

# Traveling Route 508: A One-Way Street to Universal Accessibility

Katharyn Bine and Gloria A. Reece

“Accessible” is a higher standard than “Section 508-compliant.” Identifying the design principles for accessible web page design, and which of those principles are required under Section 508, is a useful approach to the issue for any organization that must comply with the Section 508 standards. The legislation has no standards for determining whether your web site complies with Section 508. Possible processes include: evaluating the site using a text-to-speech application; evaluating the site using validation software; and usability testing.

## WORKING TO 508 ... HOW TO DESIGN ACCESSIBLE USER-CENTERED WEB PAGES

This section identifies effective accessible design principles for web pages. Principles are given in 30 categories in Table 1: audio, browsers, color, content and structure, filtering (lists, frames), fonts, forms, images, links, multimedia, navigation, network, PDF files, screen flicker, spacing (interletter, interword, leading, length of line, margins, paragraph style, spatial relationships), standards, style sheets, tables, text-only pages, testing and validation, timed responses, user interface (applets, DHTML, Java, JavaScript, plug-ins, programmatic objects, scrolling text, Shockwave, web page downloads), user interaction, user preferences, video, web page downloads, and writing and style. The principles are adapted from current literature on accessible design. Section 508 principles are noted in the table.

**Table 1.** Principles for Accessible Web Pages

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	<b>Audio</b>
508	Provide audio and text transcripts for video. Use closed captions or other text equivalents for audio or video.
	<b>Browsers</b>
	Build-in backward compatibility when writing HTML code.
	Plan for work-arounds when dealing with browser-related bugs.
	Test web pages to ensure that on-screen displays are accurate for each of the supported browsers.

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Track browser name, version number, operating system, and non-standard settings during the test phase.

Apply interim solutions to accommodate end-user preferences for assistive technologies and older browsers.

### **Color**

508 Apply color so that web pages can be understood if users do not have the ability to identify or differentiate between specific colors.

Maximize contrast between foreground and background elements.

Avoid using color when it is necessary for the end-user to make meaningful distinctions between items.

Avoid busy backgrounds that may interfere with reading.

Avoid loud textures, patterns, or images.

Use portable colors for backgrounds.

Contrast dark colors from the extremes on the color wheel with very light mid-scale colors.

Avoid contrasting light colors from extreme locations on the color wheel against dark mid-scale colors.

Avoid use of achromatic colors (white, grey, black) that are similar in brightness.

Avoid contrasting low chromatic colors with those that are similar in brightness.

Avoid contrasting hues from adjacent parts of the color wheel, especially if the colors do not contrast sharply.

### **Content and Architecture**

Minimize the need for users to remember material as they navigate screens.

Use simple, direct, concrete language.

Provide orientation information regarding site structure and content.

Use a consistent layout.

Use a consistent presentation style across web pages.

### **Filtering (Lists, Frames)**

Use ALT string to identify filter images such as bullets in lists.

508 Provide meaningful NOFRAMES content plus appropriate links to other pages on the site.

Omit frames whenever possible.

Avoid IFRAME until the technology becomes portable.

Use browser-compatible specifications

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when creating frame borders.

### Fonts

(See also, "User Preferences.")

Apply user-defined dynamic fonts.

Use standard outline fonts.

Maintain flexibility in changing fonts via browser.

Use Roman posture.

Avoid italics.

Use sans serif fonts.

Use semi-bold or bold.

Minimize use of underscore to prevent confusion with linked material.

Avoid uppercase.

Use fonts with familiar, easy-to-recognize characters.

### Forms

508 Create forms that allow people using assistive technology to access the information, field elements, and functions required to complete and submit the form.

508 Provide instructions for use.

508 Provide cues for use.

508 Provide links to alternate, accessible forms, (e-mail, voice mail, TTY, etc.) for forms for those that are inaccessible by people with varying physical and sensory abilities.

Avoid using image map "submit" buttons.

Use text labels for all controls.

Group and label related controls.

Group and label menu controls.

Consider using alternate page links with additional contact information.

### Hardware and Software

Identify all of the platforms for web page delivery during the discover phase of the project.

Check screen resolution settings and quality of on-screen display of web page.

Plan for non-optimal situations with hardware and software in web page designs.

Plan for future trends and design changes as the site develops.

Plan for platform differences (desktop computers, Palm OS, WebTV, wireless technologies, etc.)

Use compromise when designing for multimodal (print and on-screen) delivery.

