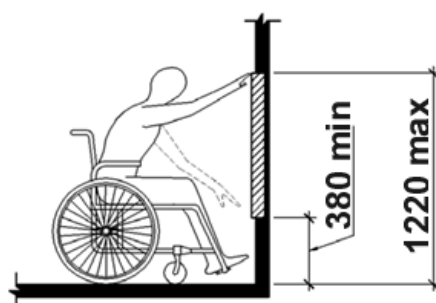


Figure 9: Unobstructed forward reach

8.3.3.1.3 Obstructed reach

8.3.3.1.3.1 Clear floor space

Where the access space is integral to the ICT and has an obstruction which is integral to the ICT which hinders the access to any essential controls, the ICT should provide a clear floor space which extends beneath the obstructing element for a distance not less than the required reach depth over the obstruction.

8.3.3.1.3.2 Obstructed (< 510 mm) forward reach

Where the access space is integral to the ICT and has an obstruction which is integral to the ICT and which is less than 510 mm (20 inches), the forward reach to all essential controls should be no higher than 1 220 mm (48 inches) above the floor contact of the ICT. This is shown in Figure 10 (a).

8.3.3.1.3.3 Obstructed (> 510 mm) forward reach

Where the access space is integral to the ICT and has an obstruction which is integral to the ICT and which is greater than 510 mm (20 inches) and less than 635 mm (25 inches) maximum, the forward reach to all essential controls should be no higher than 1 120 mm (44 inches) above the floor contact of the ICT. This is shown in Figure 10 (b).

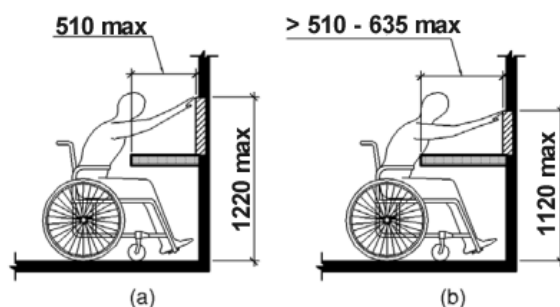


Figure 10: Obstructed high reach

8.3.3.2 Side reach

8.3.3.2.1 Unobstructed high side reach

Where the access space is integral to the ICT, allows a parallel approach, and the side reach is unobstructed or obstructed by an element integral to the ICT which is less than 255 mm (10 inches), all essential controls should be within a high side reach which is less than or equal to 1 220 mm (48 inches) above the floor of the access space. This is shown in Figure 11.

8.3.3.2.2 Unobstructed low side reach

Where the access space is integral to the ICT, allows a parallel approach, and the side reach is unobstructed or obstructed by an element integral to the ICT which is less than 255 mm (10 inches), all essential controls should be within a low side reach which is greater than or equal to 380 mm (15 inches) above the floor of the access space. This is shown in Figure 11.

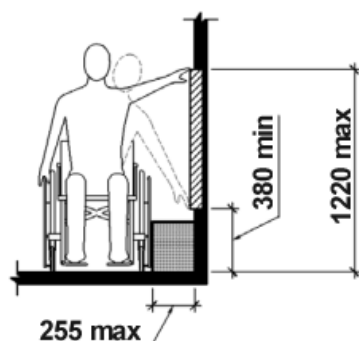


Figure 11: Unobstructed side reach

8.3.3.2.3 Obstructed side reach

8.3.3.2.3.1 Obstructed (≤ 255 mm) side reach

Where the access space is integral to the ICT, allows a parallel approach and has an obstruction which is integral to the ICT, the height of the obstruction should be less than 865 mm (34 inches). Where the depth of the obstruction is less than or equal to 255 mm (10 inches), the high side reach to all essential controls should be no higher than 1 220 mm (48 inches) above the floor of the access space. This is shown in Figure 12 (a).

