



BSI Standards Publication

Accessibility requirements for ICT products and services

National foreword

This British Standard is the UK implementation of EN 301549:2021. It supersedes BS EN 301549:2019, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ICT/2, ICT Accessibility.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

© The British Standards Institution 2021
Published by BSI Standards Limited 2021

ISBN 978 0 539 16459 6

ICS 33.030; 53.080

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 June 2021.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

English version

Accessibility requirements for ICT products and services

Exigences d'accessibilité pour les produits et services
TIC

Barrierefreiheitsanforderungen für IKT-Produkte und -
Dienstleistungen

This European Standard was approved by CEN on 23 April 2021.

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

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

CEN and CENELEC members are the national standards bodies and national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



CEN-CENELEC Management Centre:
Rue de la Science 23,
B-1040 Brussels
Belgium

ETSI Secretariat
650, Route des Lucioles
06921 Sophia-Antipolis Cedex
France

© 2021 CEN/CENELEC All rights of exploitation in any form and by any means reserved worldwide for CEN national Members and for CENELEC Members.

Ref. No. EN 301549:2021 E

Reference

REN/HF-00301549v321

Keywords

accessibility, HF, ICT, procurement

CEN

Rue de la science, 23
B-1040 Brussels
- BELGIUM

Tel: + 32 2 550 08 11
Fax: + 32 2 550 08 19

CENELEC

Rue de la science, 23
B-1040 Brussels
- BELGIUM

Tel.: +32 2 519 68 71
Fax: +32 2 519 69 19

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex -
FRANCE

Tel.: +33 4 92 94 42 00
Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:

[ETSI Search & Browse Standards](#)

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at [ETSI Deliverables](#).

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

[ETSI deliverable status](#)

If you find errors in the present document, please send your comment to one of the following services:

[ETSI Committee Support Staff](#)

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2021.

© Comité Européen de Normalisation 2021.

© Comité Européen de Normalisation Electrotechnique 2021.

All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members.

3GPP™ and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

oneM2M™ logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners.

GSM® and the GSM logo are trademarks registered and owned by the GSM Association.

ETSI CEN CENELEC



Documents

Document Sharing Hub

Contents

Contents	3
Intellectual Property Rights	8
Foreword	8
Modal verbs terminology	9
Introduction	9
1 Scope	11
2 References	11
2.1 Normative references	11
2.2 Informative references	12
3 Definition of terms, symbols and abbreviations	15
3.1 Terms	15
3.2 Symbols	19
3.3 Abbreviations	19
4 Functional performance	20
4.1 Meeting functional performance statements	20
4.2 Functional performance statements	20
4.2.1 Usage without vision	20
4.2.2 Usage with limited vision	20
4.2.3 Usage without perception of colour	20
4.2.4 Usage without hearing	21
4.2.5 Usage with limited hearing	21
4.2.6 Usage with no or limited vocal capability	21
4.2.7 Usage with limited manipulation or strength	21
4.2.8 Usage with limited reach	21
4.2.9 Minimize photosensitive seizure triggers	22
4.2.10 Usage with limited cognition, language or learning	22
4.2.11 Privacy	22
5 Generic requirements	23
5.1 Closed functionality	23
5.1.1 Introduction (informative)	23
5.1.2 General	23
5.1.3 Non-visual access	23
5.1.4 Functionality closed to text enlargement	26
5.1.5 Visual output for auditory information	27
5.1.6 Operation without keyboard interface	27
5.1.7 Access without speech	27
5.2 Activation of accessibility features	27
5.3 Biometrics	28
5.4 Preservation of accessibility information during conversion	28
5.5 Operable parts	28
5.5.1 Means of operation	28
5.5.2 Operable parts discernibility	28
5.6 Locking or toggle controls	28
5.6.1 Tactile or auditory status	28
5.6.2 Visual status	28
5.7 Key repeat	29
5.8 Double-strike key acceptance	29
5.9 Simultaneous user actions	29
6 ICT with two-way voice communication	30
6.1 Audio bandwidth for speech	30
6.2 Real-Time Text (RTT) functionality	30

6.2.1	RTT provision	30
6.2.2	Display of RTT	31
6.2.3	Interoperability	31
6.2.4	RTT responsiveness	32
6.3	Caller ID	32
6.4	Alternatives to voice-based services	32
6.5	Video communication	33
6.5.1	General (informative)	33
6.5.2	Resolution	33
6.5.3	Frame rate	33
6.5.4	Synchronization between audio and video	33
6.5.5	Visual indicator of audio with video	33
6.5.6	Speaker identification with video (sign language) communication	34
6.6	Alternatives to video-based services	34
7	ICT with video capabilities	35
7.1	Caption processing technology	35
7.1.1	Captioning playback	35
7.1.2	Captioning synchronization	35
7.1.3	Preservation of captioning	35
7.1.4	Captions characteristics	35
7.1.5	Spoken subtitles	35
7.2	Audio description technology	36
7.2.1	Audio description playback	36
7.2.2	Audio description synchronization	36
7.2.3	Preservation of audio description	36
7.3	User controls for captions and audio description	36
8	Hardware	37
8.1	General	37
8.1.1	Generic requirements	37
8.1.2	Standard connections	37
8.1.3	Colour	37
8.2	Hardware products with speech output	37
8.2.1	Speech volume gain	37
8.2.2	Magnetic coupling	37
8.3	Stationary ICT	38
8.3.0	General	38
8.3.1	Forward or side reach	38
8.3.2	Forward reach	38
8.3.3	Side reach	40
8.3.4	Clear floor or ground space	41
8.3.5	Visibility	43
8.3.6	Installation instructions	43
8.4	Mechanically operable parts	43
8.4.1	Numeric keys	43
8.4.2	Operation of mechanical parts	44
8.4.3	Keys, tickets and fare cards	44
8.5	Tactile indication of speech mode	44
9	Web	45
9.0	General (informative)	45
9.1	Perceivable	45
9.1.1	Text alternatives	45
9.1.2	Time-based media	45
9.1.3	Adaptable	46
9.1.4	Distinguishable	46
9.2	Operable	47
9.2.1	Keyboard accessible	47
9.2.2	Enough time	47
9.2.3	Seizures and physical reactions	48
9.2.4	Navigable	48

