EXHIBIT A

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

AMERICAN SOCIETY FOR TESTING AND
MATERIALS d/b/a ASTM INTERNATIONAL;

NATIONAL FIRE PROTECTION
ASSOCIATION, INC.; and

AMERICAN SOCIETY OF HEATING,
REFRIGERATING, AND AIR CONDITIONING
ENGINEERS, INC.,

                Plaintiffs/Counter-defendants,

      v.

PUBLIC.RESOURCE.ORG, INC.,

                Defendant/Counterclaimant.

Case No. 1:13-cv-01215-TSC-DAR

EXPERT REPORT OF JAMES R. FRUCHTERMAN

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Introduction

As an expert in accessibility of written materials for people who have disabilities that affect using standard print (people who are print disabled), I have been retained by Public.Resource.Org to evaluate the accessibility of certain online content available on the websites of the plaintiffs and the defendant in this case. As someone dedicated to improving accessibility for the benefit of people with disabilities and in the public interest, I agreed to evaluate the accessibility to people who are blind of specific commonly used standard documents located on different websites.

This expert report is a summary of certain opinions that I intend to give, if asked, at trial regarding the accessibility of documents on various websites to people who are blind. This report also states the bases for my opinions, and it discloses the data or other information considered in forming those opinions. I reserve the right to change or supplement this report if additional evidence comes to my attention, and to prepare demonstratives and/or exhibits to illustrate or explain my opinions, as appropriate.

A copy of my curriculum vitae, including a list of my publications and presentations, is **Exhibit A** to this report. I provide my expertise in this case pro bono, and I am not receiving compensation for my time researching, writing this report, or testifying. I previously served as an expert in *The Authors Guild, Inc. et al. v. HathiTrust, et al.*, Case No. 1:11-cv-06351-HB (S.D.N.Y.) (case filed September 12, 2011), although I did not testify in that case. I have not given deposition or trial testimony in the past four years.

Background and Qualifications

I serve as Founder and Chief Executive Officer of Benetech, a nonprofit dedicated to creating new technology solutions that serve humanity and empower people to improve their lives. In 1980 I earned a B.S. in Engineering and an M.S. in Applied Physics from California Institute of Technology. I co-founded Calera Recognition Systems in 1982. Calera developed optical character recognition (OCR) technology that allowed computers to read virtually all printed text.

In 1989, I founded Arkenstone, a nonprofit social enterprise, which produced reading machines for the print disabled community based on the Calera technology, and was at one time the largest maker of affordable reading systems for the blind. The Arkenstone product line was sold in 2000 and the resulting capital funded the next phase of Arkenstone under its new name, Benetech. I have been the CEO of Benetech/Arkenstone since 1989.

I have served on three U.S. federal government advisory committees for disability issues: the Section 255 Telecommunications Access Advisory Committee, the Section 508 Electronic Information and Technology Access Advisory Committee, and the Advisory Commission on Accessible Instructional Materials in Postsecondary Education for Students with Disabilities. I have received numerous other awards and recognition for my work making print materials accessible to people who are blind or otherwise print disabled. In 2006 I received a MacArthur Fellowship. I was named an Outstanding Social Entrepreneur in 2003 by the Schwab Foundation and have frequently participated in the World Economic Forum Annual Meetings in Davos, Switzerland. Benetech received the Skoll Award for Social Entrepreneurship under my leadership. I also received the Migel Medal from the American Foundation for the Blind, the Robert F. Bray Award from the American Council of the Blind, and the American Library

Association's Francis Joseph Campbell Award in recognition of my successful efforts to make literary works more accessible to people who are blind or visually impaired.

What Does Accessibility Mean for a Blind Person?

Accessibility is usually defined in a functional way: can a person with a disability independently access the same information and perform the same tasks as a person without a disability? When it comes to accessing materials traditionally available as print, such as standards, there are many groups of print disabilities. The most severe is blindness, where a person cannot perceive the printed text at all. The next is vision impairment, where a person generally cannot perceive the text directly or with corrective lens, but may be able to use magnifiers of different types to read the text. Another group is learning disabilities that interfere with reading, such as dyslexia. A closely related group of disabilities involve brain injuries that affect reading or the retention of material read. Another group is physical disabilities that interfere with the holding or seeing of books or the turning of pages.

In this report, I focused on the accessibility challenges that would be experienced by blind people, because they are generally the most severe print disabilities. The other groups of people with print disabilities use similar technologies to access print (such as having it read aloud), and experience similar challenges as blind people. In the accessibility field, it is generally understood that if you make information accessible to a blind person, it will probably also meet the accessibility needs of the great majority of people with other print disabilities.

The most common technology used by a blind person for accessibility is called a screen reader. As the name suggests, a screen reader is a program that runs on a personal computer or a smartphone that reads the information on the screen aloud (using a computer-synthesized voice)

to a blind person. The screen reader runs "on top of" other programs, figuring out not only what text is on the screen, but also the controls that are displayed: items such as buttons, menus, text-entry boxes and the like. Because of the amount of information on a complete screen, and its complexity, blind people need to be able to focus on the most important information so that they do not waste time listening to everything on the screen.

For the purpose of this report, measuring the accessibility of standards, I am assuming that the blind user is using a screen reader on top of a web browser on a personal computer. Based on the information the screen reader can glean from the web pages displayed on the screen, can a blind person locate the standard and read it?

The accessibility tasks I tested were designed to assess whether a blind user with basic assistive technology skills could perform the same kind of tasks one might expect a user without a disability to perform in accessing a given standard, without requiring the intervention of a third party. This functional approach is the most common method of assessing accessibility. The specific tasks I investigated were:

- Could a blind user with basic assistive technology skills independently access a specific standard of interest?

- Could a blind user independently read the entire standard using assistive technology?

- Could a blind user independently navigate to a specific place in the standard and read the content in that place?

- Could a blind user independently do a full text search and find specific mentions of terms of interest?

I conducted these tests on a number of the same standards available on the Public.Resource.Org website and in the free reading sections of the websites of the National Fire Protection

Association (NFPA), the American Society of Heating, Refrigerating and Air-Conditioning

Engineers (ASHRAE), and the American Society for Testing and Materials (ASTM). I primarily

used the Window-Eyes screen reading software to perform my tests, but I also confirmed some

of my observations with the JAWS screen reading program (these are the two most commonly-

used screen reading programs by people who are print disabled). In order to further confirm my

observations, I was assisted by an engineer who is blind and who is a skilled daily user of screen

reader software. This engineer used the JAWS screen reader to confirm that as an individual

who is print disabled and a regular user of a screen reader program, he was unable to access the

website and several specific standards that I had found to be inaccessible to people who are print

disabled.

Overview and Summary of Opinions

Having reviewed the accessibility of the same standards content rendered by

Public.Resource.Org and those of the free access options provided by the NFPA, ASHRAE and

ASTM, it is my opinion that Public.Resource.Org currently provides the only accessible option

for people/citizens with print disabilities to access these standards.

Based on my extensive experience with content accessibility, approaches for "free

access" that make it impossible to copy text generally make it impossible for the assistive

technology used by people with print disabilities, especially blind people, to read the text aloud,

present it visually in more accessible manners, or make the text available in braille.

Technological mechanisms that are designed to stop copying generally have the unfortunate side

effect of locking out people with print disabilities from the ability to read the material.

The versions of the standards on the NFPA, ASHRAE, and ASTM free reading websites are not available in a way that is accessible to blind users. First, the NFPA and ASTM websites require registration before a user can access free standards on their websites. Although a blind user may be able to register on the ASTM website, a person who is blind would not be able to independently gain access to the NFPA standards because the NFPA website uses a registration process that employs buttons without proper markings for the blind to perceive them with accessibility software. Second, the free reading websites for NFPA, ASHRAE, and ASTM each display their standards in separate windows that prevent assistive technology from perceiving the words in those windows, meaning that that blind people would not be able to tell the difference between the standards and a blank window. These websites do not allow the text of the standard to be read aloud by a screen reader; the navigation controls do not work with a screen reader, so blind people are unable to navigate to a specific location in the standard; and the text search function does not work with a screen reader.

In contrast, the versions of the standards on the Public.Resource.Org website are available in a way that is accessible to blind users. Firstly, the Public.Resource.Org website does not require a registration process before a user can access the files containing the standards; the files are directly available to users. Secondly, many of the standards on the Public.Resource.Org website are available in well-structured HTML, a highly accessible format that allows blind users similar quality of access as that enjoyed by a person without a disability accessing a print version of the standard (or a locked digital version). Although some standards are available only in PDF format on the Public.Resource.Org website, those documents are accessible through extra steps such as optical character recognition. To summarize, it is my opinion that the standards on the Public.Resource.Org website are accessible to the blind through screen reader software, whereas

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the standards on the free reading portions of the NFPA, ASHRAE, and ASTM websites are not accessible to the blind through screen reader software. Furthermore, it is my opinion that people with other print disabilities, such as vision impairment, dyslexia, brain injury and physical disabilities, would find the standards on the Public.Resource.Org accessible with screen readers and other assistive technology, whereas the standards on the free reading portions of the NFPA, ASHRAE, and ASTM websites would not be accessible to the great majority of people with these types of print disabilities.

Testing the National Fire Protection Association Website's Accessibility

I performed my test of the NFPA, ASHRAE, and ASTM websites in two phases. The first phase was an investigation of whether a blind or visually impaired person can gain access to a standard on the NFPA website by going through a process of obtaining free access while using a screen reading program. On the NFPA website it appears that users must register and agree to terms of use before accessing any of the free standards on the website. The results of the test are that a blind user would not be able to independently sign up for a free account on the NFPA website because the registration process involves elements that cannot be perceived by screen reading software.

The accessibility standard in common use for websites is the Web Content Accessibility Guidelines (WCAG), published by the World Wide Web Consortium, the main standards body for technology related to the Web. A copy of the WCAG is **Exhibit C**. (As with other World Wide Web Consortium standards, the WCAG standard is freely available at no cost on the World Wide Web Consortium website, in HTML, as stated in the World Wide Web Consortium Document License, **Exhibit D**). The very first element in the WCAG standard specifies that

"information and user interface components must be presentable to users in ways they can perceive." The key recommendation for how to address this need is to "provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language." The two easiest ways to meet this requirement are to present textual content as text and to add text labels to non-text content. For example, the text in a regular web page is highly accessible: the screen reader software can simply grab each word, sentence and paragraph and read it aloud (or make it larger, or provide it to a braille device). Screen readers understand web page structure, so links and headers are identified as such when they are read aloud. A visual button on a page can easily have a text label as part of the web page that identifies its function (for example, "I agree"). A screen reader encountering such a button on a web page would simply say aloud "Button, I agree," and the screen reader provides a blind person with a way to activate the button using the keyboard (because blind people avoid using mice for obvious reasons).

These fundamental requirements for accessibility are the ones that the NFPA website fails to meet. Rather than cataloging the many parts of the WCAG accessibility standards the NFPA website fails to meet, I will focus on two key items. The first is that a blind person trying to sign up for a free access account needs the assistance of a sighted person to sign up. This is because, for instance, the NFPA website uses a visual button for the "I Agree" function on its registration page, and this visual button fails to have a text label, meaning that a blind person using a screen reader would not know what the button is for. A blind person who arrived at the point where he or she needed to assent to the terms and conditions after some effort would not be able to tell what to do, or which button to push, because there is no text equivalent attached to the "I AGREE" button. On the NFPA website, the screen reader knows that there are buttons but

can't tell what they do because there are no text labels on them, and the letters "I AGREE" are shown only as a picture of those words, which is not perceptible to a blind person.

The second phase of my test was to perform the functional tests on a specific standard, NPFA 101-2000. In this second phase of the test is also where the NFPA free access website fails to make the text accessible, and fails to meet the WCAG accessibility standard mentioned above. Rather than presenting the text in a standard webpage, which is the typical way to present information in a web browser, the NFPA site opens an image-only window. Rather than presenting the text of the standard as HTML text, it presents it as a picture of the text. See the screen shot below.
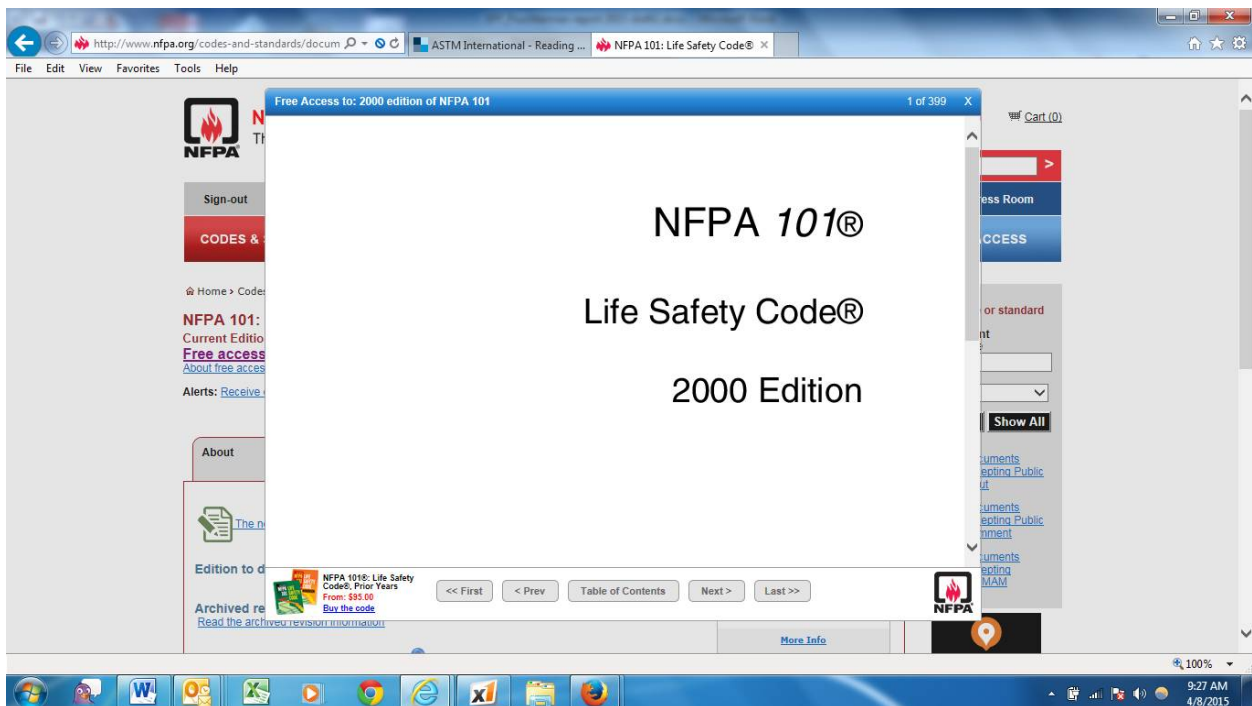

To a sighted person, both the text in a standard webpage and the text in an image-only window looks pretty similar: the words are visible. But, "under the hood," so to speak, the use of an image prevents the browser from presenting the text on the screen as text. A browser ordinarily transmits text to a screen reader in a way that facilitates access for the visually

impaired. Instead, when NFPA's website presents text only within an image, the web browser

processes it as an image, as if someone took a picture of a page and sent it as a photo rather than

sending a text file. The screen reader cannot perceive the text in an image; all the screen reader

can perceive is that there is a big picture on the screen. A screen reader stops working at this

point: it does not know what is in the picture. And so even if a blind person were able to open a

specific standard on the NFPA website, such as NFPA 101, he or she will not be able to perceive

any of the content in the standard because the page appears blank to him or her. This means that

on the NFPA free reading website a blind person cannot independently read the standard, go to a

specific page within it, or search it for terms of interest.

