



Application of the Rehabilitation Act Section 508 to the NPFC

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FORWARD

Most of the information contained in this paper was obtained from Government and commercial websites. In some instances, information was added or legal or technical jargon was removed to improve clarity.

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1.0 Introduction

The following paper provides a brief summary of Section 508 and its associated technical standards in layman's terms. It identifies the elements of the NPFC information technology (IT) infrastructure that are affected by the technical standards and a brief discussion of how the vendor products NPFC uses are supporting accessibility. The paper concludes with some suggested next steps NPFC can take to become compliant with the law.

Detailed information about the standards, a list of useful websites, and a list of some assistive technologies are provided in the appendices.

2.0 Overview of Section 508

The revised Section 508 of the Rehabilitation Act of 1973 imposes strict accessibility requirements for any electronic and information technology developed, maintained, procured, or used by federal agencies. Electronic and information technology include computers (such as hardware, software, and accessible data such as web pages), facsimile machines, copiers, telephones, and other equipment used for transmitting, receiving, using, or storing information.

Section 508 requires that Federal agencies' electronic and information technology be accessible to people with disabilities, including employees and members of the public. Agencies must procure accessible technology regardless of whether they have employees with disabilities. In an effort for federal procurement officers to enforce the Section 508 law, they will only purchase electronic and information technology products that comply with the government standard.

The law does allow a few exceptions but they only apply to intelligence activities, cryptologic activities associated with national security, command and control of military forces, and equipment that is part of weapons systems. If implementing the law will result in an "undue burden," the agency does not have to comply with the standards. Undue burden is defined to mean "significant difficulty or expense considering all agency resources available to the agency or component." Meaning funds specifically available for electronic and information technology. However, the agency still has to provide information to users in an alternative means. If commercial products are not available that meet all the standards, agencies are required to procure products that best meets them.

Section 508 contains unique provisions that allow government employees and members of the public to sue Federal agencies that fail to comply with defined accessibility standards. The standards, published in the Federal Register on December 20, 2000, are effective immediately. However, complaints and lawsuits may be filed 6 months from this date – starting June 21, 2001

2.1 Technical Standards

Section 508 defines standards for accessibility in the following 6 technology areas:

1. Software applications and operating systems
2. Web-based information or applications
3. Telecommunication products
4. Video and multimedia products
5. Self contained, closed products (e.g., information kiosks, calculators, and fax machines)
6. Desktop and portable computers

The specific provisions of the standards, with additional comments for clarity, are provided in Appendix A. The following sections (Sections 3.0 through 8.0), provides a brief overview of the standards, the NPFC environment that the standard applies to, and information about how commercial products currently used by the NPFC are addressing accessibility.

Where accessibility standards could not be defined, Section 508 provides functional performance criteria (see Section 9.0) that must be applied. Information about products and product support services, primarily documentation, be also be accessible (see Section 10.0).

3.0 Software Applications and Operating Systems

3.1 Overview of the Standard

Most of the specifications for software pertain to usability for people with vision impairments. For example, one provision requires alternative keyboard navigation, which is essential for people with vision impairments who cannot rely on pointing devices, such as a mouse. Other provisions address animated displays, color and contrast settings, flash rate, and electronic forms, among others.

3.2 NPFC Applications Environment

The primary vendor products utilized by NEMIS are provided by Oracle, Microsoft, and Lotus. The standard NPFC workstation runs Microsoft Windows NT operating system and Microsoft Office COTS applications for office automation. Funds management is provided through Oracle Financials, Microsoft Internet Information Server, and Lotus Notes. In some instances, these vendors are making accessibility changes to their products allowing the NPFC to configure the application to meet their accessibility needs. In other instances, these companies are providing accessibility development tools which the NPFC will have to use to develop accessible applications. Below is a brief summary of the approaches Oracle, Microsoft, and Lotus are following to supporting accessibility.

3.2.1 Oracle Products

Oracle's approach to accessibility is to focus on the common requirements of the disabled user population and satisfy those requirements through their Java and HTML products.