8.3.3.2.3.2 Obstructed (≤ 610 mm) side reach

Where the access space is integral to the ICT, allows a parallel approach and has an obstruction which is integral to the ICT, the height of the obstruction should be less than 865 mm (34 inches). Where the depth of the obstruction is greater than 255 mm (10 inches) with a maximum depth of 610 mm (24 inches), the high side reach to all essential controls should be no higher than 1 170 mm (46 inches) above the floor of the access space. This is shown in Figure 12 (b).

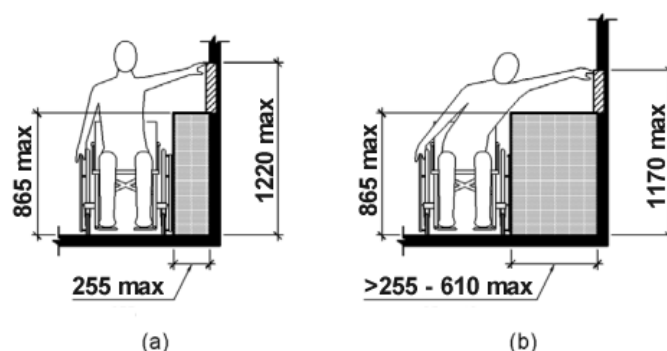


Figure 12: Obstructed high side reach

8.3.4 Visibility

Where the operating area is integral to the ICT, and a display screen is provided, information on the screen should be legible from a point located 1 015 mm (40 inches) above the centre of the floor of the operating area (as defined in clause 8.3.2.2).

NOTE: The intent of this provision is that the information on the screen can be read by users with normal vision and appropriate language skills, when seated in a wheelchair.

8.3.5 Installation instructions

Where an ICT is intended to be installed, instructions should be made available which outline a method to install the ICT in a manner that ensures that the dimensions of the integral spaces of the ICT conform to clauses 8.3.2 to 8.3.4.

8.4 Mechanically operable parts

8.4.1 Numeric keys

Where provided, physical numeric keys arranged in a rectangular keypad layout shall have the number five key tactilely distinct from the other keys of the keypad.

NOTE: Recommendation ITU-T E.161 [i.20] describes the 12-key telephone keypad layout and provides further details of the form of tactile markers.

8.4.2 Operation of mechanical parts

8.4.2.1 Means of operation of mechanical parts

Where a control requires grasping, pinching, or twisting of the wrist to operate it, an accessible alternative means of operation that does not require these actions shall be provided.

8.4.2.2 Force of operation of mechanical parts

Where a control requires a force greater than 22,2 N to operate it, an accessible alternative means of operation that requires a force less than 22,2 N shall be provided.

8.4.3 Keys, tickets and fare cards

Where ICT provides keys, tickets or fare cards, and their orientation is important for further use, they shall have an orientation that is tactilely discernible.

NOTE: ETSI ETS 300 767 [i.6] defines suitable tactile indications for plastic cards.

8.5 Tactile indication of speech mode

Where ICT is designed for shared use and speech output is available, a tactile indication of the means to initiate the speech mode of operation shall be provided.

NOTE: The tactile indication could include Braille instructions.

9 Web

9.0 General (informative)

Requirements in clause 9 apply to web pages (as defined in clause 3.1) including:

- Conformance with WCAG 2.0 Level AA is equivalent to conforming with clauses 9.1.1, 9.1.2, 9.1.3.1 to 9.1.3.3, 9.1.4.1 to 9.1.4.5, 9.2.1.1, 9.2.1.2, 9.2.1.4, 9.2.1.1, 9.2.1.2, 9.2.2, 9.2.3, 9.2.4, 9.3, 9.4.1.1, 9.4.1.2 and the conformance requirements of clause 9.5 of the present document.
- Conformance with WCAG 2.1 Level AA is equivalent to conforming with all of clauses 9.1 to 9.4 and the conformance requirements of clause 9.5 of the present document.
- Requirements for other documents and software are provided in clauses 10 and 11 respectively.

NOTE 1: When evaluating web sites they are evaluated as individual web pages. Web applications, mobile web applications etc. are covered under the definition of web page which is quite broad and covers all web content types.