Testing the American Society of Heating, Refrigerating and Air-Conditioning Engineers Website's Accessibility

Counsel suggested I investigate the accessibility of ASHRAE Standard 90.1-2010,

Energy Standard for Buildings Except Low-Rise Residential Buildings (I-P). ASHRAE's

website does not require a visitor to sign up for a free account before viewing certain standards,

and so a blind user should be able to navigate to the place where online read-only versions of the

standards reside, and then identify specific standards by number and description. Thus, the first

of the four tasks, navigating to a specific standard, is a task that a blind person can perform

independently on the ASHRAE website. See the screen shot below of this portion of the

ASHRAE website with the listing of links to different standards.
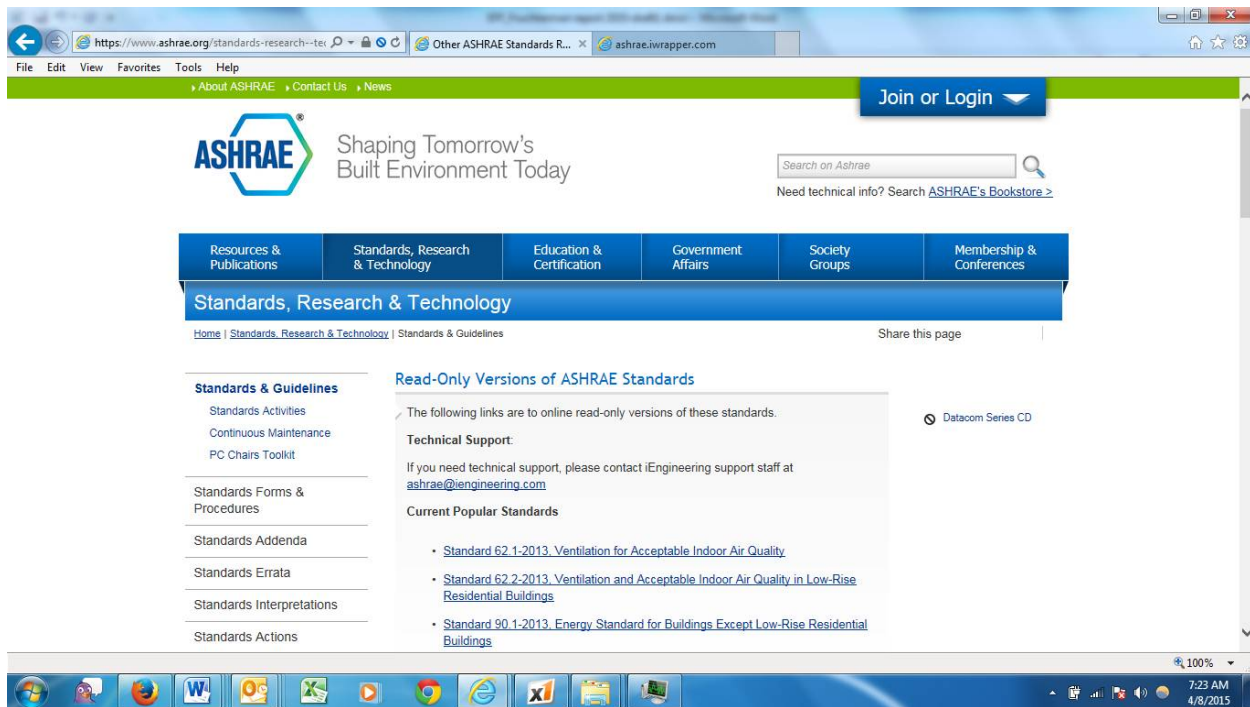
However, once a specific standard is chosen, the standard is not perceptible to a blind person, for the same reason that I discussed earlier with respect to the NFPA website. See the screen shot below of the ASHRAE 90.1-2010 standard as displayed on the website. The text of the standard is inaccessible to a blind person, and therefore a blind person is unable to perform the functional accessibility tasks. First, the ASHRAE website presents the standard in a window that prevents screen reader software from reading aloud the text of the standard. Second, the navigation controls on the standards-display portion of the ASHRAE website do not work with a screen reader, so a blind person would be unable to navigate to a specific location in the standard. Lastly, although there is a text search function that works for a sighted person, I was unable to get that functionality to work with a screen reader. And, even if I could get the search function to work with a screen reader, a screen reader would still be unable to read aloud the actual content of the standard at that point, and so the exercise would be pointless for a blind person.
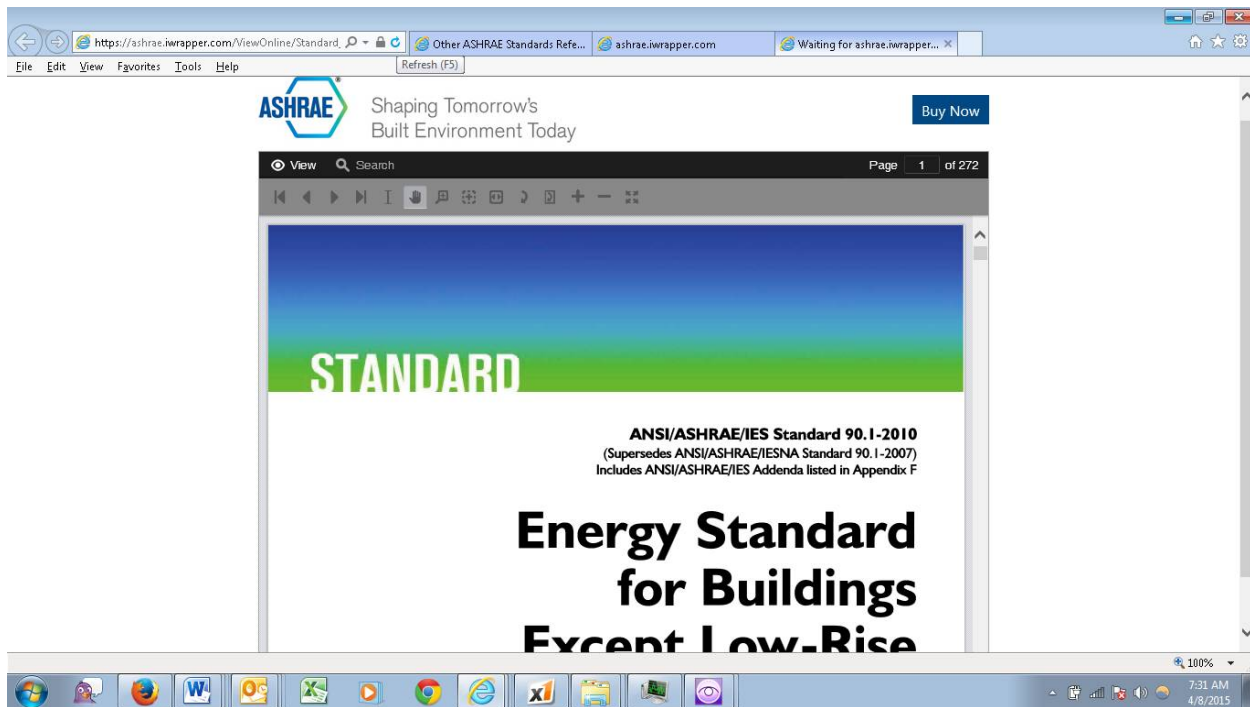
Because the ASHRAE website provides the content of the standard as an image, it is inaccessible to a blind person. As I mentioned above, the WCAG accessibility standard requires the text to be provided for any information delivered as an image, and the ASHRAE website fails to do so for the standard I tested. I also tested five other ASHRAE standards (ASHRAE 62.1-2013, 62.2-2013, 90.1-2013 (I-P), 90.2-2007, and 189.1-2014) on the ASHRAE website, and they all presented the same image-based interface to the standards, and are therefore inaccessible to blind people.

Testing the American Society for Testing and Materials Website's Accessibility

Counsel suggested I investigate the accessibility of Standard B557-84 Wrought and Cast Aluminum- and Magnesium-Alloy Products. The ASTM website requires visitors to sign up for a free account before viewing certain standards. The process of setting up a free account is accessible, and therefore a blind person should be able to independently gain access to the

ASTM Reading Room, where the standards are located. A blind user could navigate to the place

where online read-only versions of the standards reside, and could identify specific standards by

number and description. Thus the first of the four tasks, navigating to a specific standard, was a

task that a blind person could perform independently. See the screen shot below of this portion

of the ASTM website with the listing of links to different standards.
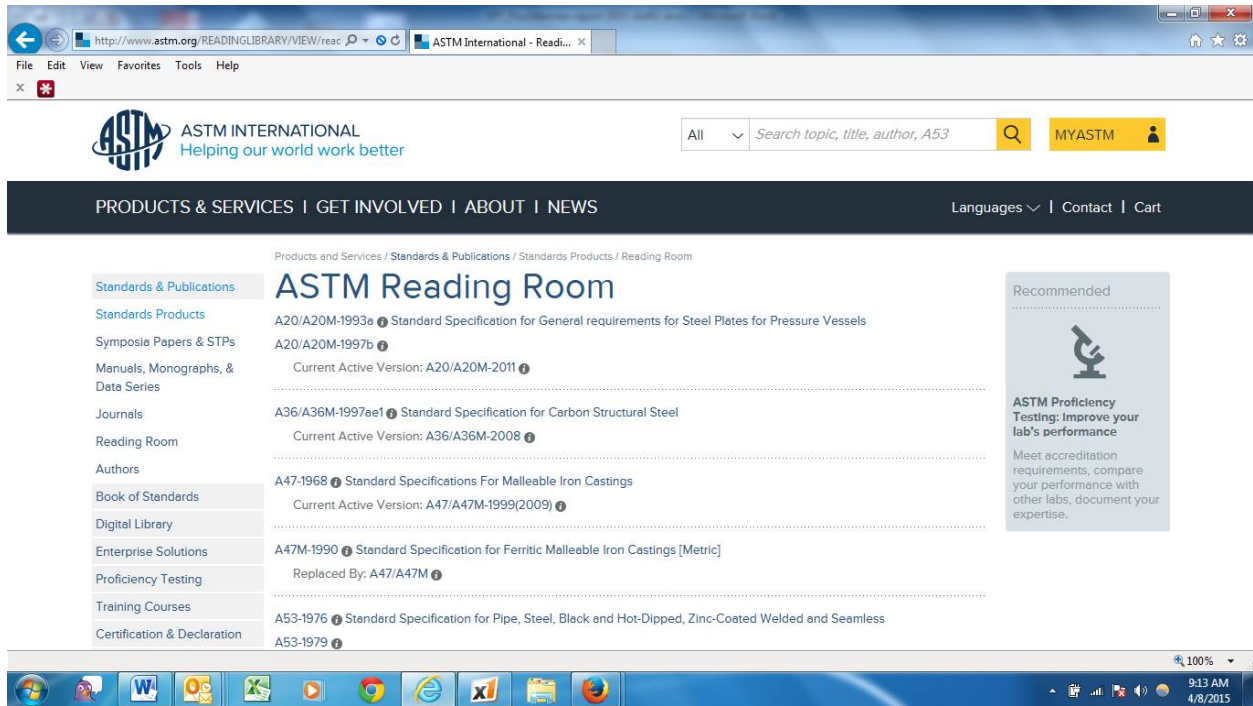
I was able to locate a version of the standard ASTM B557-84e1. When one selects the standard,

a new window appears with an image-only viewer of the standard. For the same reason as I

described earlier with respect to the NFPA and ASHRAE websites, this standard on the ASTM

website is not perceptible to a blind person. First, the ASTM website presents the standard in a

window that prevents screen reader software from reading aloud the text of the standard.

Second, the navigation controls on the standards-displaying portion of the ASTM website do not

work with a screen reader, so a blind person would be unable to navigate to a specific location in

the standard. I was not able to locate a text-searching function on the ASTM standard I

examined.
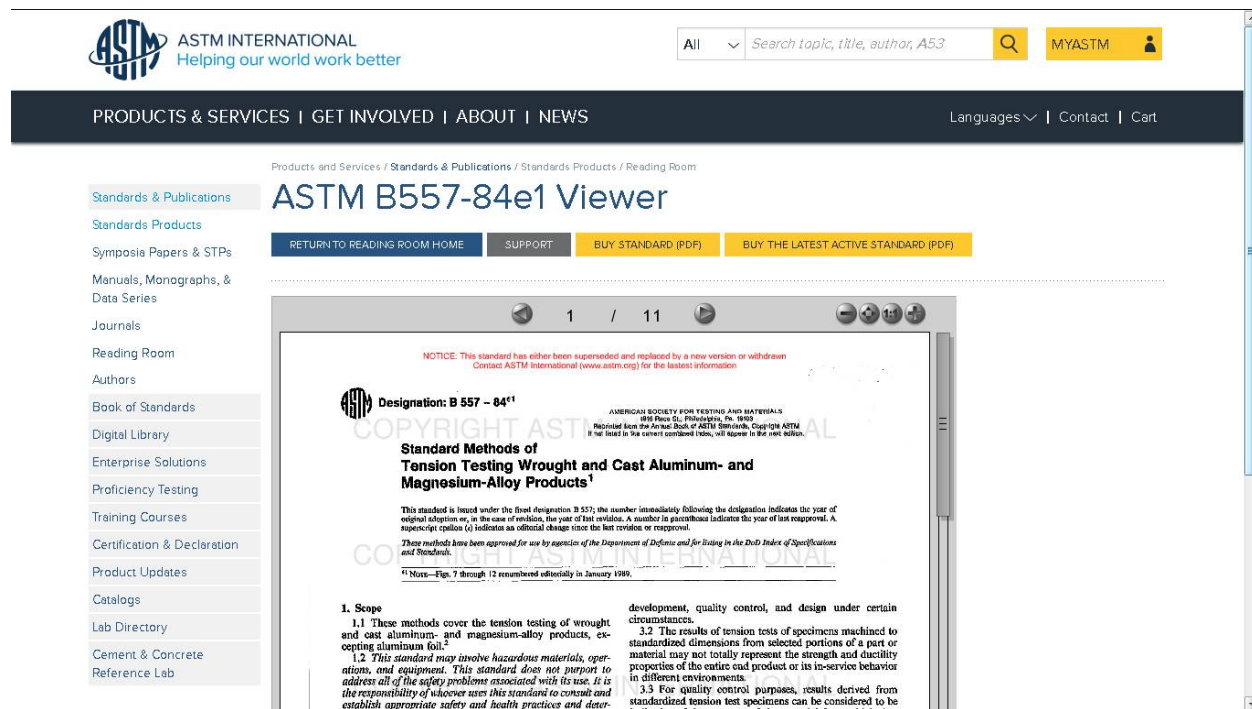
Because the content of the ASTM standard appears as an image in the ASTM Reading

Room, it is inaccessible to the blind person. As I mentioned above, the WCAG accessibility

standard requires the text to be provided for any information delivered as an image, and the

ASTM website fails to do that for the standard I tested. I also tested the first standard listed on

the website, ASTM A20/A20M-93a, and it presented the same image-based inaccessible

interface to the standard, meaning that a blind person would not be able to perceive it.