9.2.5	Input modalities	48
9.3	Understandable	49
9.3.1	Readable	49
9.3.2	Predictable	49
9.3.3	Input assistance	49
9.4	Robust	50
9.4.1	Compatible	50
9.5	WCAG 2.1 AAA Success Criteria	50
9.6	WCAG conformance requirements	51
10	Non-web documents	52
10.0	General (informative)	52
10.1	Perceivable	52
10.1.1	Text alternatives	52
10.1.2	Time-based media	53
10.1.3	Adaptable	54
10.1.4	Distinguishable	54
10.2	Operable	56
10.2.1	Keyboard accessible	56
10.2.2	Enough time	57
10.2.3	Seizures and physical reactions	58
10.2.4	Navigable	58
10.2.5	Input modalities	59
10.3	Understandable	60
10.3.1	Readable	60
10.3.2	Predictable	60
10.3.3	Input assistance	61
10.4	Robust	61
10.4.1	Compatible	61
10.5	Caption positioning	62
10.6	Audio description timing	62
11	Software	63
11.0	General (informative)	63
11.1	Perceivable	64
11.1.1	Text alternatives	64
11.1.2	Time-based media	64
11.1.3	Adaptable	65
11.1.4	Distinguishable	67
11.2	Operable	68
11.2.1	Keyboard accessible	68
11.2.2	Enough time	69
11.2.3	Seizures and physical reactions	70
11.2.4	Navigable	71
11.2.5	Input modalities	72
11.3	Understandable	73
11.3.1	Readable	73
11.3.2	Predictable	73
11.3.3	Input assistance	74
11.4	Robust	75
11.4.1	Compatible	75
11.5	Interoperability with assistive technology	76
11.5.1	Closed functionality	76
11.5.2	Accessibility services	76
11.6	Documented accessibility usage	80
11.6.1	User control of accessibility features	80
11.6.2	No disruption of accessibility features	80
11.7	User preferences	80
11.8	Authoring tools	80
11.8.0	General (informative)	80
11.8.1	Content technology	80

11.8.2	Accessible content creation	80
11.8.3	Preservation of accessibility information in transformations	80
11.8.4	Repair assistance	81
11.8.5	Templates	81
12	Documentation and support services	82
12.1	Product documentation	82
12.1.1	Accessibility and compatibility features	82
12.1.2	Accessible documentation	82
12.2	Support services	82
12.2.1	General (informative)	82
12.2.2	Information on accessibility and compatibility features	82
12.2.3	Effective communication	82
12.2.4	Accessible documentation	83
13	ICT providing relay or emergency service access	84
13.1	Relay services requirements	84
13.1.1	General (informative)	84
13.1.2	Text relay services	84
13.1.3	Sign relay services	84
13.1.4	Lip-reading relay services	84
13.1.5	Captioned telephony services	84
13.1.6	Speech to speech relay services	84
13.2	Access to relay services	84
13.3	Access to emergency services	85
14	Conformance	86
Annex A (informative): Relationship between the present document and the essential requirements of Directive 2016/2102		87
Annex B (informative): Relationship between requirements and functional performance statements		103
B.1	Relationships between clauses 5 to 13 and the functional performance statements	103
B.2	Interpretation of Table B.2	111
B.2.0	General	111
B.2.1	Example	111
Annex C (normative): Determination of conformance		113
C.1	Introduction	113
C.2	Empty clause	113
C.3	Empty clause	113
C.4	Functional performance	113
C.5	Generic requirements	113
C.5.1	Closed functionality	113
C.5.2	Activation of accessibility features	118
C.5.3	Biometrics	118
C.5.4	Preservation of accessibility information during conversion	118
C.5.5	Operable parts	118
C.5.6	Locking or toggle controls	119
C.5.7	Key repeat	119
C.5.8	Double-strike key acceptance	119
C.5.9	Simultaneous user actions	120
C.6	ICT with two-way voice communication	120
C.6.1	Audio bandwidth for speech	120
C.6.2	Real-Time Text (RTT) functionality	120
C.6.3	Caller ID	124
C.6.4	Alternatives to voice-based services	124
C.6.5	Video communication	124
C.6.6	Alternatives to video-based services	125
C.7	ICT with video capabilities	126
C.7.1	Caption processing technology	126
C.7.2	Audio description technology	127
C.7.3	User controls for captions and audio description	127

C.8	Hardware	128
C.8.1	General	128
C.8.2	Hardware products with speech output	128
C.8.3	Stationary ICT	129
C.8.4	Mechanically operable parts	134
C.8.5	Tactile indication of speech mode	135
C.9	Web	135
C.9.0	General (informative)	135
C.9.1	Perceivable	135
C.9.2	Operable	139
C.9.3	Understandable	142
C.9.4	Robust	144
C.9.5	WCAG 2.1 AAA Success Criteria (informative)	144
C.9.6	WCAG 2.1 conformance requirements	144
C.10	Non-web documents	145
C.10.0	General (informative)	145
C.10.1	Perceivable	145
C.10.2	Operable	149
C.10.3	Understandable	152
C.10.4	Robust	153
C.10.5	Caption positioning	154
C.10.6	Audio description timing	154
C.11	Software	154
C.11.0	General	154
C.11.1	Perceivable	154
C.11.2	Operable	160
C.11.3	Understandable	164
C.11.4	Robust	166
C.11.5	Interoperability with assistive technology	166
C.11.6	Documented accessibility usage	171
C.11.7	User preferences	172
C.11.8	Authoring tools	172
C.12	Documentation and support services	173
C.12.1	Product documentation	173
C.12.2	Support services	173
C.13	ICT providing relay or emergency service access	174
C.13.1	Relay service requirements	174
C.13.2	Access to relay services	175
C.13.3	Access to emergency services	175
	Annex D (informative): Further resources for cognitive accessibility	176
	Annex E (informative): Guidance for users of the present document	177
E.1	Introduction	177
E.2	Overview	177
E.3	Clause 4	178
E.4	How to use the standard	178
E.4.1	Self scoping requirements	178
E.4.2	Connection between requirements and functional performance statements	178
E.5	The European Web Accessibility Directive [i.28]	179
E.6	Annex D: Further resources for cognitive accessibility	179
	Annex F (informative): Change history	180
	History	181

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

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 and is now submitted for the combined Public Enquiry and Vote phase of the standards EN Approval Procedure.

EN 301 549 was originally produced under Mandate M 376 [i.3] and specified 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 procurement. The other deliverables prepared in response to the original Mandate M 376 were: ETSI TR 102 612 [i.9] "Human Factors (HF); European accessibility requirements for public procurement of products and services in the ICT domain (European Commission Mandate M 376, Phase 1)", TR 101 550 [i.7] "Documents relevant to EN 301 549 "Accessibility requirements suitable for public procurement of ICT products and services in Europe"", TR 101 551 [i.8] "Guidelines on the use of accessibility award criteria suitable for public procurement of ICT products and services in Europe", and TR 101 552 [i.30] "Guidance for the application of conformity assessment to accessibility requirements for public procurement of ICT products and services in Europe". These have not been updated to reflect any changes to the content or scope of the present document, made as a part of the M 554 revision effort.