### Images

508 Use ALT, longdesc, or in element content for images, multimedia objects, logos, photos, artwork, Java applets, or other types of web page content that cannot be

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reduced to ASCII text.

508 Use client-side image maps instead of server-side image maps except when it is necessary to define regions that do not have an available geometric shape.

508 Use redundant text links for each active region of a server-side image map. Use the alternative text attribute (ALT text) of the image to provide a textual description of the image for people accessing the page in a non-graphical method (e.g., text only, speech, or Braille).

508 Use ALT text labels for image maps. Use links for lengthy text descriptions of graphics.

Use ALT parameter to describe invisible graphics or language preferences.

508 Use descriptions of links when using a client-side image map.

Use the alternative text attribute (ALT text) of the image tag to provide a textual description of the image for people accessing the page in a non-graphical method (e.g., text only, speech, or Braille).

Use ALT text labels for image maps.

Use links for lengthy text descriptions of graphics.

Use ALT parameter to describe invisible graphics or language preferences.

Use descriptions of links when using a client-side image map.

List links as text when confined to use of server-side image maps.

Use empty string annotations for decorative graphics.

Use a nonscript alternative when using scripts.

Provide alternative text when using applets.

Provide semantic titles to horizontal rules.

Use easy-to-recognize graphics.

Avoid using small graphics as buttons.

### International

Use metrics when this unit of measure is clear to the target audience.

Provide metric equivalents whenever possible.

Provide or link to a table of conversions whenever possible.

Specify relevant measuring systems when a unit may be ambiguous.

Provide currency units and country indicators in pricing information.

Provide links to current exchange rates as needed.

Avoid use of religious and political symbols.

Avoid using color as a symbol. (See also,

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	principles for “Color.”)
	Avoid using facial expressions or hand signs as icons.
	Clarify dates by spelling out month and using a four–digit designation for year.
	Avoid using time indicators whenever possible.
	Express time using a description that is offset from the current time (e.g., “The newscast will begin in 4 hours and 30 minutes.”)
	Specify a target audience for web pages when the message is aimed at a local market.
	Provide contact information (includes country code) suitable for a global audience.
	Use a common international language.
	Use simple, direct text.
	Avoid idioms.
	Avoid slang.
	Avoid metaphors.
	Apply multiple languages when essential.
	Avoid using national flags to identify language support for the site.
	State the names of each language supported in its native tongue: English, Espanol, Francais, etc.
	<b>Links</b>
508	Provide a method that allows users to skip repetitive links.
	Provide text versions of the links associated with image maps.
	Write link names so that they are self–explanatory.
	Avoid presenting links directly next to each other.
	Provide text–based links for graphics of text as links to facilitate browser changes for font size accommodations.
	Verify that the links that readers need on a page are visible without scrolling.
	Use concise link names.
	Use substantive, descriptive words that convey information about the link.
	Accommodate screen readers by delimiting list of links.
	<b>Multimedia</b>
508	Use text captioning for audible output.
508	Use audio descriptions for important visual information.
	Use text equivalents for multimedia elements.
	<b>Navigation</b>
	Provide a clear method of navigation (orientation, information, navigation bars, site map, etc.) for users.

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	<b>Network</b>
	Optimize and test your site to accommodate minimal network capabilities of end–users.
	<b>PDF Files</b>
	Provide HTML or plain text versions.
	Make charts or graphs in the PDF file accessible.
	Provide URL for "Access Adobe" at the Adobe website.
	<b>Screen Flicker</b>
508	Design web pages so that they avoid screen flicker with frequencies greater than 2 Hz. And lower than 55 Hz.
508	Avoid using applets that cause screen flicker frequencies greater than 2 Hz. and lower than 55 Hz.
	Avoid using content requiring plug–ins that cause screen flicker with frequencies greater than 2 Hz. and lower than 55 Hz.
	<b>Spacing (Interletter, Interword, Leading, Margins and Length of Line, Spatial Relationships)</b>
	Avoid close interletter spacing for people with central visual field defects.
	Use a wider spacing (e.g., monospaced fonts) than is provided in proportional fonts.
	Use a wider spacing (e.g., monospaced fonts) than is provided in proportional fonts.
	Use leading that is 25–30% of the point size.
	Add spacing between paragraphs.
	Apply more space between paragraphs than between lines.
	Avoid placing important material on extreme right or left areas of the screen for people with total peripheral vision loss.
	Avoid using spatial relationships to clarify text (e.g., “the button on the right” or “the paragraph below.”)
	Use generous spacing around small buttons whenever necessary to use them.
	Allow extra–wide binding margin for web materials intended for print.
	Permit 50–65 characters per line.
	Avoid leading reader’s eye off screen prematurely.
	Use generous space between columns.
	<b>Standards</b>
	Apply standards: W3C technologies, ADA–508, etc.