Testing the Public.Resource.Org Website's Accessibility

After unsuccessfully trying to access the NFPA 101-2000, ASHRAE 90.1-2010 and

ASTM B557-84 standards on the websites of the three standards organization as a blind user

would, I went to the same standards on the Public.Resource.Org website and tried the same

tasks. I was able to successfully complete all of the accessibility tasks on all three of the standards on the Public.Resource.Org website.

The Public.Resource.Org website has no required sign-up procedure, so I did not need to test the accessibility of that process. It is possible to go directly to a specific standard either by using a direct weblink or by navigating the text-oriented website. For example, searching on the terms "NFPA 101 resource.org" shows the standard available directly from Google's search engine in the top few links, in both PDF and HTML form. HTML is generally more accessible, so I selected that link and it directly opened up in my browser. The entire text of the standard was available, and I was able to read the standard using screen reading software, navigate to a specific place in the document using screen reading software, and search for key terms using screen reading software. My test therefore indicated that a blind person using a screen reader would be able to perform all of the functional tasks: reading the entire standard, navigating to a specific place in the standard, or searching on key terms. Because the text is provided as standard HTML, a blind person is able to listen to the text, or access it using a digital braille device. This kind of HTML content is also highly accessible to people with other print disabilities and the assistive technology they use to access print. For example, people with low vision or with dyslexia often use a screen reader to read text aloud.
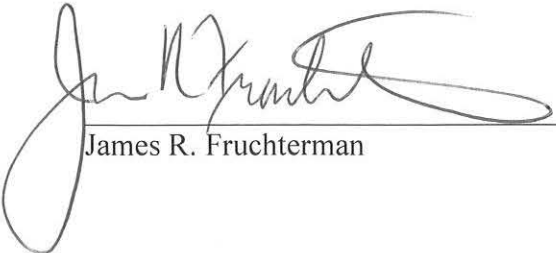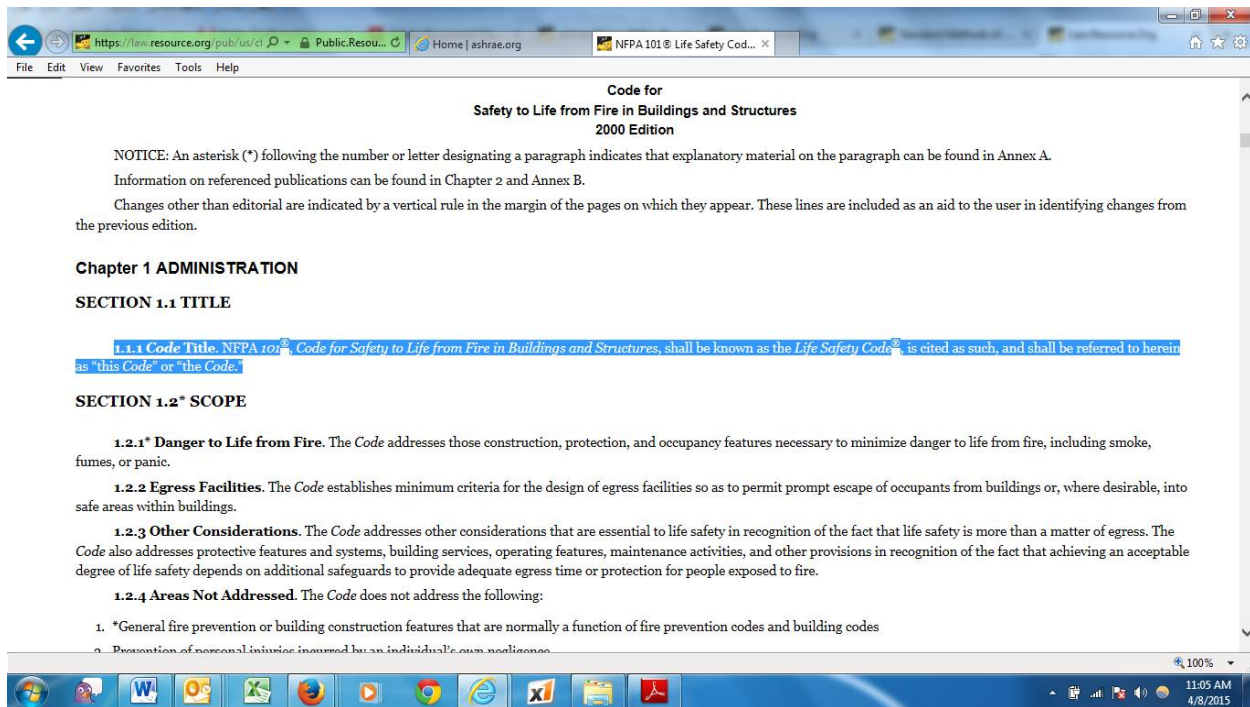
I also found a version of the ASTM B557-84 standard on the Public.Resource.Org website as an HTML file. It was well-structured and highly accessible. Like the NPFA 101-2000 standard on the Public.Resource.Org website, this standard could be readily located and accessed by a blind person using a screen reader, and could then be perceived in its entirety using the screen reader.

I then examined the accessibility of more recent versions of the NFPA 101 standard located on the Public.Resource.Org website. These were available only in PDF formats, not HTML. I accessed the 2012 version of the NPFA 101 standard, and found that it was an image-based PDF. I also searched for the ASHRAE 90.1-2010 standard and found it in PDF form on the Public.Resource.Org website without needing to login to access it. It was also an image-based PDF. Image-based PDFs are generally not accessible to blind people. However, these files both came with the underlying text associated with the page images. It was possible for me to open the PDFs in a browser or Adobe Reader, do a Select All command (Control A on a PC),

a Copy command (Control C on a PC) and then switch to a text-oriented word processing program (Microsoft Word) and paste the text of the entire standard into a file there. The text appeared to be an automatic optical character recognition version of the standard, which meant there were some errors in the transcription. But, generally the accuracy was sufficient to perform the functional tasks: reading the entire standard, navigating to a specific place in the standard, or searching on key terms. It should be noted that this approach would not likely occur to a blind person opening an image PDF file, because the Adobe software does not announce that the underlying text was present. It is also possible for a blind person to independently perform optical character recognition on image-based PDFs themselves and access the text that way, and many advanced computer users that are blind would be aware that this is possible. Although performing optical character recognition on a PDF is not as optimal as having HTML text available to read immediately without conversion, this method by which PDFs can be made perceptible to the blind is still better than having no access, which is effectively what the NFPA, ASHRAE, and ASTM websites offer.

Dated: April 13, 2015

James R. Fruchterman

Exhibit A

James R. Fruchterman

Founder and CEO

Benetech

Education

- California Institute of Technology
  B.S. Engineering, 1976-80
  M.S. Applied Physics, 1978-80

- Stanford University, 1980-81
  Ph.D. Studies in Electrical Engineering

Professional Experience

- CEO and Founder, 2015-present
  President, CEO, Chairman, Founder, 2000-2014
  Benetech (name changed from Arkenstone in 2000)
  Palo Alto, California

- President, CEO, Chairman, Founder, 1989-2000
  Arkenstone, Inc.
  Moffett Field, California

- Director, 1989-present
  Vice President Finance, CFO, 1989-2004
  President & CEO, Founder, 1989-95
  RAF Technology, Inc.
  Palo Alto, California and Redmond, Washington

- Vice President, Marketing, 1987-89
  Founder, Vice President, Finance, 1982-88
  Calera Recognition Systems, Inc.
  Santa Clara, California

- Prior engineering positions with:
    - Phoenix Engineering, Inc.
    - G.C.H., Inc.
    - IBM T.J. Watson Research Center
    - General Motors Company
    - NASA — Jet Propulsion Laboratory
    - Fermi National Accelerator Laboratory

Publications

- Technology Serving Humanity (chapter). In Schultz, R. (editor) *Creating Good Work*, Palgrave Macmillan, February 2013

- Guest Editor's Page, AFB Journal of Visual Impairment & Blindness, October-November 2012

- An Interview With Technology Guru George Kerscher, AFB Journal of Visual Impairment & Blindness, October-November 2012

- For Love or Lucre, Stanford Social Innovation Review, Spring 2011

- Developing Information Technology to Meet Social Needs. In *Innovations*, MIT Press, 2008

- Accessing Books and Documents, a chapter in the book, Assistive Technology for Vision-Impaired and Blind People, Springer Verlag 2008

- Everyone Deserves Access to Technology, OpEd in *The Sacramento Bee* by Jim Fruchterman and Gregg Vanderheiden, June 17, 2007

- Document Recognition Serving People With Disabilities, *Proc. SPIE 6500*, International Society for Optics and Photonics, 2007

- Pattern Recognition Technology Helps Disabled People Access Books, *SPIE Newsroom*, International Society for Optics and Photonics, May 14, 2007

- Nothing Ventured Nothing Gained, Addressing the Critical Gaps in Risk-Taking Capital for Social Enterprise, by Jed Emerson, Tim Freundlich and Jim Fruchterman, published by Oxford Said Business School, 2006

- Build Great Companies, Then Help Build a Great World, OpEd in *The San Jose Mercury News*, November 13, 2006

- Comments on Accessibility of Google Print and Google's Library Project, white paper, February 2005

- Technology Benefiting Humanity, published in the Association for Computing Machines *Ubiquity* magazine, March 2004

- The Power of Technology Social Enterprises, published in the N-TEN forecast series, February 2004

- In the Palm of Your Hand: A Vision of the Future of Technology for People with Visual Impairments, published in the American Foundation for the Blind's *Journal of Vision Impairment and Blindness*, October 2003

- The Chafee Amendment: Improving Access to Information, published in *Information Technology and Disabilities*, a journal published by Equal Access to Software and Information (EASI), co-authored with Bookshare Senior Product Manager Alison Lingane, October 2003

- The Soundproof Book: Exploration of Rights Conflict and Access to Commercial EBooks for People with Disabilities, published in *First Monday*, co-authored with George Kerscher, the International Project Manager of the DAISY Consortium, May 2002

- Bookshare, Books without Barriers, at the Closing the Gap conference, Minneapolis, MN, October 2001

- Two presentations given at the IT Accessibility 2001 Conference, May 2001 at the National Institute of Standards and Technology
  - [I Dream of Software](#)
  - [The Business Case for Adaptive Technology](#)
- Humanizing the Voice of the Machine, with Prof. Mari Ostendorf (University of Washington), Annual Meeting of the American Association for the Advancement of the Machine, Boston, MA, February 2000
- [The Many Facets of Open Book: Ruby Edition](#), California State University, Northridge (CSUN), 15th Technology and Persons with Disabilities Conference, March 2000
- [Corporate Responsibility for Adaptive Technology](#), California State University, Northridge (CSUN), 14th Technology and Persons with Disabilities Conference, March 1999
- [Developing Partnerships for Assistive and Universally Designed Technology for Persons with Disabilities](#), Testimony before United States House of Representatives, Committee on Science, Subcommittee on Technology, August 4, 1998
- Access to Maps and Location Information through Virtual Reality Techniques and GPS Satellite Receivers, 3rd International Technical Aids Seminar, Tokyo, Japan, July 1994

Invited Talks

- "*[Innovation in America: The Role of Technology](#)*," August 1, 2013, Testimony before U.S. House of Representatives, Judiciary Committee's Subcommittee on Courts, Intellectual Property, and the Internet.
- ["Social Change at Scale – That's Innovation!"](#) May 2012, TEDxSanJoseCA 2012, San Jose, CA.
- *["The Power of Failure, People and Karma Banking,"](#) May 20, 2012,* Commencement speech, St. Mary's College, Moraga, CA.
- *"Raising the Floor," October, 2011, Keynote Speech,* Association for Education and Rehabilitation of the Blind and Visually Impaired Conference, Cleveland OH.
- *Keynote speech, IEEE Sections Congress, August 2011, San Francisco, CA.*
- "[Making the Book Truly Accessible](#)," Tools of Change Conference, New York, NY, 2011 Keynote Speech
- UBS-Ashoka Visionaris Award, Keynote Speech, Social Entrepreneur of the Year Award, Mexico City, Mexico, September, 2010
- A series of three invited speeches on Bookshare and accessible books, in Tokyo, Shizuoka and Osaka, Japan, February, 2009
- Keynote Speech, Social Enterprise World Forum, Edinburgh, Scotland, September, 2008
- "Raising the Floor: Providing Accessible Technology and Content to Every Person with a Disability on the Planet," International Conference on Computers Helping People with Special Needs, Linz, Austria, July, 2008 Keynote Speech
- "Raising the Floor," CSUN Conference on Technology and Persons with Disabilities, March, 2008 Keynote Speech