This revision to EN 301 549 has been prepared under the Commission's standardisation request C(2017)2585 final [i.27] to provide, in additions to its other uses, one voluntary means of conforming to the essential requirements of Directive 2016/2102 on the accessibility of the websites and mobile applications of public sector bodies [i.28]. The minimum requirements of the European Web Accessibility Directive (Directive 2016/2102) are explicitly detailed in Annex A.

Once the present document is cited in the Official Journal of the European Union under Directive 2016/2102 [i.28], conformance 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 EN 301 549 [i.29] (V2.1.2) (08-2018).

The significant changes since EN 301 549 [i.29] (V2.1.2) are:

- the requirements related to Real-Time Text (RTT) in clause 6.2 have been revised and extended;
- the WCAG 2.1 AAA Success Criteria that were previously in an Annex D are now included in clause 9.5;
- a new Annex D, "Further resources for cognitive accessibility", has been added;

- a new Annex E "Guidance for users of the present document" has been added.
- a new Annex F "change history" has been added.

National transposition dates	
Date of adoption of this EN:	10 March 2021
Date of latest announcement of this EN (doa):	30 June 2021
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 December 2021
Date of withdrawal of any conflicting National Standard (dow):	31 December 2022

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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Introduction

The present document is developed in response to standardisation request M 554 [i.27] from the European Commission to CEN, CENELEC and ETSI. It is a revision of the European Standard (EN) that was initially prepared in response to Phase 2 of Mandate M 376 [i.3].

The present document covers a wide range of requirements for a variety of ICT solutions. It is relevant for all organizations who buy, develop or manufacture ICT products or services. It consists of fourteen clauses and six annexes:

- Clauses 0 to 3 include background information, the scope of the standard, and links to other standards, definitions and explanations of abbreviations.
- Clause 4 contains functional performance statements that explain the functionality that is needed to enable users with different abilities to locate, identify and operate functions in technology. The user needs underlying the functional performance statements are the basis for the requirements in subsequent clauses.
- Clauses 5 to 13 provide specific testable criteria for accessible ICT, related to technical requirements for different kinds of ICT, starting with generic requirements in clause 5.
- Clause 14 is about conformance. 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>'. Conformance is achieved when the pre-condition is true and the corresponding test (in Annex C) is passed. When the pre-condition is false the requirement is not applicable.
- Annex A has two tables with requirements related to Directive 2016/2102 on the accessibility of the websites and mobile applications of public sector bodies [i.28]. The first table applies to web pages and documents and the second applies to mobile applications. The minimum requirements are collected from clauses 9, 10 and 11 and some requirements from clauses 5, 6, 7 and 12 that are relevant to fulfill the Directive.
- Annex B contains a table showing which of the requirements set out in clauses 5 to 13 related to different types of ICT support the user needs as expressed in the functional performance statements of clause 4.
- Annex C is a normative annex that sets out the means necessary to determine conformance with the individual requirements. It does not provide a testing methodology.

- Annex D points to additional resources related to improving accessibility for users with limited cognitive, language and learning abilities.
- Annex E provides an overview and simple explanation of the structure of the present document, including an explanation of how it can be used.
- Annex F provides a change history table.

When the present document is used for most purposes, including when used in ICT procurement, all of the requirements in clauses 5 to 13, as well as the functional performance statements in clause 4 should be considered. The potential applicability of any requirement can be determined from the self-scoping phrase at the beginning of each requirement.

When the present document is used as the basis to determine conformity with the essential requirements of Directive 2016/2102 on the accessibility of the websites and mobile applications of public sector bodies [i.28], Tables A.1 and A.2 in Annex A identify all the applicable requirements.

NOTE 1: The present document reflects the content of the W3C WCAG 2.1 Recommendation [5].

NOTE 2: Annex E provides an overview and simple explanation of the structure of the present document, including an explanation of how it can be used. Readers who are unfamiliar with the present document are recommended to read Annex E first to give them a better understanding of the present document and how to use it.

The WCAG 2.1 [5] content referenced in clauses 9, 10 and 11 is subject to the following specific copyright provisions: Copyright © 2017-2018 W3C® (MIT, ERCIM, Keio, Beihang). The W3C document license applies.

See the [document use license](#) and [copyright FAQ](#) for more information:

<http://www.w3.org/Consortium/Legal/copyright-documents>

<http://www.w3.org/Consortium/Legal/IPR-FAQ>

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 is intended to be used with web based technologies, non-web technologies and hybrids that use both. It covers both software and hardware as well as services. It is intended for use by both providers and procurers, but it is expected that it will also be of use to many others as well.

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.

2 References

2.1 Normative 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.

Referenced documents which are not found to be publicly available in the expected location might be found at [ETSI References in docbox](#).

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 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 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 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 TR 101 551: "Guidelines on the use of accessibility award criteria suitable for public procurement of 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 9241-11:2018: "Ergonomics of human-system interaction - Part 11: Usability: Definitions and concepts".
- [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] Void.

- [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] Section 508 of the United States Rehabilitation Act of 1973, revised 2017.
- NOTE: Available at <https://www.section508.gov/manage/laws-and-policies>.
- [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] M 554 Commission Implementing Decision C(2017)2585 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/CEN/CENELEC EN 301 549 (V2.1.2) (August 2018): "Accessibility requirements for ICT products and services".
 - [i.30] ETSI/CEN/CENELEC TR 101 552: "Guidance for the application of conformity assessment to accessibility requirements for public procurement of ICT products and services in Europe".
 - [i.31] ISO/IEC TS 20071-25:2017: "Information technology - User interface component accessibility - Part 25: Guidance on the audio presentation of text in videos, including captions, subtitles and other on-screen text".
 - [i.32] W3C Recommendation (September 2015): "Authoring Tool Accessibility Guidelines (ATAG) 2.0".
- NOTE: Available at <http://www.w3.org/TR/ATAG20/>.
- [i.33] W3C Recommendation (September 2015): "User Agent Accessibility Guidelines (UAAG) 2.0".
- NOTE: Available at <http://www.w3.org/TR/UAAG20/>.
- [i.34] ISO 21542:2011: "Building construction - Accessibility and usability of the built environment".
 - [i.35] ISO/IEC Guide 71:2014: "Guide for addressing accessibility in standards".
 - [i.36] Recommendation ITU-T T.140 (1988): "Protocol for multimedia application text conversation".
 - [i.37] Recommendation ITU-T F.703 (2000): "Multimedia conversational services".
 - [i.38] W3C WebSchemas/Accessibility 2.0.
- NOTE: Available at <https://www.w3.org/wiki/WebSchemas/Accessibility>.
- [i.39] Void.