Oracle is developing accessible-aware Java tool kits to ensures inter-operability with assistive technologies throughout the Oracle technology stack. These tool kits for Java

are using Java Soft's Accessibility API, by SUN, which is designed to give assistive technologies direct access to the information in user interface objects. For HTML, Oracle has incorporated Section 508 requirements on all their HTML content.

Below is a brief status of the compliance of several Oracle products with 508 accessibility standards:

- Oracle 8i Server
Interaction with most of Oracle 8i systems is done through system management tools, HTML documentation, via the command line either through SQL*Plus or operating system commands, or through programming APIs. Those which are accessible through the command line or via APIs are already accessible to disabled users. Oracle is still working on identifying which system management tools, HTML documentation, and other interfaces are accessible, and to require additional changes. Oracle claims "with only a small number of exceptions, the majority of server technologies products will be fully accessible without a keyboard and with screen reader technology by the June 21 2001 effective date for complying with Section 508. "
- Oracle 9i
The Oracle 9i database and prior versions can be completely managed with SQL using a command line interface. The SQL command line interface meets Section 508 standards. Oracle 9i Enterprise Manager meets Section 508 standards. Oracle 9i on Solaris will be available prior to June 21, 2001. Oracle 9i Enterprise Manager on Windows NT and Win95/98/00 will be certified with JAWS screen reader (see Appendix C) and available in the third quarter of 2001.
- Oracle iAS
Oracle iAS (Internet application server) is comprised of a number of different server components, including the Apache web server, the Oracle Forms and Reports servers, Discoverer, and Oracle Portal. The servers support applications that provide HTML and Java user interfaces. In a few cases, Microsoft windows user interfaces are required for server administration operations. Oracle has committed to providing tools for building and deploying accessible applications with 9 iAS 2.0. Oracle is also reviewing all pre-built iAS components (e.g. viewers and administrative interfaces) for accessibility via keyboard-only input and output accessible by screen readers.
- Oracle iDS
Oracle is currently reviewing all Oracle iDS (Internet Developer Suite) components for accessibility. Oracle has committed to modifying the iDS tools as necessary to ensure accessibility with keyboard-only input and output that is accessible through screen readers. Oracle expects to make all of the iDS tools accessible in phases over a number of releases.
- Documentation
Oracle documentation is available in a variety of forms, including HTML, text files and PDF. Work has been ongoing throughout 2000 to ensure that documentation will be available in accessible form, in accordance with Section 508 guidelines.

With a small number of exceptions, the majority of documentation will be fully accessible by the end of the first half of 2001.

3.2.2 Microsoft Products

Microsoft provides operating systems, COTS application, as well as development tools for building custom applications. Microsoft operating systems and COTS products already have features and enhancements to make computers accessible to people with disabilities. Documentation about these accessibility features and options is available on Microsoft's Website (refer to Appendix B).

Microsoft has developed an accessibility API called Microsoft Active Accessibility (MSAA). It provides a standard way for accessibility aids to get information about user interface elements, and for programs to expose that information to the aids. MSAA has been integrated into Microsoft Office 97 and Office 2000, Windows 98 and Windows 2000, and Internet Explorer 3.0, 4.01 and 5. A product called *Inspect* can be used to validate the accessibility of software user interface elements which use MSAA or standard windows controls. It supports software written for the Windows 9x, Windows NT or Windows 2000 platforms.

In addition to MSAA, Microsoft has published development guidelines titled, "Windows Guidelines for Accessible Software Design." These guidelines contain information about how and why to make applications accessible. Documentation about how to utilize specific accessibility features are available for the Visual Basic 6.0, Visual C++, and Visual FoxPro.

3.2.3 Lotus Notes Products

Most feature within Lotus Notes R5 Client are already accessible to handicapped individuals – especially with the help of a screen reader. IBM/Lotus has committed to making R5 completely accessible however at this time, some elements, like the group calendar, subscriptions, and the ability to create agents are not accessible at this time.

Through the IBM Accessibility Center, IBM/Lotus has developed accessibility checklists for R5 and R4 applications. Each checklist provides detailed development techniques and test strategies that can be used to implement and verify the accessibility of an application. The Accessibility Center has published guidelines for developing accessible applications (see Appendix B).