- Extensive speaking engagements to students about technology serving people with disabilities. Have done invited talks at:
    - Stanford University
    - University of California at Berkeley
    - Brigham Young University
    - University of the Pacific
    - Santa Clara University
    - California Institute of Technology
    - San Jose State
    - University of California at Santa Cruz
    - University of California at Davis
    - Loyola Marymount University
    - Pepperdine University
    - University of Washington
    - Columbia University
    - Harvard University
    - University of Geneva
    - Oxford University
- Inflection Point Opportunities in Social Investment, Closing Keynote for the UBS Philanthropy Forum, Lisbon, Portugal, July 2007
- It's Not Rocket Science: Building Social Enterprises, Keynote for the 7th Gathering of the Social Enterprise Alliance, Atlanta, Georgia, March 2006
- Opening Keynote for the Global Social Venture Competition, New York, April, 2006
- Keynote for the 7th IAPR Workshop on Document Analysis Systems, Nelson, New Zealand, February 2006
- [Building a Global Library for People with Print Disabilities](), a speech for the World Summit on the Information Society, Tunis, Tunisia, November 2005
- Innovating Information Technologies to Protect Human Rights, a speech for the World Affairs Council of Northern California, February 2004
- Setting the 2004 Agenda: Technology, speaker at the World Economic Forum, Davos, Switzerland, January 2004
- Seizing Market Failure as an Investment Opportunity, Keynote for the Business for Social Responsibility Annual Conference, Los Angeles, November 2003.
- In the Palm of Your Hand, Keynote for the World Blind Union Asia Pacific conference, Singapore, November, 2003
- Technology and Human Rights, University of Peradeniya, Sri Lanka, November, 2003
- When Markets Fail, Who Responds? Discussion Leader at the World Economic Forum, Davos, Switzerland, January 2003
- Technology for Nonprofits, with Michael Gilbert, National Gathering for Social Entrepreneurs, Minneapolis, MN, December, 2002
- Bookshare: Large Scale, Web-Based Accessible Books, TechShare conference organized by

the Royal National Institute of the Blind, Birmingham, UK, November 2002

- Putting Technology to Work for Development, speech at the United Nations to the joint meeting of the World Technology Network and UNOPS, July 2002

- Bookshare: The Project for Creating Accessible Books through Computers, at the General Session of the [National Federation of the Blind](#) 2002 Annual Convention, July 2002

- Stanford Social Entrepreneurship Conference, January 2002

- [The Once and Future Web: Tenth Anniversary of the First U.S. Web Page](#) at the Stanford Linear Accelerator Laboratory, December 2001

- NetImpact Annual Conference at Kenan-Flagler Business School, November 2001

- American Council of the Blind Annual Convention, July 2001

- [Bringing Socially Beneficial Technology into the Service of Humanity](#), EE380 at Stanford University, April 2001

- Information Technology in the Service of Human Rights at the Computers, Freedom and Privacy Conference, March 2001

- Rank Prize Fund Symposium, Grasmere, England

- Guest Lecturer for CSUN program in disability leadership

Professional Associations

- Association for Computing Machinery

- Institute of Electrical and Electronics Engineers

- American Association for the Advancement of Science

- Social Enterprise Alliance

Awards and Public Service

- Head of Benetech Delegation, Diplomatic Conference to Conclude a Treaty to Facilitate Access to Published Works by Visually Impaired Persons and Persons with Print Disabilities, World Intellectual Property Organization, Marrakesh, Morocco (2013)

- Member, Global Agenda Council on Measuring Sustainability, World Economic Forum (2012-2014)

- Member of the Board of Directors, ZeroDivide, foundation investing in community enterprises that leverage technology to benefit people in low-income and other underserved communities (2007-2013)

- Commissioner, Federal Advisory Commission on Accessible Instructional Materials in Postsecondary Education for Students with Disabilities, 2010-2011

- Duke University, CASE Award for Enterprising Social Innovation, 2011

- Brigham Young University, Center for Economic Self-Reliance Social Innovator of the Year, 2009

- AT&T Technology Innovation Award from the Alliance for Technology Access, March

2008

- Strache Leadership Award from the California State University, Northridge, 2007

- John D. and Catherine T. MacArthur Foundation Fellowship, 2006

- Technical Advisory Committee Member, National Instructional Materials Accessibility Standard, U.S. Department of Education (2005-2008)

- Advisory Committee Member, National Instructional Materials Accessibility Center, U.S. Department of Education (2006-present)

- [Skoll Award for Social Entrepreneurship](), 2004 and 2006

- Fast Company Social Capitalist Award: Top 20 Groups Changing the World, 2004

- Laureate, [The 2003 and 2001 Tech Museum Awards]()

- [American Library Association Francis Joseph Campbell Award](), 2003

- [Schwab Foundation Outstanding Social Entrepreneur of 2003 Award]()

- Member, the Community Partnership Committee, which oversees a diversity and disability agreement with SBC, Inc.

- Runner-up, Yale-Goldman Sachs National Nonprofit Business Plan Competition, 2003

- American Foundation for the Blind Access Award, 2003

- [Robert S. Bray Award](), The American Council of the Blind

- Winner, Education Category, 2002 Stockholm Challenge

- [Fast 50 Champion of Innovation]() 2002

- Judge, 2002 [National Social Venture Competition]()

- Member, Board of Directors of the [Social Enterprise Alliance]() (2000-2010, chair 2008-2010)

- Member of the Advisory Board, Telecommunications Access Rehabilitation Engineering Research Center, a joint effort of the Trace R&D Center of the University of Wisconsin-Madison and the Technology Access Program of Gallaudet University, 2001

- Panelist, National Science Foundation Small Business Innovation Research Program, 1998, 2000, 2003

- Participant, 1998 NSF Workshop for Discussing Research Priorities and Evaluation Strategies in Speech Synthesis, August, 1998

- Member, Electronic Information and Technology Access Advisory Committee, a federal advisory committee responsible for drafting federal acquisition standards for accessibility under Section 508, 1998-1999

- Member, Telecommunications Access Advisory Committee, a federal advisory committee responsible for making recommendations to the U.S. Access Board and Federal Communications Commission on implementing portions of the 1996 Telecommunications Act, 1996-1997

- U.S. Patent Number 5,470,223: System and Method for Tracking a Pedestrian

- Finalist, 1996 Discover Magazine Awards for Technological Innovation
- 1996 Access Award, American Foundation for the Blind

Major Works and Areas of Expertise

- Founder and CEO of [Benetech](), a highly innovative nonprofit company focused on using the power of technology to address social needs in areas such as disability, literacy, human rights and the environment.

- Founder of Arkenstone, Inc., a leading nonprofit organization providing adaptive technology for education and employment for people with disabilities and the largest maker of reading systems for people with blindness, vision impairment and learning disabilities. Developer of the Arkenstone Reader, the first affordable reading system for the blind. Designer of Open Book, the first talking Windows program for the blind. Co-inventor of Atlas Speaks, the first accessible map software for the blind, and of Strider, a talking GPS locator for the blind.

- Cofounder of [RAF Technology, Inc.](), the nation's leading company in optical character recognition technology for processing forms in postal and medical applications. RAF's software is used to route the United States mail.

- Cofounder of Calera Recognition Systems, Inc., the first company to develop omnifont optical character recognition that works without user training.

Exhibit B

Documents, Facts, or Data Considered in Forming My Opinions:

- The ASHRAE website, at www.ashrae.org
- The ASTM website, at www.astm.org
- The NFPA website, at www.nfpa.org
- The Public.Resource.Org website, at www.public.resource.org
- World Wide Web Consortium's Web Content Accessibility Guidelines (WCAG) 2.0, at http://www.w3.org/TR/WCAG20/
- Window-Eyes screen reader software
- JAWS screen reader software
- I also consulted with a blind engineer (and skilled daily user of screen reader technology) to confirm the specific accessibility challenges I found in my tests

Exhibit C

[contents]

W3C Recommendation

Web Content Accessibility Guidelines (WCAG) 2.0

W3C Recommendation 11 December 2008

This version:
> http://www.w3.org/TR/2008/REC-WCAG20-20081211/

Latest version:
> http://www.w3.org/TR/WCAG20/

Previous version:
> http://www.w3.org/TR/2008/PR-WCAG20-20081103/

Editors:
> Ben Caldwell, Trace R&D Center, University of Wisconsin-Madison
> Michael Cooper, W3C
> Loretta Guarino Reid, Google, Inc.
> Gregg Vanderheiden, Trace R&D Center, University of Wisconsin-Madison

Previous Editors:
> Wendy Chisholm (until July 2006 while at W3C)
> John Slatin (until June 2006 while at Accessibility Institute, University of Texas at Austin)
> Jason White (until June 2005 while at University of Melbourne)

Please refer to the **errata** for this document, which may include normative corrections.

See also **translations**.

This document is also available in non-normative formats, available from Alternate Versions of Web Content Accessibility Guidelines 2.0.

Abstract

Web Content Accessibility Guidelines (WCAG) 2.0 covers a wide range of recommendations for making Web content more accessible. Following these guidelines will make content accessible to a wider range of people with disabilities, including blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech disabilities, photosensitivity and combinations of these. Following these guidelines will also often make your Web content more usable to users in general.

WCAG 2.0 success criteria are written as testable statements that are not technology-specific. Guidance about satisfying the success criteria in specific technologies, as well as general information about interpreting the success criteria, is provided in separate documents. See Web Content Accessibility Guidelines (WCAG) Overview for an introduction and links to WCAG technical and educational material.

WCAG 2.0 succeeds Web Content Accessibility Guidelines 1.0 [WCAG10], which was published as a W3C Recommendation May 1999. Although it is possible to conform either to WCAG 1.0 or to WCAG 2.0 (or both), the W3C recommends that new and updated content use WCAG 2.0. The W3C also recommends that Web accessibility policies reference WCAG 2.0.

Status of this Document

This section describes the status of this document at the time of its publication. Other documents may supersede this

document. A list of current W3C publications and the latest revision of this technical report can be found in the [W3C technical reports index](#) at [http://www.w3.org/TR/](#).

This is the Web Content Accessibility Guidelines (WCAG) 2.0 [W3C Recommendation](#) from the [Web Content Accessibility Guidelines Working Group](#).

This document has been reviewed by W3C Members, by software developers, and by other W3C groups and interested parties, and is endorsed by the Director as a W3C Recommendation. It is a stable document and may be used as reference material or cited from another document. W3C's role in making the Recommendation is to draw attention to the specification and to promote its widespread deployment. This enhances the functionality and interoperability of the Web.

WCAG 2.0 is supported by the associated non-normative documents, [Understanding WCAG 2.0](#) and [Techniques for WCAG 2.0](#). Although those documents do not have the formal status that WCAG 2.0 itself has, they provide information important to understanding and implementing WCAG.

The Working Group requests that any comments be made using the provided [online comment form](#). If this is not possible, comments can also be sent to [public-comments-wcag20@w3.org](#). The [archives for the public comments list](#) are publicly available. Comments received on the WCAG 2.0 Recommendation cannot result in changes to this version of the guidelines, but may be addressed in errata or future versions of WCAG. The Working Group does not plan to make formal responses to comments. Archives of the [WCAG WG mailing list discussions](#) are publicly available, and future work undertaken by the Working Group may address comments received on this document.

This document has been produced as part of the W3C [Web Accessibility Initiative](#) (WAI). The goals of the WCAG Working Group are discussed in the [WCAG Working Group charter](#). The WCAG Working Group is part of the [WAI Technical Activity](#).

This document was produced by a group operating under the [5 February 2004 W3C Patent Policy](#). W3C maintains a [public list of any patent disclosures](#) made in connection with the deliverables of the group; that page also includes instructions for disclosing a patent. An individual who has actual knowledge of a patent which the individual believes contains [Essential Claim(s)](#) must disclose the information in accordance with [section 6 of the W3C Patent Policy](#).

Table of Contents

Appendices

Introduction

This section is informative.

Web Content Accessibility Guidelines (WCAG) 2.0 defines how to make Web content more accessible to people with disabilities. Accessibility involves a wide range of disabilities, including visual, auditory, physical, speech, cognitive, language, learning, and neurological disabilities. Although these guidelines cover a wide range of issues, they are not able to address the needs of people with all types, degrees, and combinations of disability. These guidelines also make Web content more usable by older individuals with changing abilities due to aging and often improve usability for users in general.

WCAG 2.0 is developed through the W3C process in cooperation with individuals and organizations around the world, with a goal of providing a shared standard for Web content accessibility that meets the needs of individuals, organizations, and governments internationally. WCAG 2.0 builds on WCAG 1.0 [WCAG10] and is designed to apply broadly to different Web technologies now and in the future, and to be testable with a combination of automated testing and human evaluation. For an introduction to WCAG, see the Web Content Accessibility Guidelines (WCAG) Overview.

Web accessibility depends not only on accessible content but also on accessible Web browsers and other user agents. Authoring tools also have an important role in Web accessibility. For an overview of how these components of Web development and interaction work together, see:

- **Essential Components of Web Accessibility**
- **User Agent Accessibility Guidelines (UAAG) Overview**
- **Authoring Tool Accessibility Guidelines (ATAG) Overview**

WCAG 2.0 Layers of Guidance

The individuals and organizations that use WCAG vary widely and include Web designers and developers, policy makers, purchasing agents, teachers, and students. In order to meet the varying needs of this audience, several layers of guidance are provided including overall *principles*, general *guidelines*, testable *success criteria* and a rich collection of *sufficient techniques, advisory techniques*, and *documented common failures* with examples, resource links and code.

- **Principles** - At the top are four principles that provide the foundation for Web accessibility: *perceivable, operable, understandable, and robust*. See also Understanding the Four Principles of Accessibility.
- **Guidelines** - Under the principles are guidelines. The 12 guidelines provide the basic goals that authors should work toward in order to make content more accessible to users with different disabilities. The guidelines are not testable, but provide the framework and overall objectives to help authors understand the success criteria and better implement the techniques.
- **Success Criteria** - For each guideline, testable success criteria are provided to allow WCAG 2.0 to be used where requirements and conformance testing are necessary such as in design specification, purchasing, regulation, and contractual agreements. In order to meet the needs of different groups and different situations, three levels of conformance are defined: A (lowest), AA, and AAA (highest). Additional information on WCAG levels can be found in Understanding Levels of Conformance.
- **Sufficient and Advisory Techniques** - For each of the *guidelines* and *success criteria* in the WCAG 2.0 document itself, the working group has also documented a wide variety of *techniques.* The techniques are informative and fall into two categories: those that are *sufficient* for meeting the success criteria and those that are *advisory*. The advisory techniques go beyond what is required by the individual success criteria and allow authors to better address the guidelines. Some advisory techniques address accessibility barriers that are not covered by the testable success criteria. Where common failures are known, these are also documented. See also Sufficient and Advisory

Techniques in Understanding WCAG 2.0.

All of these layers of guidance (principles, guidelines, success criteria, and sufficient and advisory techniques) work together to provide guidance on how to make content more accessible. Authors are encouraged to view and apply all layers that they are able to, including the advisory techniques, in order to best address the needs of the widest possible range of users.

Note that even content that conforms at the highest level (AAA) will not be accessible to individuals with all types, degrees, or combinations of disability, particularly in the cognitive language and learning areas. Authors are encouraged to consider the full range of techniques, including the advisory techniques, as well as to seek relevant advice about current best practice to ensure that Web content is accessible, as far as possible, to this community. Metadata may assist users in finding content most suitable for their needs.