- [i.40] Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC.

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms 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 user needs, characteristics and capabilities, to achieve identified goals in identified contexts of use (from ISO 9241-11:2018 [i.15])

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.

access space: space intended to be occupied by the person, including their Assistive Technology, while they are using the product

Assistive Listening Devices (ALDs): devices that help separate the sounds, particularly speech, that a person wants to hear from background noise by bringing sound directly into the ear

NOTE: These are often found in meetings and public venues such as plays, concerts and places of worship. They can also be used at home with televisions and other products with auditory output.

Assistive Technology (AT): equipment, product system, hardware, software or service that is used to increase, maintain or improve capabilities of individuals (from ISO/IEC Guide 71:2014 [i.35])

NOTE 1: Assistive technology is an umbrella term that is broader than assistive products.

NOTE 2: Assistive technology can include assistive services, and professional services needed for assessment, recommendation and provision.

NOTE 3: 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. This is an additional note, not included in ISO/IEC Guide 71:2014 [i.35].

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: combination of users, goals and tasks, resources, and environment. (from ISO 9241-11:2018 [i.15])

NOTE: The "environment" in a context of use includes the technical, physical, social, cultural and organizational environments.

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 and closed caption text. 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.

NOTE 9: Documents may contain sub-documents.

embedded: directly included in the content that is downloaded to the user agent and its extension, and is intended to be used in rendering the web page

NOTE: Something that is downloaded using a mechanism on the web page but is not used in rendering the page is not "embedded" in the page.

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 1: 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.

NOTE 2: Operable parts do not include parts involved only in maintenance or repair or other actions that are not expected of a typical user if the product is not malfunctioning. These actions include: clearing paper jams internal to the machine, replacing items or parts internal to the machine that may expose the end user to sharp or hot surfaces, replacing or repairing items designated by manufacturers as service or maintenance items in user documentation.

platform software (platform): 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 (RTT): 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

NOTE 1: Users will perceive communication as continuous if the delay between text being created by the sender and received by the recipient is less than 500 ms. However, the actual delay will be dependent on the communication network.

NOTE 2: The creation of text 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 (e.g. typing on a physical keyboard).

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

single user connection: connection that consists of sound, RTT or video (or a combination of two or three of those media) that is established by a single user action

NOTE: Even though the different media may travel over different channels, and more than one piece of hardware may be involved, it appears to the user like a single connection, and is treated by any intermediate technologies (e.g. network, auto-reception) as a single connection for purposes such as transfer.

spoken captions/subtitles audio captions/subtitles: captions/subtitles that are voiced over the audiovisual content (from ISO/IEC TS 20071-25 [i.31])

stationary ICT: ICT that stands on the floor, or is mounted on a wall or other immovable structure, and is not intended to be moved by its user

NOTE 1: Typically, stationary ICT rests on the ground (such as an information kiosk) or is installed in a wall (such as a machine that dispenses cash or performs other banking services).

NOTE 2: A manufacturer cannot control the height of ICT that is put on a table by someone else, but they are able to control the reach dimensions of self-contained ICT that rests on the ground and can specify the heights for installation in walls.

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.

turn-taking: type of organization in conversation and discourse where participants speak one at a time in alternating turns

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 Symbols

Void.

3.3 Abbreviations

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

ANSI	American National Standards Institute
AT	Assistive Technology
ATAG	Authoring Tool Accessibility Guidelines (of W3C)
CEN	Comité Européen de Normalisation
CSS	Cascading Style Sheets
DOM	Document Object Model
EFTA	European Free Trade Area
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
ISO	International Organization for Standardization
ITU-T	International Telecommunication Union - Telecommunication standardization sector
JWG	Joint Working Group (of CEN/CENELEC/ETSI)
LED	Light Emitting Device
ODF	Open Document Format
OOXML	Office Open eXtensible Markup Language
PSTN	Public Switched Telephone Network
QVGA	Quarter Video Graphics Array
RFC	Request For Comment
RTT	Real-Time Text
SIP	Session Initiation Protocol
UAAG	User Agent Accessibility Guidelines (of W3C)
URI	Uniform Resource Identifier
USB	Universal Serial Bus
VGA	Video Graphics Array
VOIP	Voice Over IP
W3C	World Wide Web Consortium
WAI	Web Accessibility Initiative
WCAG	Web Content Accessibility Guidelines (of W3C)
WLAN	Wireless Local Access Network
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 differences in ability may be permanent, temporary or situational. The requirements in clauses 5 to 13 provide specific testable criteria for accessible ICT, corresponding to the user needs reflected in clause 4.2.

NOTE 1: The relationship between the requirements from clauses 5 to 13 and the functional performance statements is set out in Annex B.

NOTE 2: The intent of clause 4.2 is to describe the ICT performance in enabling users to access 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 access needs will depend on the specific combination of needs. 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 would need 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, the ICT provides at least one mode of operation that does not require vision. This is essential for users without vision and benefits many more users in different situations.

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, the ICT provides features that enable users to make better use of their limited vision. This is essential for users with limited vision and benefits many more users in different situations.

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, the ICT provides a visual mode of operation that does not require user perception of colour. This is essential for users with limited colour perception and benefits many more users in different situations.

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, the ICT provides at least one mode of operation that does not require hearing. This is essential for users without hearing and benefits many more users in different situations.

NOTE: Visual and tactile user interfaces, including those based on sign language, may contribute towards meeting this clause.

4.2.5 Usage with limited hearing

Where ICT provides auditory modes of operation, the ICT provides enhanced audio features. This is essential for users with limited hearing and benefits many more users in different situations.

NOTE 1: Enhancement of the audio clarity, reduction of background noise, providing a joint monaural option, adjustment of balance of both audio channels, increased range of volume and greater volume in the higher frequency range can contribute towards meeting this clause.

NOTE 2: Allowing the use of Assistive Listening Devices, such as headsets with noise cancellation (connected by cable, Bluetooth or WLAN) can contribute towards meeting this clause.

NOTE 3: Users with limited hearing may also benefit from non-hearing access (see clause 4.2.4).

4.2.6 Usage with no or limited vocal capability

Where ICT requires vocal input from users, the ICT provides at least one mode of operation that does not require them to generate vocal output. This is essential users with no or limited vocal capability and benefits many more users in different situations.

NOTE 1: Vocal output includes speech and other orally generated sounds, such as whistles and clicks.

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, the ICT provides features that enable users to make use of the ICT through alternative actions not requiring manipulation, simultaneous action or hand strength. This is essential for users with limited manipulation or strength and benefits many more users in different situations.