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	Apply standards when designing for different screen resolutions
	<b>Style Sheets</b>
508	Organize documents so that they are readable without associated style sheets.
	<b>Tables</b>
508	Label table rows and columns.
508	Use mark-up to associate data cells and heading cells for tables that have two or more logical levels of row and column headings.
	Summarize or repeat complex tabular information in alternative, non-tabular format.
	Check that the tabular information is coherent when columns are removed.
	Summarize or repeat complex tabular information in alternative, non-tabular format.
	Check that the tabular information is coherent when columns are removed.
	Create tables that transform gracefully to accessible browsers and other related technologies.
	Use tables for tabular information.
	<b>Text-only Pages</b>
508	Use text-only pages when it is necessary to make a web page comply with accessibility and 508 guidelines.
508	Update the content of text-only web pages when content of the associated primary pages change.
	<b>Testing and Validation</b>
	Use automatic accessibility and browser testing and validation tools
	Use direct observation.
	Check for clarity of language.
	Test for ease of navigation.
	Validate syntax (HTML, XML, etc.).
	Validate style sheets.
	Use a text-only browser or an emulator.
	Use a variety of graphics browsers and test for sounds and graphics loaded, no mouse, frames, scripts, stylesheets, and applets unloaded.
	Test with self-voicing browsers, screen readers, magnification software, small displays, etc.
	Test with end-users.
	Check spelling and grammar.
	Review content for clarity, accuracy, and simplicity.
	Obtain evaluation comments from a variety of reviewers (subject-matter experts, expert and novice end-users with special needs, international audiences, etc.)

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	Test web pages on all hardware and software platforms during each evaluation phase.
	Ensure that web pages are accurate when newer technologies are not supported or turned off.
	Ensure that external links to web pages are valid.
	<b>Timed Responses</b>
508	Alert users that a timed response is being required.
508	Allow users sufficient time to complete timed responses.
508	Provide a mechanism for allowing users to indicate that they need more time to complete the response.
	<b>User Interface: DHTML, Shockwave, Scrolling Text, Java, JavaScript, Plug-ins, etc.</b>
508	Identify information provided by scripts with functional text that can be read by assistive technologies.
508	Use plain links to enable users to access subsequent pages of your site.
	Provide plain text HTML alternatives for material presented in formats other than plain HTML.
	Ensure that meaningful content is available for Flash movies to users who cannot access Flash.
	Use plain links to enable users to access subsequent pages of your site.
	Ensure that JavaScript pages function correctly without scripts or provide parallel pages that do not use JavaScript.
	Offer Flash and non-Flash versions of pages to ensure that users have control over how information is presented.
	Avoid moving, blinking, and auto-refreshing text.
	Avoid using "rollovers" and non-standard pop-up menus.
	Design for device independence.
	<b>User Interaction</b>
	Use auditory rather than visual browsers.
	Avoid requiring users to click on small or moving targets to proceed to another page.
	Check that the TAB order uses a coherent sequence for the content.
	Use TABINDEX attribute for cases where the tab sequence needs revising for coherence.
	Avoid requiring users to type whenever possible.
	Avoid requiring users to make frequent transitions between clicking and typing.

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### User Preferences

Allow end-user control over preference settings for fonts, link colors, image loading, plug-ins, enabled features (Java, JavaScript, cookies, security features, speed, or other preferences) (See also, principles for “Fonts.”)

### Video

Provide audio and text transcripts for video.

### Web Page Downloads

Allow a maximum of 20 seconds for download of web pages using a medium speed internet connection.

### Writing and Style

Use an easy-to-understand language.

Indent first line of paragraph.

Use hanging-indent style for paragraphs.

Provide detail by linking to additional information.

Use brevity.

Use a clear focus.

Use simple, concise words.

Apply a grade school reading level.

Write headings that facilitate skimming and scanning reading styles.

Use quotes, questions, statements or surprise, news blurbs to gain audience attention.

Use accurate grammar, spelling, and punctuation.

Avoid jargon.