WCAG 2.0 Supporting Documents

The WCAG 2.0 document is designed to meet the needs of those who need a stable, referenceable technical standard. Other documents, called supporting documents, are based on the WCAG 2.0 document and address other important purposes, including the ability to be updated to describe how WCAG would be applied with new technologies. Supporting documents include:

1. **How to Meet WCAG 2.0** - A customizable quick reference to WCAG 2.0 that includes all of the guidelines, success criteria, and techniques for authors to use as they are developing and evaluating Web content.
2. **Understanding WCAG 2.0** - A guide to understanding and implementing WCAG 2.0. There is a short "Understanding" document for each guideline and success criterion in WCAG 2.0 as well as key topics.
3. **Techniques for WCAG 2.0** - A collection of techniques and common failures, each in a separate document that includes a description, examples, code and tests.
4. **The WCAG 2.0 Documents** - A diagram and description of how the technical documents are related and linked.

See Web Content Accessibility Guidelines (WCAG) Overview for a description of the WCAG 2.0 supporting material, including education resources related to WCAG 2.0. Additional resources covering topics such as the business case for Web accessibility, planning implementation to improve the accessibility of Web sites, and accessibility policies are listed in WAI Resources.

Important Terms in WCAG 2.0

WCAG 2.0 includes three important terms that are different from WCAG 1.0. Each of these is introduced briefly below and defined more fully in the glossary.

Web Page
It is important to note that, in this standard, the term "Web page" includes much more than static HTML pages. It also includes the increasingly dynamic Web pages that are emerging on the Web, including "pages" that can present entire virtual interactive communities. For example, the term "Web page" includes an immersive, interactive movie-like experience found at a single URI. For more information, see Understanding "Web Page".

Programmatically Determined
Several success criteria require that content (or certain aspects of content) can be "programmatically determined." This means that the content is delivered in such a way that user agents, including assistive technologies, can extract and present this information to users in different modalities. For more information, see Understanding Programmatically Determined.

Accessibility Supported
Using a technology in a way that is accessibility supported means that it works with assistive technologies (AT) and the accessibility features of operating systems, browsers, and other user agents. Technology features can only be relied upon to conform to WCAG 2.0 success criteria if they are used in a way that is "accessibility supported". Technology features can be used in ways that are not accessibility supported (do not work with assistive technologies, etc.) as long as they are not relied upon to conform to any success criterion (i.e., the same information or functionality is also available another way that is supported).
The definition of "accessibility supported" is provided in the Appendix A: Glossary section of these guidelines. For more information, see Understanding Accessibility Support.

WCAG 2.0 Guidelines

This section is normative.

Principle 1: Perceivable - Information and user interface components must be presentable to users in ways they can perceive.

Guideline 1.1 Text Alternatives: Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.

1.1.1 Non-text Content: All non-text content that is presented to the user has a text alternative that serves the equivalent purpose, except for the situations listed below. (Level A)

- **Controls, Input:** If non-text content is a control or accepts user input, then it has a name that describes its purpose. (Refer to Guideline 4.1 for additional requirements for controls and content that accepts user input.)
- **Time-Based Media:** If non-text content is time-based media, then text alternatives at least provide descriptive identification of the non-text content. (Refer to Guideline 1.2 for additional requirements for media.)
- **Test:** If non-text content is a test or exercise that would be invalid if presented in text, then text alternatives at least provide descriptive identification of the non-text content.
- **Sensory:** If non-text content is primarily intended to create a specific sensory experience, then text alternatives at least provide descriptive identification of the non-text content.
- **CAPTCHA:** If the purpose of non-text content is to confirm that content is being accessed by a person rather than a computer, then text alternatives that identify and describe the purpose of the non-text content are provided, and alternative forms of CAPTCHA using output modes for different types of sensory perception are provided to accommodate different disabilities.
- **Decoration, Formatting, Invisible:** If non-text content is pure decoration, is used only for visual formatting, or is not presented to users, then it is implemented in a way that it can be ignored by assistive technology.

Guideline 1.2 Time-based Media: Provide alternatives for time-based media.

1.2.1 Audio-only and Video-only (Prerecorded): For prerecorded audio-only and prerecorded video-only media, the following are true, except when the audio or video is a media alternative for text and is clearly labeled as such: (Level A)

- **Prerecorded Audio-only:** An alternative for time-based media is provided that presents equivalent information for prerecorded audio-only content.
- **Prerecorded Video-only:** Either an alternative for time-based media or an audio track is provided that presents equivalent information for prerecorded video-only content.

1.2.2 Captions (Prerecorded): Captions are provided for all prerecorded audio content in synchronized media, except when the media is a media alternative for text and is clearly labeled as such. (Level A)

1.2.3 Audio Description or Media Alternative (Prerecorded): An alternative for time-based media or audio description of the prerecorded video content is provided for synchronized media, except when the media is a media alternative for text and is clearly labeled as such. (Level A)

1.2.4 Captions (Live): Captions are provided for all live audio content in synchronized media. (Level AA)

1.2.5 Audio Description (Prerecorded): Audio description is provided for all prerecorded video content in synchronized media. (Level AA)

1.2.6 Sign Language (Prerecorded): Sign language interpretation is provided for all prerecorded audio content in synchronized media. (Level AAA)

1.2.7 Extended Audio Description (Prerecorded): Where pauses in foreground audio are insufficient to allow audio descriptions to convey the sense of the video, extended audio description is provided for all prerecorded video content in synchronized media. (Level AAA)

1.2.8 Media Alternative (Prerecorded): An alternative for time-based media is provided for all prerecorded synchronized media and for all prerecorded video-only media. (Level AAA)

1.2.9 Audio-only (Live): An alternative for time-based media that presents equivalent information for live audio-only content is provided. (Level AAA)

Guideline 1.3 Adaptable: Create content that can be presented in different ways (for example simpler layout) without losing information or structure.

1.3.1 Info and Relationships: Information, structure, and relationships conveyed through presentation can be programmatically determined or are available in text. (Level A)

1.3.2 Meaningful Sequence: When the sequence in which content is presented affects its meaning, a correct reading sequence can be programmatically determined. (Level A)

1.3.3 Sensory Characteristics: Instructions provided for understanding and operating content do not rely solely on sensory characteristics of components such as shape, size, visual location, orientation, or sound. (Level A)

Note: For requirements related to color, refer to Guideline 1.4.

Guideline 1.4 Distinguishable: Make it easier for users to see and hear content including separating foreground from background.

1.4.1 Use of Color: Color is not used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element. (Level A)

Note: This success criterion addresses color perception specifically. Other forms of perception are covered in Guideline 1.3 including programmatic access to color and other visual presentation coding.

1.4.2 Audio Control: If any audio on a Web page plays automatically for more than 3 seconds, either a mechanism is available to pause or stop the audio, or a mechanism is available to control audio volume independently from the overall system volume level. (Level A)

Note: Since any content that does not meet this success criterion can interfere with a user's ability to use the whole page, all content on the Web page (whether or not it is used to meet other success criteria) must meet this success criterion. See Conformance Requirement 5: Non-Interference.

1.4.3 Contrast (Minimum): The visual presentation of text and images of text has a contrast ratio of at least 4.5:1, except for the following: (Level AA)

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

1.4.4 Resize text: Except for captions and images of text, text can be resized without assistive technology up to 200 percent without loss of content or functionality. (Level AA)

1.4.5 Images of Text: If the technologies being used can achieve the visual presentation, text is used to convey information rather than images of text except for the following: (Level AA)

- **Customizable:** The image of text can be visually customized to the user's requirements;
- **Essential:** A particular presentation of text is essential to the information being conveyed.

Note: Logotypes (text that is part of a logo or brand name) are considered essential.

1.4.6 Contrast (Enhanced): The visual presentation of text and images of text has a contrast ratio of at least 7:1, except for the following: (Level AAA)

- **Large Text:** Large-scale text and images of large-scale text have a contrast ratio of at least 4.5:1;
- **Incidental:** Text or images of text that are part of an inactive user interface component, that are pure decoration, that are not visible to anyone, or that are part of a picture that contains significant other visual content, have no contrast requirement.
- **Logotypes:** Text that is part of a logo or brand name has no minimum contrast requirement.

1.4.7 Low or No Background Audio: For prerecorded audio-only content that (1) contains primarily speech in the foreground, (2) is not an audio CAPTCHA or audio logo, and (3) is not vocalization intended to be primarily musical expression such as singing or rapping, at least one of the following is true: (Level AAA)

- **No Background:** The audio does not contain background sounds.
- **Turn Off:** The background sounds can be turned off.
- **20 dB:** The background sounds are at least 20 decibels lower than the foreground speech content, with the exception of occasional sounds that last for only one or two seconds.
    Note: Per the definition of "decibel," background sound that meets this requirement will be approximately four times quieter than the foreground speech content.

1.4.8 Visual Presentation: For the visual presentation of blocks of text, a mechanism is available to achieve the following: (Level AAA)

1. Foreground and background colors can be selected by the user.
2. Width is no more than 80 characters or glyphs (40 if CJK).
3. Text is not justified (aligned to both the left and the right margins).
4. Line spacing (leading) is at least space-and-a-half within paragraphs, and paragraph spacing is at least 1.5 times larger than the line spacing.
5. Text can be resized without assistive technology up to 200 percent in a way that does not require the user to scroll horizontally to read a line of text on a full-screen window.

1.4.9 Images of Text (No Exception): Images of text are only used for pure decoration or where a particular presentation of text is essential to the information being conveyed. (Level AAA)

Note: Logotypes (text that is part of a logo or brand name) are considered essential.

Principle 2: Operable - User interface components and navigation must be operable.

Guideline 2.1 Keyboard Accessible: Make all functionality available from a keyboard.

2.1.1 Keyboard: All functionality of the content is operable through a keyboard interface without requiring specific timings for individual keystrokes, except where the underlying function requires input that depends on the path of the user's movement and not just the endpoints. (Level A)

Note 1: This exception relates to the underlying function, not the input technique. For example, if using handwriting to enter text, the input technique (handwriting) requires path-dependent input but the underlying function (text input) does not.

Note 2: This does not forbid and should not discourage providing mouse input or other input methods in addition to keyboard operation.

2.1.2 No Keyboard Trap: If keyboard focus can be moved to a component of the page using a keyboard interface, then focus can be moved away from that component using only a keyboard interface, and, if it requires more than unmodified arrow or tab keys or other standard exit methods, the user is advised of the method for moving focus away. (Level A)

Note: Since any content that does not meet this success criterion can interfere with a user's ability to use the whole page, all content on the Web page (whether it is used to meet other success criteria or not) must meet this success criterion. See Conformance Requirement 5: Non-Interference.

2.1.3 Keyboard (No Exception): All functionality of the content is operable through a keyboard interface without requiring specific timings for individual keystrokes. (Level AAA)

Guideline 2.2 Enough Time: Provide users enough time to read and use content.

2.2.1 Timing Adjustable: For each time limit that is set by the content, at least one of the following is true: (Level A)

- **Turn off:** The user is allowed to turn off the time limit before encountering it; or
- **Adjust:** The user is allowed to adjust the time limit before encountering it over a wide range that is at least ten times the length of the default setting; or
- **Extend:** The user is warned before time expires and given at least 20 seconds to extend the time limit with a simple action (for example, "press the space bar"), and the user is allowed to extend the time limit at least ten times; or
- **Real-time Exception:** The time limit is a required part of a real-time event (for example, an auction), and no alternative to the time limit is possible; or
- **Essential Exception:** The time limit is essential and extending it would invalidate the activity; or
- **20 Hour Exception:** The time limit is longer than 20 hours.

Note: This success criterion helps ensure that users can complete tasks without unexpected changes in content or context that are a result of a time limit. This success criterion should be considered in conjunction with Success Criterion 3.2.1, which puts limits on changes of content or context as a result of user action.

2.2.2 Pause, Stop, Hide: For moving, blinking, scrolling, or auto-updating information, all of the following are true: (Level A)

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

Note 1: For requirements related to flickering or flashing content, refer to Guideline 2.3.

Note 2: Since any content that does not meet this success criterion can interfere with a user's ability to use the whole page, all content on the Web page (whether it is used to meet other success criteria or not) must meet this success criterion. See Conformance Requirement 5: Non-Interference.

Note 3: Content that is updated periodically by software or that is streamed to the user agent is not required to preserve or present information that is generated or received between the initiation of the pause and resuming presentation, as this may not be technically possible, and in many situations could be misleading to do so.

Note 4: An animation that occurs as part of a preload phase or similar situation can be considered essential if interaction cannot occur during that phase for all users and if not indicating progress could confuse users or cause them to think that content was frozen or broken.

2.2.3 No Timing: Timing is not an essential part of the event or activity presented by the content, except for non-interactive synchronized media and real-time events. (Level AAA)

How to Meet 2.2.3
Understanding 2.2.3

2.2.4 Interruptions: Interruptions can be postponed or suppressed by the user, except interruptions involving an emergency. (Level AAA)

How to Meet 2.2.4
Understanding 2.2.4

2.2.5 Re-authenticating: When an authenticated session expires, the user can continue the activity without loss of data after re-authenticating. (Level AAA)

How to Meet 2.2.5
Understanding 2.2.5

Guideline 2.3 Seizures: Do not design content in a way that is known to cause seizures.

Understanding Guideline 2.3

2.3.1 Three Flashes or Below Threshold: Web pages do not contain anything that flashes more than three times in any one second period, or the flash is below the general flash and red flash thresholds. (Level A)

How to Meet 2.3.1
Understanding 2.3.1

Note: Since any content that does not meet this success criterion can interfere with a user's ability to use the whole page, all content on the Web page (whether it is used to meet other success criteria or not) must meet this success criterion. See Conformance Requirement 5: Non-Interference.

2.3.2 Three Flashes: Web pages do not contain anything that flashes more than three times in any one second period. (Level AAA)

How to Meet 2.3.2
Understanding 2.3.2

Guideline 2.4 Navigable: Provide ways to help users navigate, find content, and determine where they are.

Understanding Guideline 2.4

2.4.1 Bypass Blocks: A mechanism is available to bypass blocks of content that are repeated on multiple Web pages. (Level A)

How to Meet 2.4.1
Understanding 2.4.1

2.4.2 Page Titled: Web pages have titles that describe topic or purpose. (Level A)

How to Meet 2.4.2
Understanding 2.4.2

2.4.3 Focus Order: If a Web page can be navigated sequentially and the navigation sequences affect meaning or operation, focusable components receive focus in an order that preserves meaning and operability. (Level A)

How to Meet 2.4.3
Understanding 2.4.3

2.4.4 Link Purpose (In Context): The purpose of each link can be determined from the link text alone or from the link text together with its programmatically determined link context, except where the purpose of the link would be ambiguous to users in general. (Level A)

How to Meet 2.4.4
Understanding 2.4.4

2.4.5 Multiple Ways: More than one way is available to locate a Web page within a set of Web pages except where the Web Page is the result of, or a step in, a process. (Level AA)

How to Meet 2.4.5
Understanding 2.4.5

2.4.6 Headings and Labels: Headings and labels describe topic or purpose. (Level AA)

2.4.7 Focus Visible: Any keyboard operable user interface has a mode of operation where the keyboard focus indicator is visible. (Level AA)

2.4.8 Location: Information about the user's location within a set of Web pages is available. (Level AAA)

2.4.9 Link Purpose (Link Only): A mechanism is available to allow the purpose of each link to be identified from link text alone, except where the purpose of the link would be ambiguous to users in general. (Level AAA)

2.4.10 Section Headings: Section headings are used to organize the content. (Level AAA)

Note 1: "Heading" is used in its general sense and includes titles and other ways to add a heading to different types of content.