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, all the elements required for operation will need to be within reach of all users. This is essential for users with limited reach and benefits many more users in different situations.

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, the ICT provides at least one mode of operation that minimizes the potential for triggering photosensitive seizures. This is essential for users with photosensitive seizure triggers.

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

4.2.10 Usage with limited cognition, language or learning

The ICT provides features and/or presentation that makes it simpler and easier to understand, operate and use. This is essential for users with limited cognition, language or learning, and benefits many more users in different situations.

NOTE 1: Adjustable timings, error indication and suggestion, and a logical focus order are examples of design features that may contribute towards meeting this clause.

NOTE 2: Providing an audio output of the text is an example of providing support for people with limited reading abilities.

NOTE 3: Providing spelling aid and word prediction of the text is an example of providing support for people with limited writing abilities.

NOTE 4: Interaction with content can be made easier, and less prone to errors, by presenting tasks in steps that are easy to follow.

4.2.11 Privacy

Where ICT provides features for accessibility, the ICT maintains the privacy of users of these features at the same level as other users.

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 requirements within this clause replace those 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 personal 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 Audio output of visual information

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 such as braille for deaf-blind users.

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, the present clause 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

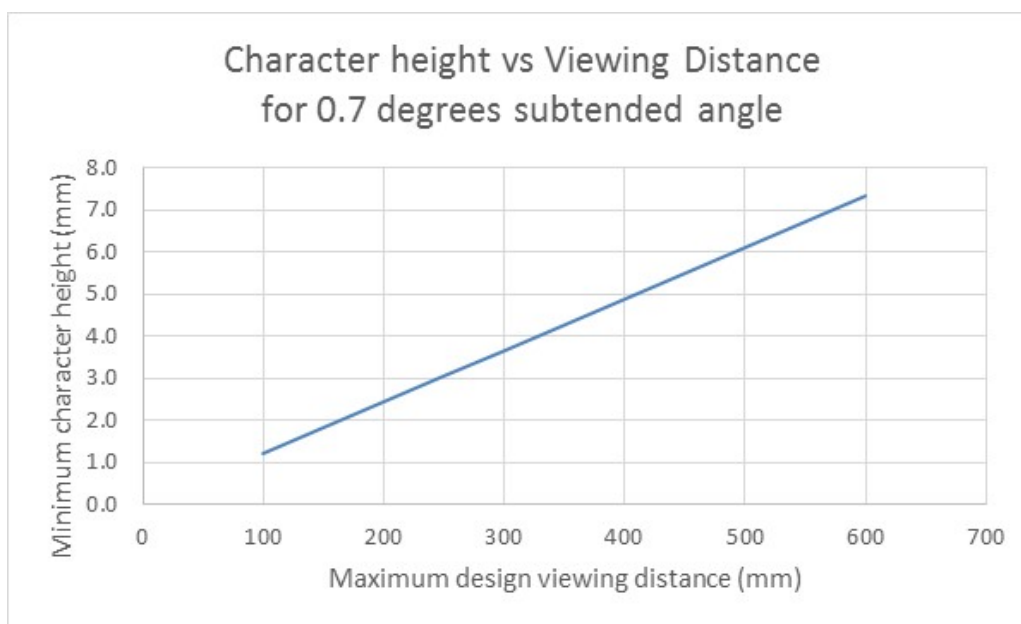


Figure 1: Relationship between minimum character height and maximum design viewing distance

5.1.5 Visual output for auditory information

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

5.1.7 Access without speech

Where speech is needed to operate closed functions of ICT, the ICT shall provide at least one mode of operation using an alternative input mechanism that does not require speech.

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 the status of 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 status of 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 has a mode of operation requiring 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 is in a mode that provides a means for two-way voice communication, the ICT shall provide a means for two-way RTT communication, except where this would require design changes to add input or output hardware to the ICT.

NOTE 1: This requirement includes those products which do not have physical display or text entry capabilities but have the capability to connect to devices that do have such capabilities. It also includes intermediate ICT between the endpoints of the communication.

NOTE 2: There is no requirement to add: a hardware display, a hardware keyboard, or hardware to support the ability to connect to a display or keyboard, wired or wirelessly, if this hardware would not normally be provided.

NOTE 3: For the purposes of interoperability, support of Recommendation ITU-T T.140 [i.36] is widely used.

6.2.1.2 Concurrent voice and text

Where ICT provides a means for two-way voice communication and for users to communicate by RTT, it shall allow concurrent voice and text through a single user connection.

NOTE 1: With many-party communication, as in a conference system, it is allowed (but not required or necessarily recommended) that RTT be handled in a single display field and that "turn-taking" be necessary to avoid confusion (in the same way that turn-taking is required for those presenting/talking with voice).

NOTE 2: With many-party communication, best practice is for hand-raising for voice users and RTT users to be handled in the same way, so that voice and RTT users are in the same queue.

NOTE 3: With a many-party conference system that has chat as one of its features - the RTT (like the voice) would typically be separate from the chat so that RTT use does not interfere with chat (i.e. people can be messaging in the chat field while the person is presenting/talking with RTT - in the same manner that people message using the chat feature while people are talking with voice). RTT users would then use RTT for presenting and use the Chat feature to message while others are presenting (via Voice or RTT).

NOTE 4: The availability of voice and RTT running concurrently (and separately from chat) can also allow the RTT field to support text captioning when someone is speaking (and it is therefore not being used for RTT since it is not the RTT user's turn to speak).

NOTE 5: Where both server-side software and local hardware and software are required to provide voice communication, where neither part can support voice communication without the other and are sold as a unit for the voice communication function, the local and server-side components are considered a single product.

6.2.2 Display of RTT

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.

NOTE: The ability of the user to choose between having the send and receive text be displayed in-line or separately, and with options to select, allows users to display RTT in a form that works best for them. This would allow Braille users to use a single field and take turns and have text appear in the sequential way that they may need or prefer.

6.2.2.2 Programmatically determinable send and receive direction

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

NOTE: This enables screen readers to distinguish between incoming text and outgoing text when used with RTT functionality.

6.2.2.3 Speaker identification

Where ICT has RTT capabilities, and provides speaker identification for voice, the ICT shall provide speaker identification for RTT.

NOTE: This is necessary to enable both voice and RTT participants to know who is currently communicating, whether it be in RTT or voice.

6.2.2.4 Visual indicator of Audio with RTT

Where ICT provides two-way voice communication, and has RTT capabilities, the ICT shall provide a real-time visual indicator of audio activity on the display.