Notes 4.6 does not work well with screen reader software, in part, because it uses so many custom controls. R5 has implemented the MSAA (described in Section 3.2.2) and is almost completely accessible. MSAA is used to provide a generic method by which screen reader software can convert graphic user interface information from R5 into speech. The screen reader used must be able to interface with MSAA.

R5 provides accelerator keys (i.e., key combination like Alt+F) for all menus, menu items, dialog box controls, and the search bar. The most highly used and important commands have command keys. Lotus has made key navigation consistent within R5, making it easier to user who cannot use a mouse.

4.0 Web-Based Internet and Intranet Information and Applications

4.1 Overview of the Standard

The web-based standard is based upon the access guidelines developed by the Web Accessibility Initiative of the World Wide Web Consortium. Many of these provisions ensure access for people with vision impairments who rely on various assistive products to access computer-based information, such as screen readers, which translate what is on a computer screen into automated audible output, and refreshable Braille displays. Certain conventions, such as verbal tags or identification of graphics and format devices, like frames, are necessary so that these devices can "read" them for the user in a sensible way. The standards do not prohibit the use of web site graphics or animation. Instead, the standards aim to ensure that such information is also available in an accessible format. Generally, this means use of text labels or descriptors for graphics and certain format elements (HTML code already provides an "Alt Text" tag for graphics which can serve as a verbal descriptor for graphics). This section also addresses the usability of multimedia presentations, image maps, style sheets, scripting languages, applets and plug-ins, and electronic forms.

The standards apply to Federal web sites but not to private sector web sites (unless a site is provided under contract to a Federal agency, in which case only that web site or portion covered by the contract would have to comply). Accessible sites offer significant advantages that go beyond access. For example, those with "text-only" options provide a faster downloading alternative and can facilitate transmission of web-based data to cell phones and personal digital assistants.

4.2 NPFC Web-Based Environment

Most of the applications under the NEMIS umbrella are either web-based or have been web-enabled. Users access these web-based applications using Microsoft Internet Explorer browser. In addition to these applications, NPFC has an Intranet and two Internet websites: <http://www.npfc.gov> for the Certificate of Financial Responsibility (COFR) Vessel Information Database and <http://www.uscg.mil/hq/npfc/npfc.htm> for organizational information. These dynamic and static websites and web-based applications must comply with the both the software application standards in Section 3.0 as well as the web-based standards in this section.

The NPFC websites contain documents in Adobe PDF. These PDF documents are currently not accessible however Section 4.2.1 describes Adobes approach to fixing this problem.

4.2.1 Microsoft Internet Explorer 5

Internet Explorer 5 (IE 5) can be configured to increase accessibility by changing the way Web pages look. This can be accomplished by modifying the settings in the Tools (Internet Options) and View (Text Size) menus.

IE 5 supports cascading style sheets (CSS). IE 5 users can turn off style sheet to customize the way text appear in Web pages. This does not turn off the positional information in a style sheet which means text that renders in one position can overlap neighboring text when the font size is scaled, making readability difficult. Advanced

users can further customize the display of Web pages by setting their own cascading style sheets. This advanced feature enables users to specify colors, fonts, and other style information.

Web developers can accommodate users preference by using style sheets that make the navigation elements appear to be at the top, even though they are structurally and functionally at the bottom. Note, however, that this only works with IE 5 (see Appendix B for a link to the Microsoft's accessibility documentation).

In HTML 4.0, Web developers can customize Web pages to make it easier for people who rely on the keyboard to navigate a Web site. Custom keyboard shortcuts can be created using the ACCESSKEY attribute. ACCESSKEY can be used with IE versions 4 and later but may not work with other browsers.

In addition to these standard features within IE 5, users can download and install customization tools, such as the Zoom In/Zoom Out feature, available through the Microsoft Web Accessories Kit.

4.2.2 Adobe

The NPFC uses PDF for publishing documents on the public website (e.g., Technical Operating Procedures). Acrobat 5.0 Reader uses MSAA that exposes Adobe PDF information to accessible assistive applications. It also provides other features like the ability to allow users to increase color contrasts by creating custom color schemes and shortcut keys for individuals who cannot use a mouse.