Note 2: This success criterion covers sections within writing, not user interface components. User Interface components are covered under Success Criterion 4.1.2.

Principle 3: Understandable - Information and the operation of user interface must be understandable.

Guideline 3.1 Readable: Make text content readable and understandable.

3.1.1 Language of Page: The default human language of each Web page can be programmatically determined. (Level A)

3.1.2 Language of Parts: The human language of each passage or phrase in the content can be programmatically determined except 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. (Level AA)

3.1.3 Unusual Words: A mechanism is available for identifying specific definitions of words or phrases used in an unusual or restricted way, including idioms and jargon. (Level AAA)

3.1.4 Abbreviations: A mechanism for identifying the expanded form or meaning of abbreviations is available. (Level AAA)

3.1.5 Reading Level: When text requires reading ability more advanced than the lower secondary education level after removal of proper names and titles, supplemental content, or a version that does not require reading ability more advanced than the lower secondary education level, is available. (Level AAA)

3.1.6 Pronunciation: A mechanism is available for identifying specific pronunciation of words where meaning of the words, in context, is ambiguous without knowing the pronunciation. (Level AAA)

Guideline 3.2 Predictable: Make Web pages appear and operate in predictable ways.

3.2.1 On Focus: When any component receives focus, it does not initiate a change of context. (Level A)

3.2.2 On Input: Changing the setting of any user interface component does not automatically cause a change of context unless the user has been advised of the behavior before using the component. (Level A)

3.2.3 Consistent Navigation: Navigational mechanisms that are repeated on multiple Web pages within a set of Web pages occur in the same relative order each time they are repeated, unless a change is initiated by the user. (Level AA)

3.2.4 Consistent Identification: Components that have the same functionality within a set of Web pages are identified consistently. (Level AA)

3.2.5 Change on Request: Changes of context are initiated only by user request or a mechanism is available to turn off such changes. (Level AAA)

Guideline 3.3 Input Assistance: Help users avoid and correct mistakes.

3.3.1 Error Identification: If an input error is automatically detected, the item that is in error is identified and the error is described to the user in text. (Level A)

3.3.2 Labels or Instructions: Labels or instructions are provided when content requires user input. (Level A)

3.3.3 Error Suggestion: If an input error is automatically detected and suggestions for correction are known, then the suggestions are provided to the user, unless it would jeopardize the security or purpose of the content. (Level AA)

3.3.4 Error Prevention (Legal, Financial, Data): For Web pages that cause legal commitments or financial transactions for the user to occur, that modify or delete user-controllable data in data storage systems, or that submit user test responses, at least one of the following is true: (Level AA)
1. **Reversible:** Submissions are reversible.
2. **Checked:** Data entered by the user is checked for input errors and the user is provided an opportunity to correct them.
3. **Confirmed:** A mechanism is available for reviewing, confirming, and correcting information before finalizing the submission.

3.3.5 Help: Context-sensitive help is available. (Level AAA)

3.3.6 Error Prevention (All): For Web pages that require the user to submit information, at least one of the following is true: (Level AAA)
1. **Reversible:** Submissions are reversible.

2. **Checked:** Data entered by the user is checked for input errors and the user is provided an opportunity to correct them.
3. **Confirmed:** A mechanism is available for reviewing, confirming, and correcting information before finalizing the submission.

Principle 4: Robust - Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

Guideline 4.1 Compatible: Maximize compatibility with current and future user agents, including assistive technologies.

Understanding Guideline 4.1

4.1.1 Parsing: In content implemented using markup languages, elements have complete start and end tags, elements are nested according to their specifications, elements do not contain duplicate attributes, and any IDs are unique, except where the specifications allow these features. (Level A)

How to Meet 4.1.1
Understanding 4.1.1

Note: Start and end tags that are missing a critical character in their formation, such as a closing angle bracket or a mismatched attribute value quotation mark are not complete.

4.1.2 Name, Role, Value: For all user interface components (including but not limited to: form elements, links and components generated by scripts), the name and role can be programmatically determined; states, properties, and values that can be set by the user can be programmatically set; and notification of changes to these items is available to user agents, including assistive technologies. (Level A)

How to Meet 4.1.2
Understanding 4.1.2

Note: This success criterion is primarily for Web authors who develop or script their own user interface components. For example, standard HTML controls already meet this success criterion when used according to specification.

Conformance

This section is normative.

This section lists requirements for conformance to WCAG 2.0. It also gives information about how to make conformance claims, which are optional. Finally, it describes what it means to be accessibility supported, since only accessibility-supported ways of using technologies can be relied upon for conformance. Understanding Conformance includes further explanation of the accessibility-supported concept.

Conformance Requirements

In order for a Web page to conform to WCAG 2.0, all of the following conformance requirements must be satisfied:

1. Conformance Level: One of the following levels of conformance is met in full.
- **Level A:** For Level A conformance (the minimum level of conformance), the Web page satisfies all the Level A Success Criteria, or a conforming alternate version is provided.
- **Level AA:** For Level AA conformance, the Web page satisfies all the Level A and Level AA Success Criteria, or a Level AA conforming alternate version is provided.
- **Level AAA:** For Level AAA conformance, the Web page satisfies all the Level A, Level AA and Level AAA Success Criteria, or a Level AAA conforming alternate version is provided.

Note 1: Although conformance can only be achieved at the stated levels, authors are encouraged to report (in their claim) any progress toward meeting success criteria from all levels beyond the achieved level of conformance.

Note 2: 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.

2. Full pages: Conformance (and conformance level) is for full Web page(s) only, and cannot be achieved if part of a Web page is excluded.

Note 1: For the purpose of determining conformance, alternatives to part of a page's content are considered part of the page when the alternatives can be obtained directly from the page, e.g., a long description or an alternative presentation of a video.

Note 2: Authors of Web pages that cannot conform due to content outside of the author's control may consider a Statement of Partial Conformance.

3. Complete processes: When a Web page is one of a series of Web pages presenting a process (i.e., a sequence of steps that need to be completed in order to accomplish an activity), all Web pages in the process conform at the specified level or better. (Conformance is not possible at a particular level if any page in the process does not conform at that level or better.)

Example: An online store has a series of pages that are used to select and purchase products. All pages in the series from start to finish (checkout) conform in order for any page that is part of the process to conform.

4. Only Accessibility-Supported Ways of Using Technologies: Only accessibility-supported ways of using technologies are relied upon to satisfy the success criteria. Any information or functionality that is provided in a way that is not accessibility supported is also available in a way that is accessibility supported. (See Understanding accessibility support.)

5. Non-Interference: If technologies are used in a way that is not accessibility supported, or if they are used in a non-conforming way, then they do not block the ability of users to access the rest of the page. In addition, the Web page as a whole continues to meet the conformance requirements under each of the following conditions:

1. when any technology that is not relied upon is turned on in a user agent,
2. when any technology that is not relied upon is turned off in a user agent, and
3. when any technology that is not relied upon is not supported by a user agent

In addition, the following success criteria apply to all content on the page, including content that is not otherwise relied upon to meet conformance, because failure to meet them could interfere with any use of the page:

*   **1.4.2 - Audio Control**,
*   **2.1.2 - No Keyboard Trap**,
*   **2.3.1 - Three Flashes or Below Threshold**, and
*   **2.2.2 - Pause, Stop, Hide**.

Note: If a page cannot conform (for example, a conformance test page or an example page), it cannot be included in the scope of conformance or in a conformance claim.

For more information, including examples, see Understanding Conformance Requirements.

Conformance Claims (Optional)

Conformance is defined only for Web pages. However, a conformance claim may be made to cover one page, a series of pages, or multiple related Web pages.

Required Components of a Conformance Claim

Conformance claims are **not required**. Authors can conform to WCAG 2.0 without making a claim. However, if a conformance claim is made, then the conformance claim **must** include the following information:

1. **Date** of the claim
2. **Guidelines title, version and URI** "Web Content Accessibility Guidelines 2.0 at http://www.w3.org/TR/2008/REC-WCAG20-20081211/"
3. **Conformance level** satisfied: (Level A, AA or AAA)
4. **A concise description of the Web pages**, such as a list of URIs for which the claim is made, including whether subdomains are included in the claim.

     Note 1: The Web pages may be described by list or by an expression that describes all of the URIs included in the claim.

     Note 2: Web-based products that do not have a URI prior to installation on the customer's Web site may have a statement that the product would conform when installed.

5. A list of the **Web content technologies relied upon**.

Note: If a conformance logo is used, it would constitute a claim and must be accompanied by the required components of a conformance claim listed above.

Optional Components of a Conformance Claim

In addition to the required components of a conformance claim above, consider providing additional information to assist users. Recommended additional information includes:

- A list of success criteria beyond the level of conformance claimed that have been met. This information should be provided in a form that users can use, preferably machine-readable metadata.
- A list of the specific technologies that are "*used but not relied upon*."
- A list of user agents, including assistive technologies that were used to test the content.
- Information about any additional steps taken that go beyond the success criteria to enhance accessibility.
- A machine-readable metadata version of the list of specific technologies that are relied upon.
- A machine-readable metadata version of the conformance claim.

Note 1: Refer to Understanding Conformance Claims for more information and example conformance claims.

Note 2: Refer to Understanding Metadata for more information about the use of metadata in conformance claims.

Statement of Partial Conformance - Third Party Content

Sometimes, Web pages are created that will later have additional content added to them. For example, an email program, a blog, an article that allows users to add comments, or applications supporting user-contributed content. Another example would be a page, such as a portal or news site, composed of content aggregated from multiple contributors, or sites that automatically insert content from other sources over time, such as when advertisements are inserted dynamically.

In these cases, it is not possible to know at the time of original posting what the uncontrolled content of the pages will be. It is important to note that the uncontrolled content can affect the accessibility of the controlled content as well. Two options are available:

1. A determination of conformance can be made based on best knowledge. If a page of this type is monitored and repaired (non-conforming content is removed or brought into conformance) within two business days, then a determination or claim of conformance can be made since, except for errors in externally contributed content which are corrected or removed when encountered, the page conforms. No conformance claim can be made if it is not possible to monitor or correct non-conforming content;
   OR
2. A "statement of partial conformance" may be made that the page does not conform, but could conform if certain parts were removed. The form of that statement would be, "This page does not conform, but would conform to WCAG 2.0 at level X if the following parts from uncontrolled sources were removed." In addition, the following would also be true of uncontrolled content that is described in the statement of partial conformance:
   a. It is not content that is under the author's control.
   b. It is described in a way that users can identify (e.g., they cannot be described as "all parts that we do not control" unless they are clearly marked as such.)

Statement of Partial Conformance - Language

A "statement of partial conformance due to language" may be made when the page does not conform, but would conform if accessibility support existed for (all of) the language(s) used on the page. The form of that statement would be, "This page does not conform, but would conform to WCAG 2.0 at level X if accessibility support existed for the following language(s):"

Appendix A: Glossary

This section is normative.

abbreviation
shortened form of a word, phrase, or name where the abbreviation has not become part of the language

Note 1: This includes initialisms and acronyms where:
1. **initialisms** are shortened forms of a name or phrase made from the initial letters of words or syllables contained in that name or phrase

Note 1: Not defined in all languages.

Example 1: SNCF is a French initialism that contains the initial letters of the Société Nationale des Chemins de Fer, the French national railroad.

Example 2: ESP is an initialism for extrasensory perception.

2. **acronyms** are abbreviated forms made from the initial letters or parts of other words (in a name or phrase) which may be pronounced as a word

Example: NOAA is an acronym made from the initial letters of the National Oceanic and Atmospheric Administration in the United States.

Note 2: Some companies have adopted what used to be an initialism as their company name. In these cases, the new name of the company is the letters (for example, Ecma) and the word is no longer considered an abbreviation.

accessibility supported

supported by users' assistive technologies as well as the accessibility features in browsers and other user agents
To qualify as an accessibility-supported use of a Web content technology (or feature of a technology), both 1 and 2 must be satisfied for a Web content technology (or feature):

1. **The way that the Web content technology is used must be supported by users' assistive technology (AT).** This means that the way that the technology is used has been tested for interoperability with users' assistive technology in the human language(s) of the content,
   AND

2. **The Web content technology must have accessibility-supported user agents that are available to users.** This means that at least one of the following four statements is true:
   a. The technology is supported natively in widely-distributed user agents that are also accessibility supported (such as HTML and CSS);
      OR
   b. The technology is supported in a widely-distributed plug-in that is also accessibility supported;
      OR
   c. The content is available in a closed environment, such as a university or corporate network, where the user agent required by the technology and used by the organization is also accessibility supported;
      OR
   d. The user agent(s) that support the technology are accessibility supported and are available for download or purchase in a way that:
      - does not cost a person with a disability any more than a person without a disability **and**
      - is as easy to find and obtain for a person with a disability as it is for a person without disabilities.

Note 1: The WCAG Working group and the W3C do not specify which or how much support by assistive technologies there must be for a particular use of a Web technology in order for it to be classified as accessibility supported. (See Level of Assistive Technology Support Needed for "Accessibility Support".)

Note 2: Web technologies can be used in ways that are not accessibility supported as long as they are not relied upon and the page as a whole meets the conformance requirements, including Conformance Requirement 4: Only Accessibility-Supported Ways of Using Technologies and Conformance Requirement 5: Non-Interference, are met.

Note 3: When a Web Technology is used in a way that is "accessibility supported," it does not imply that the entire technology or all uses of the technology are supported. Most technologies, including HTML, lack support for at least one feature or use. Pages conform to WCAG only if the uses of the technology that are accessibility supported can be relied upon to meet WCAG requirements.

Note 4: When citing Web content technologies that have multiple versions, the version(s) supported should be specified.

Note 5: One way for authors to locate uses of a technology that are accessibility supported would be to consult compilations of uses that are documented to be accessibility supported. (See Understanding Accessibility-Supported Web Technology Uses.) Authors, companies, technology vendors, or others may document accessibility-supported ways of using Web content technologies. However, all ways of using technologies in the documentation would need to meet the definition of accessibility-supported Web content technologies above.

alternative for time-based media

document including correctly sequenced text descriptions of time-based visual and auditory information and providing a means for achieving the outcomes of any time-based interaction

Note: A screenplay used to create the synchronized media content would meet this definition only if it was corrected

to accurately represent the final synchronized media after editing.

ambiguous to users in general

the purpose cannot be determined from the link and all information of the Web page presented to the user simultaneously with the link (i.e., readers without disabilities would not know what a link would do until they activated it)

Example: The word guava in the following sentence "One of the notable exports is guava" is a link. The link could lead to a definition of guava, a chart listing the quantity of guava exported or a photograph of people harvesting guava. Until the link is activated, all readers are unsure and the person with a disability is not at any disadvantage.