NOTE 1: The visual indicator may be a simple character position on the display that flickers on and off to reflect audio activity, or presentation of the information in another way that can be both visible to sighted users and passed on to deaf-blind users who are using a braille display.

NOTE 2: Without this indication a person who lacks the ability to hear does not know when someone is talking.

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 the applicable RTT interoperability mechanisms described below:

- a) ICT interoperating with other ICT directly connected to the Public Switched Telephone Network (PSTN), using 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 RTT that conforms to IETF RFC 4103 [i.13]. For ICT interoperating with other ICT using the IP Multimedia Sub-System (IMS) to implement VOIP, the set of protocols specified in ETSI TS 126 114 [i.10], ETSI TS 122 173 [i.11] and ETSI TS 134 229 [i.12] describe how IETF RFC 4103 [i.13] would apply;
- c) ICT interoperating with other ICT using technologies other than a or b, above, using a relevant and applicable common specification for RTT exchange that is published and available for the environments in which they will be operating. This common specification shall include a method for indicating loss or corruption of characters;

- d) ICT interoperating with other ICT using a standard for RTT that has been introduced for use in any of the above environments, and is supported by all of the other active ICT that support voice and RTT in that environment.

NOTE 1: In practice, new standards are introduced as an alternative codec/protocol that is supported alongside the existing common standard and used when all end-to-end components support it while technology development, combined with other reasons including societal development and cost efficiency, may make others become obsolete.

NOTE 2: Where multiple technologies are used to provide voice communication, multiple interoperability mechanisms may be needed to ensure that all users are able to use RTT.

EXAMPLE: A conferencing system that supports voice communication through an internet connection might provide RTT over an internet connection using a proprietary RTT method (option c). However, regardless of whether the RTT method is proprietary or non-proprietary, if the conferencing system also offers telephony communication it will also need to support options a or b to ensure that RTT is supported over the telephony connection.

6.2.4 RTT responsiveness

Where ICT utilises RTT input, that RTT input shall be transmitted to the ICT network or platform on which the ICT runs within 500 ms of the time that the smallest reliably composed unit of text entry is available to the ICT for transmission. Delays due to platform or network performance shall not be included in the 500 ms limit.

NOTE 1: For character by character input, the "smallest reliably composed unit of text entry" would be a character. For word prediction it would be a word. For some voice recognition systems - the text may not exit the recognition software until an entire word (or phrase) has been spoken. In this case, the smallest reliably composed unit of text entry available to the ICT would be the word (or phrase).

NOTE 2: The 500 ms limit allows buffering of characters for this period before transmission so character by character transmission is not required unless the characters are generated more slowly than 1 per 500 ms.

NOTE 3: A delay of 300 ms, or less, produces a better impression of flow to the user.

6.3 Caller ID

Where ICT provides caller identification or similar telecommunications functions, the caller identification and similar telecommunications functions shall be available in text form as well as being programmatically determinable, unless the functionality is closed.

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 shall 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 1: Tasks that involve both operating the interface and perceiving the information would require that both the interface and information be accessible without use of speech or hearing.

NOTE 2: Solutions capable of handling audio, RTT 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 a resolution of at least Quarter Video Graphics Array (QVGA, 320 x 240), 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.

Increasing the resolution and frame rate further improves both sign language (especially finger spelling) and lipreading, with frame rate being more important than resolution.

Time differences between audio and video (asynchronicity) can have a great impact on lip-reading - with video that lags behind audio having greater negative effect.

End-to-end latency can be a problem in video (sign) communication. Overall delay values below 400 ms are preferred, with an increase in preference down to 100 ms. 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.

NOTE: Recommendation ITU-T F.703 [i.37] defines and gives requirements for Total Conversation that relate to the integration of audio, RTT and video in a single user connection.

6.5.2 Resolution

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

- a) shall support at least QVGA resolution;
- b) should preferably support at least VGA 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 20 Frames Per Second (FPS);
- b) should preferably support a frame rate of at least 30 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 shall ensure a maximum time difference of 100 ms between the speech and video presented to the user.

NOTE: Recent research shows that, if audio leads the video, the intelligibility suffers much more than the reverse.

6.5.5 Visual indicator of audio with video

Where ICT provides two-way voice communication, and includes real-time video functionality, the ICT shall provide a real-time visual indicator of audio activity.

NOTE 1: The visual indicator may be a simple visual dot or LED, or other type of on/off indicator, that flickers to reflect audio activity.

NOTE 2: Without this indication a person who lacks the ability to hear does not know when someone is talking.

6.5.6 Speaker identification with video (sign language) communication

Where ICT provides speaker identification for voice users, it shall provide a means for speaker identification for real-time signing and sign language users once the start of signing has been indicated.

NOTE 1: The speaker ID can be in the same location as for voice users for multiparty calls.

NOTE 2: This mechanism might be triggered manually by a user, or automatically where this is technically achievable.

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 RTT 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 1: Captions may contain information about timing, colour and positioning. This caption data is necessary 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.

NOTE 2: If a Braille device is connected, the ICT should provide an option to display captions on the Braille device.

NOTE 3: Clause 7.1.1 refers to the ability of the player to display captions. Clauses 9.1.2.2, 10.1.2.2 and 11.1.2.2 refer to the provision of captions for the content (the video).

7.1.2 Captioning synchronization

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

- Captions in recorded material: within 100 ms of the time stamp of the caption.
- Live captions: within 100 ms of the availability of the caption to the player.

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.

7.1.4 Captions characteristics

Where ICT displays captions, it shall provide a way for the user to adapt the displayed characteristics of captions to their individual requirements, except where the captions are displayed as unmodifiable characters.

NOTE 1: Defining the background and foreground colour of subtitles, font type, size opacity of the background box of subtitles, and the contour or border of the fonts can contribute to meeting this requirement.

NOTE 2: Subtitles that are bitmap images are examples of unmodifiable characters.

7.1.5 Spoken subtitles

Where ICT displays video with synchronized audio, it shall have a mode of operation to provide a spoken output of the available captions, except where the content of the displayed captions is not programmatically determinable.

NOTE 1: Being able to manage speech output range for spoken subtitles independently from general ICT speech is preferable for most users. That is possible when the audio file with spoken subtitle is delivered in a separate audio track and mixed in the end users device.

NOTE 2: Presenting the separate audio track with spoken subtitles in synchronization with the displayed subtitles/captions improves understandability of the subtitles.

NOTE 3: Providing subtitles/captions as separate text-streams, facilitates converting the respective texts into audio.

NOTE 4: Subtitles that are bitmap images are examples where the content of the displayed captions will not be programmatically determinable.