PDF files created using Acrobat 5.0 solve the PDF accessibility problem by allowing developers to create tagged PDF files. This tagging provides a logical structure to a document, making it readable by screen readers. Adobe has developed a converter called Adobe 5.0 Make Accessible which converts untagged PDF files into tagged PDF files. Adobe has committed to having this plug-in available at the beginning of May.

5.0 Telecommunications Products

5.1 Overview of the Standard

This section is designed primarily to ensure access to people who are deaf or hard of hearing. This includes compatibility with hearing aids, cochlear implants, assistive listening devices, and TTYs. TTYs are devices that enable people with hearing or speech impairments to communicate over the telephone; they typically include an acoustic coupler for the telephone handset, a simplified keyboard, and a visible message display. One requirement calls for a standard non-acoustic TTY connection point for telecommunication products that allow voice communication but that do provide TTY functionality. Other specifications address adjustable volume controls for output, product interface with hearing technologies, and the usability of keys and controls by people who may have impaired vision or limited dexterity or motor control. Access to voicemail services is included under this technical standard.

5.2 NPFC Telecommunications Environment

NPFC telephone and cell phone services are provided through the Department of Transportation (DOT) Transportation Administrative Service Center (TASC) Telecommunications Operations (TOPS) organization and their contracting mechanisms. At this time, TASC has not published their compliance with these standards.

6.0 Video or Multimedia Products

6.1 Overview of the Standard

Multimedia products involve more than one media and include, but are not limited to, video programs, narrated slide production, and computer generated presentations. Provisions address caption decoder circuitry (for any system with a screen larger than 13 inches) and secondary audio channels for television tuners, including tuner cards for use in computers. The standards also require captioning and audio description for training and informational multimedia productions developed or procured by Federal agencies which supports an agency's mission. The standards also provide that viewers be able to turn captioning or video description features on or off. This standards applies regardless of the anticipated audience.

6.2 NPFC Video or Multimedia Environment

The NPFC has plans to use video to provide information about financial management and as a training tool. These videos will be produced with the technical support of a contractor who be able to support these standards. Provisions for the FAR are currently being developed.

7.0 Self Contained, Closed Products

7.1 Overview of the Standard

This section covers products that generally have imbedded software but are often designed in such a way that a user cannot easily attach or install assistive technology. Examples include information kiosks, information transaction machines, copiers, printers, calculators, fax machines, and similar types of products. The standards require that access features be built into the system so users do not have to attach an assistive device to it. Other specifications address mechanisms for private listening (handset or a standard headphone jack), touch screens, auditory output and adjustable volume controls, and location of controls in accessible reach ranges.

7.2 NPFC's Imbedded Environment

All FAX machines and the copy machine on the 7th floor are provided through a contract with TASC. All other copy machines and all printers are purchased or leased by NPFC. TASC is responsible for procuring products that are compliant with this standard. At this time, TASC has not published their compliance with Section 508. The NPFC is responsible for the remaining copy machines and all printers. Contracts for these copy machines and printers will need to include provisions in the FAR for accessibility.

8.0 Desktop and Portable Computers

8.1 Overview of the Standard

These standards focus on the physical characteristics of computer systems including keyboards and other mechanically operated controls, touch screens, use of biometric forms of identification, and ports and connectors.

8.2 NPFC Desktop and Portable Computers

These standards apply to all NPFC computer workstations.

9.0 Functional Performance Criteria

The performance requirements are intended for overall product evaluation and for technologies or components for which there is no specific requirement under the technical standards (Sections 3.0 through 8.0). These criteria are designed to ensure that the individual accessible components work together to create an accessible product. They cover operation, including input and control functions, operation of mechanical mechanisms, and access to visual and audible information. These provisions are structured to allow people with sensory or physical disabilities to locate, identify, and operate input, control and mechanical functions and to access the information provided, including text, static or dynamic images, icons, labels, sounds or incidental operating cues. For example, one provision requires that at least one mode allow operation by people with low vision (visual acuity between 20/70 and 20/200) without relying on audio input since many people with low vision may also have a hearing loss.

10.0 Information, Documentation, and Support

Section 508 includes access to all information, documentation, and support provided to end users of covered technologies. This includes user guides, installation guides for end-user installable devices, and customer support and technical support communications. Such information must be available in alternate formats upon request at no additional charge. Alternate formats or methods of communication, can include Braille, cassette recordings, large print, electronic text, Internet postings, TTY access, and captioning and audio description for video materials.