ASCII art

picture created by a spatial arrangement of characters or glyphs (typically from the 95 printable characters defined by ASCII).

assistive technology (as used in this document)

hardware and/or software that acts as a user agent, or along with a mainstream user agent, to provide functionality to meet the requirements of users with disabilities that go beyond those offered by mainstream user agents

Note 1: functionality provided by assistive technology includes alternative presentations (e.g., as synthesized speech or magnified content), alternative input methods (e.g., voice), additional navigation or orientation mechanisms, and content transformations (e.g., to make tables more accessible).

Note 2: Assistive technologies often communicate data and messages with mainstream user agents by using and monitoring APIs.

Note 3: The distinction between mainstream user agents and assistive technologies is not absolute. Many mainstream user agents provide some features to assist individuals with disabilities. The basic difference is that mainstream user agents target broad and diverse audiences that usually include people with and without disabilities. Assistive technologies target narrowly defined populations of users with specific disabilities. The assistance provided by an assistive technology is more specific and appropriate to the needs of its target users. The mainstream user agent may provide important functionality to assistive technologies like retrieving Web content from program objects or parsing markup into identifiable bundles.

Example: Assistive technologies that are important in the context of this document include the following:
- screen magnifiers, and other visual reading assistants, which are used by people with visual, perceptual and physical print disabilities to change text font, size, spacing, color, synchronization with speech, etc. in order to improve the visual readability of rendered text and images;
- screen readers, which are used by people who are blind to read textual information through synthesized speech or braille;
- text-to-speech software, which is used by some people with cognitive, language, and learning disabilities to convert text into synthetic speech;
- speech recognition software, which may be used by people who have some physical disabilities;
- alternative keyboards, which are used by people with certain physical disabilities to simulate the keyboard (including alternate keyboards that use head pointers, single switches, sip/puff and other special input devices.);
- alternative pointing devices, which are used by people with certain physical disabilities to simulate mouse pointing and button activations.

audio

the technology of sound reproduction

Note: Audio can be created synthetically (including speech synthesis), recorded from real world sounds, or both.

audio description

narration added to the soundtrack to describe important visual details that cannot be understood from the main soundtrack alone

Note 1: Audio description of video provides information about actions, characters, scene changes, on-screen text, and other visual content.

Note 2: In standard audio description, narration is added during existing pauses in dialogue. (See also extended audio description.)

Note 3: Where all of the video information is already provided in existing audio, no additional audio description is necessary.

Note 4: Also called "video description" and "descriptive narration."

audio-only

a time-based presentation that contains only audio (no video and no interaction)

blinking

switch back and forth between two visual states in a way that is meant to draw attention

Note: See also flash. It is possible for something to be large enough and blink brightly enough at the right frequency to be also classified as a flash.

blocks of text

more than one sentence of text

CAPTCHA

initialism for "Completely Automated Public Turing test to tell Computers and Humans Apart"

Note 1: CAPTCHA tests often involve asking the user to type in text that is displayed in an obscured image or audio file.

Note 2: A Turing test is any system of tests designed to differentiate a human from a computer. It is named after famed computer scientist Alan Turing. The term was coined by researchers at Carnegie Mellon University. [CAPTCHA]

captions

synchronized visual and/or text alternative for both speech and non-speech audio information needed to understand the media content

Note 1: Captions are similar to dialogue-only subtitles except captions convey not only the content of spoken dialogue, but also equivalents for non-dialogue audio information needed to understand the program content, including sound effects, music, laughter, speaker identification and location.

Note 2: Closed Captions are equivalents that can be turned on and off with some players.

Note 3: Open Captions are any captions that cannot be turned off. For example, if the captions are visual equivalent images of text embedded in video.

Note 4: Captions should not obscure or obstruct relevant information in the video.

Note 5: In some countries, captions are called subtitles.

Note 6: Audio descriptions can be, but do not need to be, captioned since they are descriptions of information that is already presented visually.

changes of context

major changes in the content of the Web page that, if made without user awareness, can disorient users who are not able to view the entire page simultaneously
Changes in context include changes of:

1. user agent;
2. viewport;
3. focus;
4. content that changes the meaning of the Web page.

Note: A change of content is not always a change of context. Changes in content, such as an expanding outline, dynamic menu, or a tab control do not necessarily change the context, unless they also change one of the above (e.g., focus).

Example: Opening a new window, moving focus to a different component, going to a new page (including anything that would look to a user as if they had moved to a new page) or significantly re-arranging the content of a page are examples of changes of context.

conformance

satisfying all the requirements of a given standard, guideline or specification

conforming alternate version

version that

1. conforms at the designated level, and
2. provides all of the same information and functionality in the same human language, and
3. is as up to date as the non-conforming content, and

4. for which at least one of the following is true:

a. the conforming version can be reached from the non-conforming page via an accessibility-supported mechanism, or

b. the non-conforming version can only be reached from the conforming version, or

c. the non-conforming version can only be reached from a conforming page that also provides a mechanism to reach the conforming version

Note 1: In this definition, "can only be reached" means that there is some mechanism, such as a conditional redirect, that prevents a user from "reaching" (loading) the non-conforming page unless the user had just come from the conforming version.

Note 2: The alternate version does not need to be matched page for page with the original (e.g., the conforming alternate version may consist of multiple pages).

Note 3: If multiple language versions are available, then conforming alternate versions are required for each language offered.

Note 4: Alternate versions may be provided to accommodate different technology environments or user groups. Each version should be as conformant as possible. One version would need to be fully conformant in order to meet conformance requirement 1.

Note 5: The conforming alternative version does not need to reside within the scope of conformance, or even on the same Web site, as long as it is as freely available as the non-conforming version.

Note 6: Alternate versions should not be confused with supplementary content, which support the original page and enhance comprehension.

Note 7: Setting user preferences within the content to produce a conforming version is an acceptable mechanism for reaching another version as long as the method used to set the preferences is accessibility supported.

See Understanding Conforming Alternate Versions

content (Web content)

information and sensory experience to be communicated to the user by means of a user agent, including code or markup that defines the content's structure, presentation, and interactions

context-sensitive help

help text that provides information related to the function currently being performed

Note: Clear labels can act as context-sensitive help.

contrast ratio

(L1 + 0.05) / (L2 + 0.05), where

- L1 is the relative luminance of the lighter of the colors, and
- L2 is the relative luminance of the darker of the colors.

Note 1: Contrast ratios can range from 1 to 21 (commonly written 1:1 to 21:1).

Note 2: Because authors do not have control over user settings as to how text is rendered (for example font smoothing or anti-aliasing), the contrast ratio for text can be evaluated with anti-aliasing turned off.

Note 3: For the purpose of Success Criteria 1.4.3 and 1.4.6, contrast is measured with respect to the specified background over which the text is rendered in normal usage. If no background color is specified, then white is assumed.

Note 4: Background color is the specified color of content over which the text is to be rendered in normal usage. It is a failure if no background color is specified when the text color is specified, because the user's default background color is unknown and cannot be evaluated for sufficient contrast. For the same reason, it is a failure if no text color is specified when a background color is specified.

Note 5: When there is a border around the letter, the border can add contrast and would be used in calculating the contrast between the letter and its background. A narrow border around the letter would be used as the letter. A wide border around the letter that fills in the inner details of the letters acts as a halo and would be considered background.

Note 6: WCAG conformance should be evaluated for color pairs specified in the content that an author would expect to appear adjacent in typical presentation. Authors need not consider unusual presentations, such as color changes made by the user agent, except where caused by authors' code.

correct reading sequence

any sequence where words and paragraphs are presented in an order that does not change the meaning of the

content

emergency

a sudden, unexpected situation or occurrence that requires immediate action to preserve health, safety, or property

essential

if removed, would fundamentally change the information or functionality of the content, **and** information and functionality cannot be achieved in another way that would conform

extended audio description

audio description that is added to an audiovisual presentation by pausing the video so that there is time to add additional description

Note: This technique is only used when the sense of the video would be lost without the additional audio description and the pauses between dialogue/narration are too short.

flash

a pair of opposing changes in relative luminance that can cause seizures in some people if it is large enough and in the right frequency range

Note 1: See general flash and red flash thresholds for information about types of flash that are not allowed.

Note 2: See also blinking.

functionality

processes and outcomes achievable through user action

general flash and red flash thresholds

a flash or rapidly changing image sequence is below the threshold (i.e., content **passes**) if any of the following are true:

1. there are no more than three **general flashes** and / or no more than three **red flashes** within any one-second period; or
2. the combined area of flashes occurring concurrently occupies no more than a total of .006 steradians within any 10 degree visual field on the screen (25% of any 10 degree visual field on the screen) at typical viewing distance

where:

- A **general flash** is defined as a pair of opposing changes in relative luminance of 10% or more of the maximum relative luminance where the relative luminance of the darker image is below 0.80; and where "a pair of opposing changes" is an increase followed by a decrease, or a decrease followed by an increase, and
- A **red flash** is defined as any pair of opposing transitions involving a saturated red.

Exception: Flashing that is a fine, balanced, pattern such as white noise or an alternating checkerboard pattern with "squares" smaller than 0.1 degree (of visual field at typical viewing distance) on a side does not violate the thresholds.

Note 1: For general software or Web content, using a 341 x 256 pixel rectangle anywhere on the displayed screen area when the content is viewed at 1024 x 768 pixels will provide a good estimate of a 10 degree visual field for standard screen sizes and viewing distances (e.g., 15-17 inch screen at 22-26 inches). (Higher resolutions displays showing the same rendering of the content yield smaller and safer images so it is lower resolutions that are used to define the thresholds.)

Note 2: A transition is the change in relative luminance (or relative luminance/color for red flashing) between adjacent peaks and valleys in a plot of relative luminance (or relative luminance/color for red flashing) measurement against time. A flash consists of two opposing transitions.

Note 3: The current working definition in the field for **"pair of opposing transitions involving a saturated red"** is where, for either or both states involved in each transition, R/(R+ G + B) >= 0.8, and the change in the value of (R-G-B)x320 is > 20 (negative values of (R-G-B)x320 are set to zero) for both transitions. R, G, B values range from 0-1 as specified in "relative luminance" definition. [HARDING-BINNIE]

Note 4: Tools are available that will carry out analysis from video screen capture. However, no tool is necessary to evaluate for this condition if flashing is less than or equal to 3 flashes in any one second. Content automatically passes (see #1 and #2 above).

human language

language that is spoken, written or signed (through visual or tactile means) to communicate with humans

Note: See also sign language.

idiom

phrase whose meaning cannot be deduced from the meaning of the individual words and the specific words cannot be changed without losing the meaning

Note: idioms cannot be translated directly, word for word, without losing their (cultural or language-dependent) meaning.

Example 1: In English, "spilling the beans" means "revealing a secret." However, "knocking over the beans" or "spilling the vegetables" does not mean the same thing.

Example 2: In Japanese, the phrase "さじを投げる" literally translates into "he throws a spoon," but it means that there is nothing he can do and finally he gives up.

Example 3: In Dutch, "Hij ging met de kippen op stok" literally translates into "He went to roost with the chickens," but it means that he went to bed early.

image of text

text that has been rendered in a non-text form (e.g., an image) in order to achieve a particular visual effect

Note: This does not include text that is part of a picture that contains significant other visual content.

Example: A person's name on a nametag in a photograph.

informative

for information purposes and not required for conformance

Note: Content required for conformance is referred to as "normative."

input error

information provided by the user that is not accepted

Note: This includes:

1. Information that is required by the Web page but omitted by the user

2. Information that is provided by the user but that falls outside the required data format or values

jargon

words used in a particular way by people in a particular field

Example: The word StickyKeys is jargon from the field of assistive technology/accessibility.

keyboard interface

interface used by software to obtain keystroke input

Note 1: A keyboard interface allows users to provide keystroke input to programs even if the native technology does not contain a keyboard.

Example: A touchscreen PDA has a keyboard interface built into its operating system as well as a connector for external keyboards. Applications on the PDA can use the interface to obtain keyboard input either from an external keyboard or from other applications that provide simulated keyboard output, such as handwriting interpreters or speech-to-text applications with "keyboard emulation" functionality.

Note 2: Operation of the application (or parts of the application) through a keyboard-operated mouse emulator, such as MouseKeys, does not qualify as operation through a keyboard interface because operation of the program is through its pointing device interface, not through its keyboard interface.

label

text or other component with a text alternative that is presented to a user to identify a component within Web content

Note 1: A label is presented to all users whereas the name may be hidden and only exposed by assistive technology. In many (but not all) cases the name and the label are the same.

Note 2: The term label is not limited to the label element in HTML.

large scale (text)

with at least 18 point or 14 point bold or font size that would yield equivalent size for Chinese, Japanese and Korean (CJK) fonts

Note 1: Fonts with extraordinarily thin strokes or unusual features and characteristics that reduce the familiarity of their letter forms are harder to read, especially at lower contrast levels.

Note 2: Font size is the size when the content is delivered. It does not include resizing that may be done by a user.

Note 3: The actual size of the character that a user sees is dependent both on the author-defined size and the user's display or user-agent settings. For many mainstream body text fonts, 14 and 18 point is roughly equivalent to 1.2 and

1.5 em or to 120% or 150% of the default size for body text (assuming that the body font is 100%), but authors would need to check this for the particular fonts in use. When fonts are defined in relative units, the actual point size is calculated by the user agent for display. The point size should be obtained from the user agent, or calculated based on font metrics as the user agent does, when evaluating this success criterion. Users who have low vision would be responsible for choosing appropriate settings.

Note 4: When using text without specifying the font size, the smallest font size used on major browsers for unspecified text would be a reasonable size to assume for the font. If a level 1 heading is rendered in 14pt bold or higher on major browsers, then it would be reasonable to assume it is large text. Relative scaling can be calculated from the default sizes in a similar fashion.

Note 5: The 18 and 14 point sizes for roman texts are taken from the minimum size for large print (14pt) and the larger standard font size (18pt). For other fonts such as CJK languages, the "equivalent" sizes would be the minimum large print size used for those languages and the next larger standard large print size.

legal commitments

transactions where the person incurs a legally binding obligation or benefit

Example: A marriage license, a stock trade (financial and legal), a will, a loan, adoption, signing up for the army, a contract of any type, etc.

link purpose

nature of the result obtained by activating a hyperlink

live

information captured from a real-world event and transmitted to the receiver with no more than a broadcast delay

Note 1: A broadcast delay is a short (usually automated) delay, for example used in order to give the broadcaster time to queue or censor the audio (or video) feed, but not sufficient to allow significant editing.