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, it shall provide a means of magnetic coupling which meets the requirements of ETSI ES 200 381-1 [2] and shall carry the "T" symbol specified in ETSI ETS 300 381 [1].

NOTE 1: ICT fulfilling the requirements of TIA-1083-A [i.24] is deemed to comply with the requirements of this clause.

NOTE 2: Magnetic coupling is also known as inductive coupling for T-coil.

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 Stationary ICT

8.3.0 General

The present document defines the dimensions for accessing stationary ICT that can be placed in a built environment, but does not define the dimensions of the built environment in general.

The scope includes stationary ICT, of which floors and circulation spaces are "an integral part" (typically kiosks and cabins), and where there are external reach ranges relevant for operating the stationary ICT.

Clauses 8.3.2 to 8.3.4 specify mandatory limits for the maximum and minimum height of operable parts and displays. Based on dimensions shown in Figure 53 of ISO 21542:2011 [i.34], it is recommended that the possible height range is reduced to:

- minimum and maximum heights of operable parts: 800 mm and 1 100 mm respectively, and
- minimum and maximum heights of displays: 1 200 mm and 1 400 mm respectively.

8.3.1 Forward or side reach

Stationary ICT shall conform to either clause 8.3.2 or clause 8.3.3.

NOTE 1: This does not preclude conforming to both clauses.

NOTE 2: The dimensions set out in clauses 407.8.3 and 407.8.2 of Section 508 of the Rehabilitation Act, as published in January 2017 [i.25], are identical to those given in clauses 8.3.2 and 8.3.3 of the present document.

NOTE 3: Physical access to stationary 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 Forward reach

8.3.2.1 Unobstructed high forward reach

Where no part of the stationary ICT obstructs the forward reach, at least one of each type of operable part shall be located no higher than 1 220 mm (48 inches) above the floor of the access space. This is shown in Figure 2.

8.3.2.2 Unobstructed low forward reach

Where no part of the stationary ICT obstructs the forward reach, at least one of each type of operable part shall be located no lower than 380 mm (15 inches) above the floor of the access space. This is shown in Figure 2.

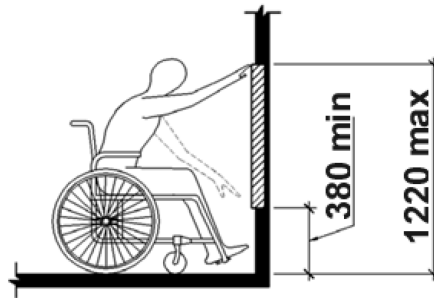


Figure 2: Unobstructed forward reach

8.3.2.3 Obstructed forward reach

8.3.2.3.1 Clear space

Where an obstruction is an integral part of the stationary ICT and hinders the access to any type of operable part, the ICT shall provide a clear space which extends beneath the obstructing element for a distance not less than the required reach depth over the obstruction.

NOTE: Ensuring that there will be unhindered "access to any type of operable part" guarantees that a user will be able access at least one of each type of operable part.

8.3.2.3.2 Obstructed (< 510 mm) forward reach

Where the stationary ICT has an obstruction which is an integral part of the ICT and which is less than 510 mm (20 inches), the forward reach to at least one of each type of operable part shall be no higher than 1 220 mm (48 inches) above the floor contact of the ICT. This is shown in Figure 3 (a).

8.3.2.3.3 Obstructed (< 635 mm) forward reach

Where the stationary ICT has an obstruction which is an integral part of the ICT and which is not less than 510 mm (20 inches) but is less than 635 mm (25 inches) maximum, the forward reach to at least one of each type of operable part shall be no higher than 1 120 mm (44 inches) above the floor contact of the ICT. This is shown in Figure 3 (b).

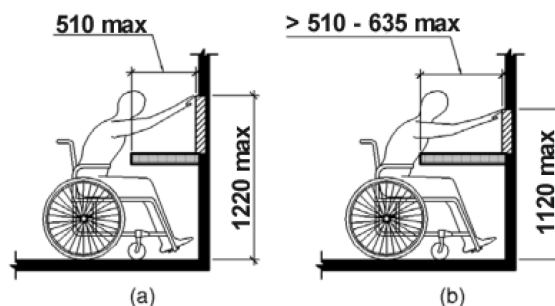


Figure 3: Obstructed forward reach

8.3.2.4 Knee and toe clearance width

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

8.3.2.5 Toe clearance

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

- 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.

This is shown in Figure 4.

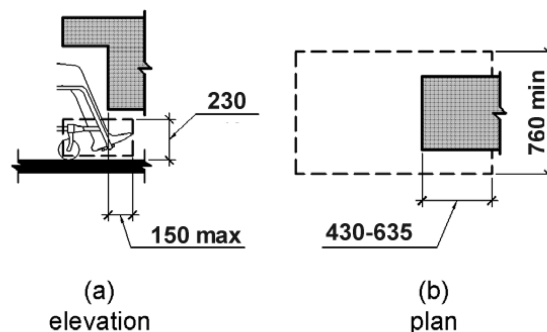


Figure 4: Toe clearance

8.3.2.6 Knee clearance

Where an obstacle is an integral part of the stationary ICT, 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 shall:

- 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 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 5.

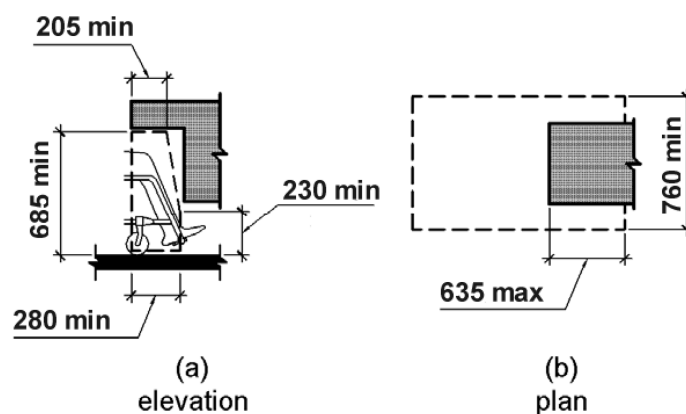


Figure 5: Knee clearance

8.3.3 Side reach

8.3.3.1 Unobstructed high side reach

Where the side reach is unobstructed or obstructed by an element that is an integral part of the stationary ICT and which is less than 255 mm (10 inches), at least one of each type of operable part shall 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 6.

8.3.3.2 Unobstructed low side reach

Where the side reach is unobstructed or obstructed by an element that is an integral part of the stationary ICT and which is less than 255 mm (10 inches), at least one of each type of operable part shall 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 6.