11.0 Next Steps

CI needs to determine which elements of the NPFC IT infrastructure that are not compliant with Section 508. For those particular elements, CI should identify an approach for bringing them into compliance. Here are some suggested next steps for each technology area addressed by law.

1. Software Applications and Operating Systems

- **Custom Application** - Disabilities vary enormously. For example, if someone has impaired vision but is not blind, a screen magnifier could make an application accessible. No changes would have to be made to the application. However, for a person who is completely blind, a screen reader would be required and the application would need to provide information to the reader in the appropriate

format for the application to be fully accessible. This might require making changes to the application. The most conservative approach is to assume a user is completely blind, hearing impaired, or cannot use a mouse and test the Oracle, Lotus Notes, and Microsoft custom applications using an assistive technology. See Appendix C for a list of assistive technologies appropriate for the application. Oracle does not use MSAA and may not be able to use the same assistive technologies as Lotus and Microsoft.

- **COTS Applications** – Microsoft NT and Microsoft Office should be compliant with the aid of an assistive technology that uses MSAA. However, other COTS products, like Smartboard, may not be. For these types of applications, NPFC will have to either test the product themselves or contact the vendor to inquire about their compliance.
- **Adobe/PDF** – The accessible version of Acrobat 5.0 and the Acrobat 5.0 Reader is scheduled to be available sometime in April 2001. Existing PDF documents will need to be converted to the 5.0 format and the converter plug-in is scheduled to be available at the beginning of May 2001.

2. Web-Based Information or Applications

- Download an evaluation copy of an accessible browser (refer to Appendix C) and test accessing the NPFC websites and web-based applications. It is possible NPFC web-based applications are already compliant.
- Run the Internet and Intranet websites against a free validation utility (refer to Appendix B).

3. Telecommunication Products

- Telecommunications services are provided through a third party, TASC, who is responsible for the contractual relationship with the vendor. Request that TASC publish how they plan to provide Section 508 compliant telecommunications services (see Item 5 below).

4. Video and Multimedia Products

- Include FAR clauses addressing Section 508 standards for any video contract support.

5. Self Contained, Closed Products

- Check all FAX, copiers, printers, and calculators against the standards in Appendix A Section 5.
- For FAX machines and copiers provided by TASC, request that TASC publish how they plan to provide Section 508 compliant telecommunications services. Include FAR clauses addressing accessibility for future NPFC contracts.

6. Desktop and Portable Computers

- Fully compliant computers are already be available.

Appendix A. – Section 508 Technical Standards

A1. Software Applications and Operating Systems Standards

- a. Applications must be able to be run using just a keyboard for people who cannot accurately operate a mouse. Keyboard alternatives are required when the function can be represented with words. If they cannot, no alternative is required.
- b. Applications cannot interfere with any assistive technologies that have been developed and documented according to industry standards.
- c. Assistive technology must be able to track the focus on a screen (i.e., a visual indication on the screen where some action may occur) as well as changes in the focus.
- d. Information that can be delivered to or received from the user must be made available to assistive technology. This includes checkboxes, menus and toolbars.
- e. For bitmap images used to identify controls, status indicator, or other programmatic elements, the meaning assigned to those images must be used consistently throughout the application.
- f. Textual information must be provided through operating system functions for displaying text so that it will be compatible with assistive technology. The minimum information that must be made available is text content, text input caret location, and text attributes.
- g. Applications must not override user selected contrast and color selections and other display attributes.
- h. When animation is displayed, the information must be displayable in at least one non-animated presentation mode at the option of the user.
- i. Color coding must not be used as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.
- j. When a product permits a user to adjust color and contrast settings, a variety of color selections capable of producing a range of contrast levels must be provided. The user must be able to select softer background and appropriate foreground colors.
- k. Software cannot use flashing or blinking text, objects, or other elements having a flash or blink frequency greater than 2 Hz and lower than 55 Hz.
- l. When electronic forms are used, the form must allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.