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*Sources:* Adapted from textual material in Alschuler, 1998; Arditi, 1994; Brink, Gergle, & Wood (2002); Chisholm et al. (2001); Flanders & Willis, 1998; Fontaine, 1995; Kilian, 1996–2001; Lay et al., 2000; Lynch & Horton, 1999; Miller, 1956; Nielsen, 2000; The Lighthouse, 1995; Text Matters, 2003; Reece, 1993–1994; Reece, 2001; Reece, 2002; Royal National Institute for the Blind, 1995–2003; Shaw, 1969; Spencer, 1968; Sullivan & Manning (1996–1998); Usable Web., 1999–2003.

## EVALUATING YOUR WEB SITE FOR SECTION 508 COMPLIANCE

Section 508 has no standards for determining whether your web site complies with Section 508. Possible processes include: evaluating the site using a screen reader; evaluating the site using validation software; and usability testing.

## Evaluating with Screen Reader Software

Testing a web site with a screen reader, such as JAWS, has advantages and drawbacks. Section 508 does not require that your web site work with JAWS! Although accommodating vision disability is always a consideration with GUIs, people with mobility and hearing disabilities may also encounter problems with your application. A screen reader cannot solve issues that these users may face.

Screen readers have a significant learning curve. If you are learning, plan for 16 hours to learn the key commands, and 10 hours to test 20 pages. A person learning to use a screen reader understands words at about 80 words per minute. A person who commonly uses a screen reader may listen at 120 words per minute—nearly twice the rate!

A test plan can accommodate the time to spot-check the application. Sites with 100 screens must have very consistent design for such an approach to work. A strategy for spot-checking would be to identify significant modules of the application and the developers responsible for those modules. By testing a few pages of each module, you can identify repetitive errors. If a developer does not understand an error, consider using a screen reader to demonstrate the error.

## Evaluating with Validation Software

Many companies have software designed to validate your website’s accessibility and Section 508 compliance. Most also have a version that offers *remediation* as well—a proposed solution to the coding error. Validation software allows you to check every page in the web application by spidering through the site. Results indicate unusual errors and repeated errors—no skip navigation, no ALT text. It cannot determine the *quality* of the accessibility. For example, the validation software can identify whether ALT text is present, but it cannot determine whether ALT text is actually needed, is adequate or accurate.

**Do not run a validation on a web application running on a production (live) server unless your client and organization agree that this should be done.**

Before you evaluate a web-based application, ensure that all code and data are backed up elsewhere. Test the web application on an internal server, not the production server. Test individual pages before launching a process that evaluates your entire application.

Issues to consider when evaluating validation software:

**Cost:** Many companies have licensing models that are aimed at the U.S. Government market. These models require the government office to purchase their tool

and a number of seats for that tool. If your organization requires only one or two seats, this pricing structure may be prohibitive. An obvious solution if your client is a U.S. Government office would be to determine whether they have already purchased such a license. Another option is to evaluate tools that are within your organization's price range. We have created a spreadsheet that lists current vendors and pricing which is available by email or in hard copy.

**Ease of Use:** Vendors have demonstration versions available for use, or will arrange for a web-based demonstration of their tools. An ideal situation would be a demo version that you are able to use on a limited number of pages, so that you can ensure that the validation software is compatible with your web application.

**Reports:** Reports should indicate which errors were found, and line numbers where errors occur. They should indicate where human evaluation is required.

## ***Evaluating with Usability Testing***

Ask people who have disabilities to test the application. See Steve Krug's "Don't Make Me Think: A Common Sense Approach to Web Usability" (2000, Que) for help with performing usability testing. If possible, arrange for a home visit so that the person may use his own computer and software.