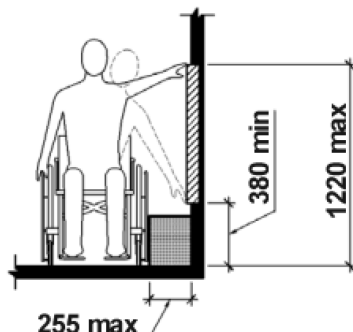


Figure 6: Unobstructed side reach

8.3.3.3 Obstructed side reach

8.3.3.3.1 Obstructed (≤ 255 mm) side reach

Where stationary ICT has an obstruction which is an integral part of the ICT, the height of the obstruction shall 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 at least one of each type of operable part shall be no higher than 1 220 mm (48 inches) above the floor of the access space. This is shown in Figure 7 (a).

8.3.3.3.2 Obstructed (≤ 610 mm) side reach

Where stationary ICT has an obstruction which is an integral part of the ICT, the height of the obstruction shall 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 at least one of each type of operable part shall be no higher than 1 170 mm (46 inches) above the floor of the access space. This is shown in Figure 7 (b).

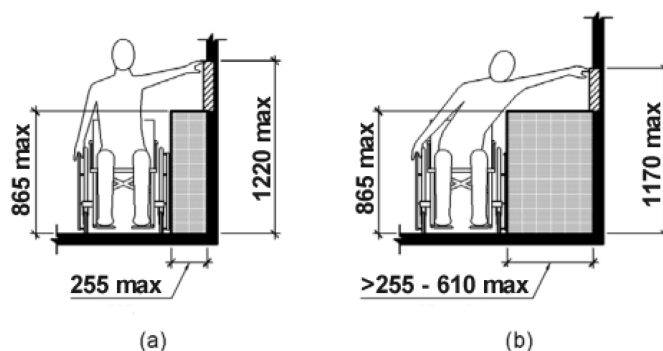


Figure 7: Obstructed high side reach

8.3.4 Clear floor or ground space

8.3.4.1 Change in level

Where stationary ICT has a floor within it, then any change of floor level within it or entering it shall be ramped with a slope no steeper than 1:48.

Exceptions:

- a) 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 8.
- b) 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 9.

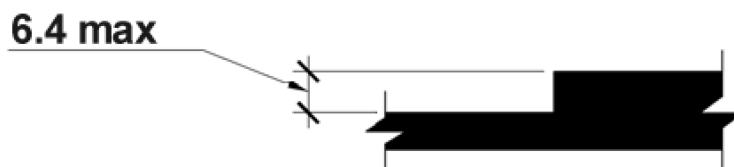


Figure 8: Vertical change in level

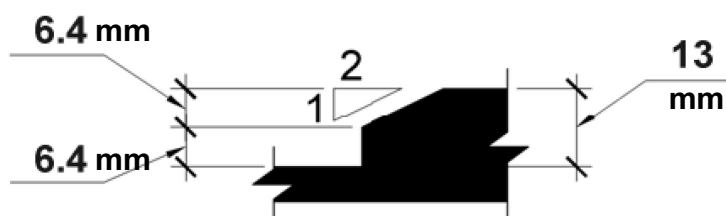


Figure 9: Bevelled change in level

8.3.4.2 Clear floor or ground space

Where stationary ICT has an operating area within it, it shall 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 10.

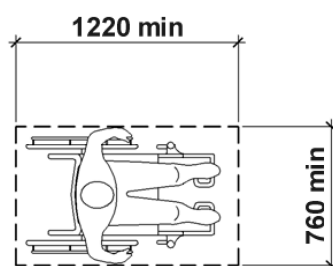


Figure 10: Clear floor or ground space

8.3.4.3 Approach

8.3.4.3.1 General

Where stationary ICT has an access space inside it, at least one full side of the space shall be unobstructed.

8.3.4.3.2 Forward approach

Where the operating area is inside an alcove within the stationary ICT, the alcove is deeper than 610 mm (24 inches), and where a forward approach is necessary, the dimension of the access space shall be a minimum of 915 mm (36 inches) wide. This is shown in Figure 11.

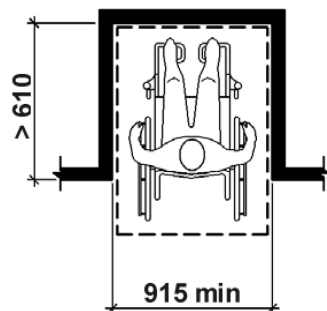


Figure 11: Manoeuvring Clearance in an Alcove, Forward Approach

8.3.4.3.3 Parallel approach

Where the operating area is inside an alcove within the stationary ICT, the alcove is deeper than 380 mm (15 inches), and where a parallel approach is possible, the dimension of the access space shall be a minimum of 1 525 mm (60 inches) wide. This is shown in Figure 12.

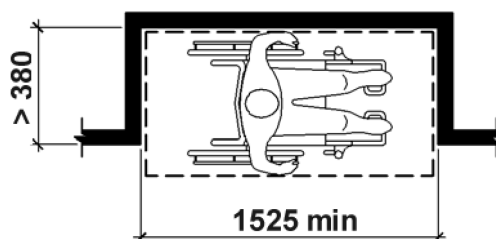


Figure 12: Manoeuvring Clearance in an Alcove, Parallel Approach

8.3.5 Visibility

Where stationary ICT provides one or more display screens, at least one of each type of display screen shall be positioned such that the information on the screen is legible from a point located 1 015 mm (40 inches) above the centre of the floor of the operating area).

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

8.3.6 Installation instructions

Installation instructions shall be made available for all stationary ICT. These instructions shall give guidance on how to install the ICT in a manner that takes into account applicable requirements for accessibility of the built environment as they apply to the installation of the ICT. Where there are no such requirements the instructions should require that the dimensions of the installed ICT conform to clauses 8.3.2 to 8.3.5 of the present document.

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 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.

NOTE: ISO 21542:2011 [i.34]: Building Construction - Accessibility and Usability of the Built Environment recommends a value between 2,5 and 5 Newtons.

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 W3C Web Content Accessibility Guidelines (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, 9.2.2, 9.2.3, 9.2.4, 9.3, 9.4.1.1, 9.4.1.2 and the conformance requirements of clause 9.6 of the present document.
- Conformance with W3C Web Content Accessibility Guidelines (WCAG 2.1) [5] Level AA is equivalent to conforming with all of clauses 9.1 to 9.4 and the conformance requirements of clause 9.6 of the present document.
- Requirements for non-web documents and non-web software are given in clauses 10 and 11 respectively.

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

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 listed in clause 9.5 of the present document. Web authors and procurement accessibility specialists are encouraged to 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 4: 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 5: "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](#).