A2. Web-Based Internet and Intranet Information and Applications Standards

- a. Provide a text equivalent for all non-text elements that provide information required for comprehending the content or facilitating navigation. This can be accomplished by using the "alt" attribute for short descriptions, the "longdesc" attribute for long descriptions (e.g., longdesc="filename.html"), or text in the element content. Since some browsers used by persons with disabilities do not accept Java applets, include text descriptions between the opening and closing <APPLET> or <OBJECT> tags.

- b. Equivalent alternatives for any multimedia presentation must be synchronized with the presentation: audio descriptions of scenes and actions and text captioning for video and text captioning for audio only. If synchronized captioning is not possible, a text transcript must be provided. Audio and video plug-in applications must also comply with Section 508 standards.
- c. Web pages must be designed so that all information conveyed with color is also available without color.
- d. Documents must be organized so they are readable without requiring an associated style sheet. Web pages cannot override user-defined style sheets that some browsers allow.
- e. Redundant text links must be provided for each active region of a server-side image map.
- f. Client-side image maps must be provided instead of server-side image maps except where the regions cannot be defined with an available geometric shape. Use the "alt" attribute to describe the active region.
- g. Row and column headers must be identified for data tables (e.g., <TH id="header1">). Do not use the PRE tag. If you are using tables for page layout, then you should NOT use markup reserved for data tables (like TH, HEADER, SCOPE, COLGROUP, etc.) because those elements will be used by some agents to identify and manipulate data.
- h. Markup must be used to associate data cells and header cells for data tables that have two or more logical levels of row or column headers.
- i. Provide descriptions of frames to facilitate frame identification and navigation. Use the "title" attribute to provide a short description.
- j. Pages must be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.
- k. A text-only page, with equivalent information or functionality, can be used as a last resort to make a web site comply with the Section 508 standard. The content of the text-only page must be updated whenever the primary page changes.
- l. When pages utilize scripting languages to display content, or to create interface elements (e.g, a rollover gif that changes when you mouse over it), the information provided by the script must be identified with functional text that can be read by assistive technology.
- m. When a web page requires that an applet, plug-in or other application be present on the client system to interpret page content, the page must provide a link to a plug-in or applet that complies with items (a) through (l) above. If this is not possible, provide equivalent information on an alternative accessible page.
- n. When electronic forms are designed to be completed on-line, the form must allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.
- o. A method must be provided that permits users to skip repetitive navigation links. For example, precede the navigation links with a link that skips over them or use the MAP element to group links, then identify the group with the "title" attribute.
- p. When a timed response is required, the user must be alerted and given sufficient time to indicate more time is required.

A3. Telecommunications Products Standards

- a. Telephone equipment must provide a standard non-acoustic connection point for TTYs. This can be provided by a direct connection through an RJ-11 jack, using a "smart" adapter, or by providing a connection at the PBX or switch level.
- b. Telecommunications products which include voice communication functionality must support all commonly used cross-manufacturer, non-proprietary, industry standard TTY signal protocols.
- c. Voice mail, auto-attendant, and interactive voice response telecommunications systems must be usable by TTY users with their TTYs.
- d. Voice mail, messaging, auto-attendant, and interactive voice response telecommunications systems that require a response from a user within a time interval, must give an alert when the time interval is about to run out, and must provide sufficient time for the user to indicate more time is required.
- e. Where provided, caller identification and similar telecommunications function must also be available for users of TTYs, and for users who cannot see displays.
- f. For transmitted voice signals, telecommunications products must provide a gain adjustable up to a minimum of 20 dB. For incremental volume control, at least one intermediate step of 12 dB of gain must be provided.
- g. If the telecommunications product allows a user to adjust the receive volume, a function must be provided to automatically reset the volume to the default level after every use.
- h. Where a telecommunications product delivers output by an audio transducer (which converts electrical energy into sound wave and vice versa) which is normally held up to the ear, a means for effective magnetic wireless coupling to hearing technologies must be provided.
- i. Interference to hearing technologies (including hearing aids, cochlear implants, and assistive listening devices) must be reduced to the lowest possible level that allows a user of hearing technologies to utilize the telecommunications product.
- j. Products that transmit or conduct information or communication, must pass through cross-manufacturer, non-proprietary, industry-standard codes, translation protocols, formats or other information necessary to provide the information or communication in a usable format. Technologies which use encoding, signal compression, format transformation, or similar techniques must not remove information needed for access or must restore it upon delivery.
- k. Products which have mechanically operated controls or keys, must comply with the following:
 1. Controls and keys must be tactilely discernible without activating the controls or keys.
 2. Controls and keys must be operable with one hand and must not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls and keys must be 5 lbs. (22.2 N) maximum.