The web content requirements in clauses 9.1 to 9.4 set out all of the Level A and Level AA Success Criteria from the W3C Web Content Accessibility Guidelines (WCAG 2.1) [5]:

- Web Pages conforming to WCAG 2.0 Level A and AA also conform to clauses 9.1.1.1 to 9.1.3.3, 9.1.4.1 to 9.1.4.5, 9.2.1.1, 9.2.1.2, 9.2.2.1 to 9.2.4.7, 9.3.1.1 to 9.4.1.2 and the conformance requirements of clause 9.5.
- Web Pages that conform to WCAG 2.1 Level AA conform to all of clauses 9.1 to 9.4 and the conformance requirements of clause 9.5.
- Web Pages conforming to clauses 9.1.1.1 to 9.1.3.3, 9.1.4.1 to 9.1.4.5, 9.2.1.1, 9.2.1.2, 9.2.2.1 to 9.2.4.7, 9.3.1.1 to 9.4.1.2, and the conformance requirements of clause 9.5, also conform to WCAG 2.0 Level AA.
- Web Pages that conform to all of clauses 9.1 to 9.4, and the conformance requirements of clause 9.5, conform to WCAG 2.1 Level AA.

NOTE 2: WCAG 2.0 is identical to ISO/IEC 40500 (2012): "Information technology - W3C Web Content Accessibility Guidelines (WCAG) 2.0" [4].

The requirements in clauses 9.1 to 9.4 are written using the concept of satisfying success criteria (defined in clause 3.1). A web page satisfies a WCAG success criterion when the success criterion does not evaluate to false when applied to the web page. This implies that if the success criterion puts conditions on a specific feature and that specific feature does not occur in the web page, then the web page satisfies the success criterion.

NOTE 3: For example, a web page that does not contain pre-recorded audio content in synchronized media will automatically satisfy WCAG success criterion 1.2.2 (captions - pre-recorded) and, in consequence, will also conform to clause 9.1.2.2.

In addition to Level AA success criteria, the Web Content Accessibility Guidelines also include success criteria for Level AAA. These are included in Annex D of the present document.

NOTE 4: The body of the present document does not include the Level AAA success criteria, both to avoid confusion with the Level A and Level AA based requirements and for harmonisation with other procurement standards.
Web authors and procurement accessibility specialists are encouraged to improve accessibility beyond the requirements of the present document and should therefore consider whether any of the WCAG Level AAA success criteria offer suggestions that may be applicable and relevant to their project, as well as potentially beneficial to some users.

NOTE 5: The W3C states that "It is not recommended that Level AAA conformance be required as a general policy for entire sites because it is not possible to satisfy all Level AAA Success Criteria for some content".

NOTE 6: "Void" clauses have been inserted in order to maintain alignment with the numbering of WCAG 2.1 Level A and Level AA Success Criteria.

9.1 Perceivable

9.1.1 Text alternatives

9.1.1.1 Non-text content

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.1.1 Non-text content](#).

9.1.2 Time-based media

9.1.2.1 Audio-only and video-only (pre-recorded)

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.2.1 Audio-only and Video-only \(Prerecorded\)](#).

9.1.2.2 Captions (pre-recorded)

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.2.2 Captions \(Prerecorded\)](#).

9.1.2.3 Audio description or media alternative (pre-recorded)

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.2.3 Audio Description or Media Alternative \(Prerecorded\)](#).

9.1.2.4 Captions (live)

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.2.4 Captions \(Live\)](#).

9.1.2.5 Audio description (pre-recorded)

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.2.5 Audio Description \(Prerecorded\)](#).

9.1.3 Adaptable

9.1.3.1 Info and relationships

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.3.1 Info and Relationships](#).

9.1.3.2 Meaningful sequence

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.3.2 Meaningful Sequence](#).

9.1.3.3 Sensory characteristics

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.3.3 Sensory Characteristics](#).

9.1.3.4 Orientation

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.3.4 Orientation](#).

9.1.3.5 Identify input purpose

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.3.5 Identify Input Purpose](#).

9.1.4 Distinguishable

9.1.4.1 Use of colour

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.4.1 Use of Color](#).