## **REFERENCES**

- (1) Alschuler, L. (1998a). Rating your site, [web page]. zdnet.com. Available: <http://www.zdnet.com/filters/printerfriendly/0,6061,1600182-84,00.html> [2001, January 16].
- (2) Alschuler, L. (1998b). The W3C access checklist, [web page]. zdnet.com. Available: <http://www.zdnet.com/filters/printerfriendly/0,5051,1600184-84,00.html> [2001, January 16].
- (3) Arditi, A., & Knoblauch, K. (1994). Choosing effective display colors for partially-sighted. Paper presented at the Society for Information Display (SID) International Symposium, Los Angeles, CA.
- (4) Brink, T., Gergle, D., & Wood, S. (2002). Designing web sites that work: Usability for the web. (1st ed.). (Vol. 1). San Diego, CA: Academic Press.
- (5) Chisholm, W., Vanderheiden, G., & Jacobs, I. (2001). Web content accessibility guidelines 1.0. Interactions: New Visions of Human-computer Interaction, Vol. 8, No. 4.
- (6) Flanders, V., & Willis, M. (1998). Web pages that suck: Learn good design by looking at bad design. (1st ed.). (Vol. 1). San Francisco: Sybex.
- (7) Fontaine, P. (1995). Universal information access on the WWW (Version June 2) [Internet]. Washington, DC: General Services Administration.
- (8) Kilian, C. (1996-2001). Effective web writing (1st ed.), [web page]. CMP Media, Inc. Available: [wysiwyg://157/http://www.webtechniques.com/archives/2001/02/kilian](http://www.webtechniques.com/archives/2001/02/kilian) [2001, January 16].
- (9) Lay, M. M., Wahlstrom, B. J., Rude, C., Selfe, C., & Selzer, J. (2000). Technical communication. (2nd ed.). (Vol. 1). Boston, MA: Irwin McGraw-Hill.
- (10) Lighthouse, T. (1995). Print legibility and partial sight: Guidelines for designing legible text. New York, NY: The Lighthouse, Inc.
- (11) Lynch, P. J., & Horton, S. (1999). Web style guide: Basic design principles for creating web sites. (1st ed.). (Vol. 1). New Haven: Yale University Press.
- (12) Miller (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *The Psychological Review*, 63(2), 81-97.
- (13) Nielsen. (2000). Designing for web usability. (1st ed.). (Vol. 1). Indianapolis, IN: New Riders Publishing.
- (14) Reece, G. A. (1993-1994). An investigation of effective document design principles and strategies to develop a hypertext solution for creating dual-delivery documents (On-line and Paper). Unpublished Master of Science (M.S.), Florida Institute of Technology, Melbourne, FL
- (15) Reece, G. A. (2001). Usable, Accessible Web Pages for Low Vision: Criteria for Designers. Chicago, IL: Annual Conference of the Society for Technical Communication.
- (16) Reece, G. A. (2002). Text legibility for web documents and low vision. Unpublished Doctor of Education, The University of Memphis, Memphis, TN. [This document is in preparation.]
- (17) Royal National Institute for the Blind. (1995-2003). Accessible web design, [web page]. RNIB. Available: <http://www.rnib.org.uk/digital/hints.htm> [2001, January 29].
- (18) Royal National Institute for the Blind. (2000). Campaign Report 15: Get the message online: Making internet shopping accessible to blind and partially-sighted people. Registered Charity No. 226227.
- (19) Shaw, A. (1969). Print for partial sight (Research project ). London, England: Library Association.
- (20) Spencer, H. (1968). The visible word. (1st ed.). (Vol. 1). New York, NY: Hastings House Publishers.

- (21) Sullivan, T., & Manning, K. (1996–1998, November 30). Could Helen Keller read your page? (1997, August 15), [web]. pantos.org. Available: <http://www.pantos.org/atw/35412.html> [1997, February 9].
- (22) Text Matters. (2002). Designing to meet the needs of visually impaired people. Text Matters. Available: [http://www.textmatters.com/guides/visually\\_impaired.html](http://www.textmatters.com/guides/visually_impaired.html) [2001, January 16]
- (23) Usable Web. (1999-2002). <http://usableweb.com/>
- (24) Krug, Steve. (2000). Don't Make Me Think: A Common Sense Approach to Web Usability. Que.

Katharyn Bine  
Senior Associate

ICF Consulting  
9300 Lee Highway  
Fairfax, VA 22031 USA  
(703) 934-3896  
[kbine@icfconsulting.com](mailto:kbine@icfconsulting.com)

Katharyn Bine writes software system documentation, provides training, develops CD-ROMs, and performs usability testing, including Section 508 compliance. She is a technical writer for ICF Consulting in Fairfax, VA and participates in the Washington, DC chapter of STC.

Gloria A. Reece, Ed.D.  
Assistant Professor  
Technology and Communication

Mercer University  
College of Continuing and Professional Studies  
1400 Coleman Avenue  
Macon, GA 31207-0001 USA  
(478) 301-2590  
[reece\\_ga@mercer.edu](mailto:reece_ga@mercer.edu)

Gloria A. Reece is an assistant professor at Mercer University where she teaches information systems courses in Technology and Communication. She is also author of an invited text, *Writing for Information Systems*, to be published by John Wiley & Sons. Her current teaching and research interests include integration of technology into teaching and learning, assessment in education, problem-based learning, and accessible, usable design.