Note 2: If information is completely computer generated, it is not live.

lower secondary education level

the two or three year period of education that begins after completion of six years of school and ends nine years after the beginning of primary education

Note: This definition is based on the International Standard Classification of Education [UNESCO].

mechanism

process or technique for achieving a result

Note 1: The mechanism may be explicitly provided in the content, or may be relied upon to be provided by either the platform or by user agents, including assistive technologies.

Note 2: The mechanism needs to meet all success criteria for the conformance level claimed.

media alternative for text

media that presents no more information than is already presented in text (directly or via text alternatives)

Note: A media alternative for text is provided for those who benefit from alternate representations of text. Media alternatives for text may be audio-only, video-only (including sign-language video), or audio-video.

name

text by which software can identify a component within Web content to the user

Note 1: The name may be hidden and only exposed by assistive technology, whereas a label is presented to all users. In many (but not all) cases, the label and the name are the same.

Note 2: This is unrelated to the name attribute in HTML.

navigated sequentially

navigated in the order defined for advancing focus (from one element to the next) using a keyboard interface

non-text content

any content that is not a sequence of characters that can be programmatically determined or where the sequence is not expressing something in human language

Note: This includes ASCII Art (which is a pattern of characters), emoticons, leetspeak (which uses character substitution), and images representing text

normative

required for conformance

Note 1: One may conform in a variety of well-defined ways to this document.

Note 2: Content identified as "informative" or "non-normative" is never required for conformance.

on a full-screen window

on the most common sized desktop/laptop display with the viewport maximized

Note: Since people generally keep their computers for several years, it is best not to rely on the latest desktop/laptop display resolutions but to consider the common desktop/laptop display resolutions over the course of several years when making this evaluation.

paused

stopped by user request and not resumed until requested by user

prerecorded

information that is not live

presentation

rendering of the content in a form to be perceived by users

primary education level

six year time period that begins between the ages of five and seven, possibly without any previous education

Note: This definition is based on the International Standard Classification of Education [UNESCO].

process

series of user actions where each action is required in order to complete an activity

Example 1: Successful use of a series of Web pages on a shopping site requires users to view alternative products, prices and offers, select products, submit an order, provide shipping information and provide payment information.

Example 2: An account registration page requires successful completion of a Turing test before the registration form can be accessed.

programmatically determined (programmatically determinable)

determined by software from author-supplied data provided in a way that different user agents, including assistive technologies, can extract and present this information to users in different modalities

Example 1: Determined in a markup language from elements and attributes that are accessed directly by commonly available assistive technology.

Example 2: Determined from technology-specific data structures in a non-markup language and exposed to assistive technology via an accessibility API that is supported by commonly available assistive technology.

programmatically determined link context

additional information that can be programmatically determined from relationships with a link, combined with the link text, and presented to users in different modalities

Example: In HTML, information that is programmatically determinable from a link in English includes text that is in the same paragraph, list, or table cell as the link or in a table header cell that is associated with the table cell that contains the link.

Note: Since screen readers interpret punctuation, they can also provide the context from the current sentence, when the focus is on a link in that sentence.

programmatically set

set by software using methods that are supported by user agents, including assistive technologies

pure decoration

serving only an aesthetic purpose, providing no information, and having no functionality

Note: Text is only purely decorative if the words can be rearranged or substituted without changing their purpose.

Example: The cover page of a dictionary has random words in very light text in the background.

real-time event

event that a) occurs at the same time as the viewing and b) is not completely generated by the content

Example 1: A Webcast of a live performance (occurs at the same time as the viewing and is not prerecorded).

Example 2: An on-line auction with people bidding (occurs at the same time as the viewing).

Example 3: Live humans interacting in a virtual world using avatars (is not completely generated by the content and occurs at the same time as the viewing).

relationships

meaningful associations between distinct pieces of content

relative luminance

the relative brightness of any point in a colorspace, normalized to 0 for darkest black and 1 for lightest white

Note 1: For the sRGB colorspace, the relative luminance of a color is defined as L = 0.2126 * **R** + 0.7152 * **G** + 0.0722 * **B** where **R**, **G** and **B** are defined as:

- if R_{sRGB} <= 0.03928 then **R** = R_{sRGB}/12.92 else **R** = ((R_{sRGB}+0.055)/1.055) ^ 2.4

- if G_{sRGB} <= 0.03928 then **G** = G_{sRGB}/12.92 else **G** = ((G_{sRGB}+0.055)/1.055) ^ 2.4

- if B_{sRGB} <= 0.03928 then **B** = B_{sRGB}/12.92 else **B** = ((B_{sRGB}+0.055)/1.055) ^ 2.4

and R_{sRGB}, G_{sRGB}, and B_{sRGB} are defined as:

- $R_{sRGB} = R_{8bit}/255$

- $G_{sRGB} = G_{8bit}/255$

- $B_{sRGB} = B_{8bit}/255$

The "^" character is the exponentiation operator. (Formula taken from [sRGB] and [IEC-4WD]).

Note 2: Almost all systems used today to view Web content assume sRGB encoding. Unless it is known that another color space will be used to process and display the content, authors should evaluate using sRGB colorspace. If using other color spaces, see Understanding Success Criterion 1.4.3.

Note 3: If dithering occurs after delivery, then the source color value is used. For colors that are dithered at the source, the average values of the colors that are dithered should be used (average R, average G, and average B).

Note 4: Tools are available that automatically do the calculations when testing contrast and flash.

Note 5: A MathML version of the relative luminance definition is available.

relied upon (technologies that are)

the content would not conform if that technology is turned off or is not supported

role

text or number by which software can identify the function of a component within Web content

Example: A number that indicates whether an image functions as a hyperlink, command button, or check box.

same functionality

same result when used

Example: A submit "search" button on one Web page and a "find" button on another Web page may both have a field to enter a term and list topics in the Web site related to the term submitted. In this case, they would have the same functionality but would not be labeled consistently.

same relative order

same position relative to other items

Note: Items are considered to be in the same relative order even if other items are inserted or removed from the original order. For example, expanding navigation menus may insert an additional level of detail or a secondary navigation section may be inserted into the reading order.

satisfies a success criterion

the success criterion does not evaluate to 'false' when applied to the page

section

A self-contained portion of written content that deals with one or more related topics or thoughts

Note: A section may consist of one or more paragraphs and include graphics, tables, lists and sub-sections.

set of Web pages

collection of Web pages that share a common purpose and that are created by the same author, group or organization

Note: Different language versions would be considered different sets of Web pages.

sign language

a language using combinations of movements of the hands and arms, facial expressions, or body positions to convey meaning

sign language interpretation

translation of one language, generally a spoken language, into a sign language

Note: True sign languages are independent languages that are unrelated to the spoken language(s) of the same country or region.

specific sensory experience

a sensory experience that is not purely decorative and does not primarily convey important information or perform a function

Example: Examples include a performance of a flute solo, works of visual art etc.

structure

1. The way the parts of a Web page are organized in relation to each other; and

2. The way a collection of Web pages is organized

supplemental content

additional content that illustrates or clarifies the primary content

Example 1: An audio version of a Web page.

Example 2: An illustration of a complex process.

Example 3: A paragraph summarizing the major outcomes and recommendations made in a research study.

synchronized media

audio or video synchronized with another format for presenting information and/or with time-based interactive components, unless the media is a media alternative for text that is clearly labeled as such

technology (Web content)

mechanism for encoding instructions to be rendered, played or executed by user agents

Note 1: As used in these guidelines "Web Technology" and the word "technology" (when used alone) both refer to Web Content Technologies.

Note 2: Web content technologies may include markup languages, data formats, or programming languages that authors may use alone or in combination to create end-user experiences that range from static Web pages to synchronized media presentations to dynamic Web applications.

Example: Some common examples of Web content technologies include HTML, CSS, SVG, PNG, PDF, Flash, and JavaScript.

text

sequence of characters that can be programmatically determined, where the sequence is expressing something in human language

text alternative

Text that is programmatically associated with non-text content or referred to from text that is programmatically associated with non-text content. Programmatically associated text is text whose location can be programmatically determined from the non-text content.

Example: An image of a chart is described in text in the paragraph after the chart. The short text alternative for the chart indicates that a description follows.

Note: Refer to Understanding Text Alternatives for more information.

used in an unusual or restricted way

words used in such a way that requires users to know exactly which definition to apply in order to understand the content correctly

Example: The term "gig" means something different if it occurs in a discussion of music concerts than it does in article about computer hard drive space, but the appropriate definition can be determined from context. By contrast, the word "text" is used in a very specific way in WCAG 2.0, so a definition is supplied in the glossary.

user agent

any software that retrieves and presents Web content for users

Example: Web browsers, media players, plug-ins, and other programs — including assistive technologies — that help in retrieving, rendering, and interacting with Web content.

user-controllable

data that is intended to be accessed by users

Note: This does not refer to such things as Internet logs and search engine monitoring data.

Example: Name and address fields for a user's account.

user interface component

a part of the content that is perceived by users as a single control for a distinct function

Note 1: Multiple user interface components may be implemented as a single programmatic element. Components here is not tied to programming techniques, but rather to what the user perceives as separate controls.

Note 2: User interface components include form elements and links as well as components generated by scripts.

Example: An applet has a "control" that can be used to move through content by line or page or random access. Since each of these would need to have a name and be settable independently, they would each be a "user interface component."

video

the technology of moving or sequenced pictures or images

Note: Video can be made up of animated or photographic images, or both.

video-only

a time-based presentation that contains only video (no audio and no interaction)

viewport

object in which the user agent presents content

Note 1: The user agent presents content through one or more viewports. Viewports include windows, frames, loudspeakers, and virtual magnifying glasses. A viewport may contain another viewport (e.g., nested frames). Interface components created by the user agent such as prompts, menus, and alerts are not viewports.

Note 2: This definition is based on User Agent Accessibility Guidelines 1.0 Glossary.

visually customized

the font, size, color, and background can be set

Web page

a 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

Note 1: Although any "other resources" would be rendered together with the primary resource, they would not necessarily be rendered simultaneously with each other.

Note 2: For the purposes of conformance with these guidelines, a resource must be "non-embedded" within the scope of conformance to be considered a Web page.

Example 1: A Web resource including all embedded images and media.

Example 2: A Web mail program built using Asynchronous JavaScript and XML (AJAX). The program lives entirely at http://example.com/mail, but includes an inbox, a contacts area and a calendar. Links or buttons are provided that cause the inbox, contacts, or calendar to display, but do not change the URI of the page as a whole.

Example 3: A customizable portal site, where users can choose content to display from a set of different content modules.

Example 4: When you enter "http://shopping.example.com/" in your browser, you enter a movie-like interactive shopping environment where you visually move around in a store dragging products off of the shelves around you and into a visual shopping cart in front of you. Clicking on a product causes it to be demonstrated with a specification sheet floating alongside. This might be a single-page Web site or just one page within a Web site.

Appendix B: Acknowledgments

This section is informative.

Additional information about participation in the Web Content Accessibility Guidelines Working Group (WCAG WG) can be found on the Working Group home page.

Participants active in the WCAG WG at the time of publication

- Bruce Bailey (U.S. Access Board)
- Frederick Boland (NIST)
- Ben Caldwell (Trace R&D Center, University of Wisconsin)
- Sofia Celic (W3C Invited Expert)
- Michael Cooper (W3C)
- Roberto Ellero (International Webmasters Association / HTML Writers Guild)
- Bengt Farre (Rigab)
- Loretta Guarino Reid (Google)
- Katie Haritos-Shea
- Andrew Kirkpatrick (Adobe)
- Drew LaHart (IBM)
- Alex Li (SAP AG)
- David MacDonald (E-Ramp Inc.)
- Roberto Scano (International Webmasters Association / HTML Writers Guild)
- Cynthia Shelly (Microsoft)
- Andi Snow-Weaver (IBM)
- Christophe Strobbe (DocArch, K.U.Leuven)
- Gregg Vanderheiden (Trace R&D Center, University of Wisconsin)

Other previously active WCAG WG participants and other contributors to WCAG 2.0

Shadi Abou-Zahra, Jim Allan, Jenae Andershonis, Avi Arditti, Aries Arditi, Mike Barta, Sandy Bartell, Kynn Bartlett, Marco Bertoni, Harvey Bingham, Chris Blouch, Paul Bohman, Patrice Bourlon, Judy Brewer, Andy Brown, Dick Brown, Doyle Burnett, Raven Calais, Tomas Caspers, Roberto Castaldo, Sambhavi Chandrashekar, Mike Cherim, Jonathan Chetwynd, Wendy Chisholm, Alan Chuter, David M Clark, Joe Clark, James Coltham, James Craig, Tom Croucher, Nir Dagan, Daniel Dardailler, Geoff Deering, Pete DeVasto, Don Evans, Neal Ewers, Steve Faulkner, Lainey Feingold, Alan J. Flavell, Nikolaos Floratos, Kentarou Fukuda, Miguel Garcia, P.J. Gardner, Greg Gay, Becky Gibson, Al Gilman, Kerstin Goldsmith, Michael Grade, Jon Gunderson, Emmanuelle Gutiérrez y Restrepo, Brian Hardy, Eric Hansen, Sean Hayes, Shawn Henry, Hans Hillen, Donovan Hipke, Bjoern Hoehrmann, Chris Hofstader, Yvette Hoitink, Carlos Iglesias, Ian Jacobs, Phill Jenkins, Jyotsna Kaki, Leonard R. Kasday, Kazuhito Kidachi, Ken Kipness, Marja-Riitta Koivunen, Preety Kumar, Gez Lemon, Chuck Letourneau, Scott Luebking, Tim Lacy, Jim Ley, William Loughborough, Greg Lowney, Luca Mascaro, Liam McGee, Jens Meiert, Niqui Merret, Alessandro Miele, Mathew J Mirabella, Charles McCathieNevile , Matt May, Marti McCuller, Sorcha Moore, Charles F. Munat, Robert Neff, Bruno von Niman, Tim Noonan, Sebastiano Nutarelli, Graham Oliver, Sean B. Palmer, Sailesh Panchang, Nigel Peck, Anne Pemberton, David Poehlman, Adam Victor Reed, Chris Ridpath, Lee Roberts, Gregory J. Rosmaita, Matthew Ross, Sharron Rush, Gian Sampson-Wild, Joel Sanda, Gordon Schantz, Lisa Seeman, John Slatin, Becky Smith, Jared Smith, Neil Soiffer, Jeanne Spellman, Mike Squillace, Michael Stenitzer, Jim Thatcher, Terry Thompson, Justin Thorp, Makoto Ueki, Eric Velleman, Dena Wainwright, Paul Walsch, Takayuki Watanabe, Jason White.

Appendix C: References

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Exhibit D

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