9.1.4.2 Audio control

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.4.2 Audio Control](#).

9.1.4.3 Contrast (minimum)

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.4.3 Contrast \(Minimum\)](#).

9.1.4.4 Resize text

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.4.4 Resize text](#).

9.1.4.5 Images of text

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.4.5 Images of Text](#).

9.1.4.6 Void

9.1.4.7 Void

9.1.4.8 Void

9.1.4.9 Void

9.1.4.10 Reflow

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.4.10 Reflow](#).

9.1.4.11 Non-text contrast

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.4.11 Non-text Contrast](#).

9.1.4.12 Text spacing

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.4.12 Text spacing](#).

9.1.4.13 Content on hover or focus

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 1.4.13 Content on Hover or Focus](#).

9.2 Operable

9.2.1 Keyboard accessible

9.2.1.1 Keyboard

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.1.1 Keyboard](#).

9.2.1.2 No keyboard trap

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.1.2 No Keyboard Trap](#).

9.2.1.3 Void

9.2.1.4 Character key shortcuts

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.1.4 Character Key Shortcuts](#).

9.2.2 Enough time

9.2.2.1 Timing adjustable

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.2.1 Timing Adjustable](#).

9.2.2.2 Pause, stop, hide

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.2.2 Pause, Stop, Hide](#).

9.2.3 Seizures and physical reactions

9.2.3.1 Three flashes or below threshold

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.3.1 Three Flashes or Below Threshold](#).

9.2.4 Navigable

9.2.4.1 Bypass blocks

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.4.1 Bypass Blocks](#).

9.2.4.2 Page titled

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.4.2 Page Titled](#).

9.2.4.3 Focus Order

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.4.3 Focus Order](#).

9.2.4.4 Link purpose (in context)

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.4.4 Link Purpose \(In Context\)](#).

9.2.4.5 Multiple ways

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.4.5 Multiple Ways](#).

9.2.4.6 Headings and labels

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.4.6 Headings and Labels](#).

9.2.4.7 Focus visible

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.4.7 Focus Visible](#).

9.2.5 Input modalities

9.2.5.1 Pointer gestures

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.5.1 Pointer Gestures](#).

9.2.5.2 Pointer cancellation

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.5.2 Pointer Cancellation](#).

9.2.5.3 Label in name

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.5.3 Label in Name](#).

9.2.5.4 Motion actuation

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 2.5.4 Motion Actuation](#).

9.3 Understandable

9.3.1 Readable

9.3.1.1 Language of page

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 3.1.1 Language of Page](#).

9.3.1.2 Language of parts

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 3.1.2 Language of Parts](#).

9.3.2 Predictable

9.3.2.1 On focus

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 3.2.1 On Focus](#).

9.3.2.2 On input

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 3.2.2 On Input](#).

9.3.2.3 Consistent navigation

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 3.2.3 Consistent Navigation](#).

9.3.2.4 Consistent identification

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 3.2.4 Consistent Identification](#).

9.3.3 Input assistance

9.3.3.1 Error identification

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 3.3.1 Error Identification](#).

9.3.3.2 Labels or instructions

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 3.3.2 Labels or Instructions](#).

9.3.3.3 Error suggestion

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 3.3.3 Error Suggestion](#).

9.3.3.4 Error prevention (legal, financial, data)

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 3.3.4 Error Prevention \(Legal, Financial, Data\)](#).

9.4 Robust

9.4.1 Compatible

9.4.1.1 Parsing

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 4.1.1 Parsing](#).

9.4.1.2 Name, role, value

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 4.1.2 Name, Role, Value](#).

9.4.1.3 Status messages

Where ICT is a web page, it shall satisfy [WCAG 2.1 Success Criterion 4.1.3 Status Messages](#).

9.5 WCAG conformance requirements

Where ICT is a web page, it shall satisfy all the following five WCAG 2.1 conformance requirements at Level AA [5].

- 1) Conformance level
- 2) Full pages
- 3) Complete processes
- 4) Only Accessibility-Supported Ways of Using Technologies
- 5) Non-interference