3. If key repeat is supported, the delay before repeat must be adjustable to at least 2 seconds. Key repeat rate must be adjustable to 2 seconds per character.
4. The status of all locking or toggle controls or keys must be visually discernible, and discernible either through touch sound.

A4. Video and Multimedia Products

- a. All analog television displays 13 inches and larger, and computer equipment that includes analog television receiver or display circuitry, must be equipped with caption decoder circuitry which appropriately receives, decodes, and displays closed captions from broadcast, cable, videotape, and DVD signals. As soon as practicable, but not later than July 1, 2002, widescreen digital television (DTV) displays measuring at least 7.8 inches vertically, DTV sets with conventional displays measuring at least 13 inches vertically, and stand-alone DTV tuners, whether or not they are marketed with display screens, and computer equipment that includes DTV receiver or display circuitry, must be equipped with caption decoder circuitry which appropriately receives, decodes, and displays closed captions from broadcast, cable, videotape, and DVD signals.
- b. Television tuners, including tuner cards for use in computers, must be equipped with secondary audio program playback circuitry.
- c. All training and informational video and multimedia productions which support the agency's mission, regardless of format, that contain speech or other audio information necessary for the comprehension of the content, must be open or closed captioned – regardless of the audience.
- d. All training and informational video and multimedia productions which support the agency's mission, regardless of format, that contain speech or other audio information necessary for the comprehension of the content, must be audio described – regardless of the audience. "Talking head" videos are not included in this provision.
- e. Display or presentation of alternate text presentation or audio descriptions (i.e., items c. and d. above) must be user-selectable unless permanent.

A5. Self Contained, Closed Products Standards

- a. Self contained products must be usable by people with disabilities without requiring an end-user to attach assistive technology to the product. Personal headsets for private listening are not assistive technology.
- b. When a timed response is required, the user must be alerted and given sufficient time to indicate more time is required.
- c. Where a product utilizes touch screens or contact-sensitive controls, a redundant set of controls is required and must comply with Items k1. through k4. in Section A3.
- d. When biometric forms of user identification or control are used, an alternative form of identification or activation, which does not require the user to possess particular biological characteristics, must also be provided.
- e. When products provide auditory output, the audio signal must be provided at a standard signal level through an industry standard connector that will allow for private listening. The product must provide the ability to interrupt, pause, and restart the audio at anytime.

- f. When products deliver voice output in a public area, incremental volume control must be provided with output amplification up to a level of at least 65 dB. Where the ambient noise level of the environment is above 45 dB, a volume gain of at least 20 dB above the ambient level must be user selectable. A function must be provided to automatically reset the volume to the default level after every use.
- g. Color coding must not be used as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.
- h. When a product permits a user to adjust color and contrast settings, a range of color selections capable of producing a variety of contrast levels must be provided.
- i. Products must be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.
- j. Products which are freestanding, non-portable, and intended to be used in one location and which have operable controls must comply with the following:
 1. The position of any operable control must be determined with respect to a vertical plane, which is 48 inches in length, centered on the operable control, and at the maximum protrusion of the product within the 48 inch length.
 2. Where any operable control is 10 inches or less behind the reference plane, the height must be 54 inches maximum and 15 inches minimum above the floor.
 3. Where any operable control is more than 10 inches and not more than 24 inches behind the reference plane, the height must be 46 inches maximum and 15 inches minimum above the floor.
 4. Operable controls must not be more than 24 inches behind the reference plane.

A6. Desktop and Portable Computers Standards

- a. All mechanically operated controls and keys must comply with Items k1. through k4. in Section A3.
- b. If a product utilizes touch screens or touch-operated controls, an input method must be provided that complies with Items k1. through k4. in Section A3.
- c. When biometric forms of user identification or control are used, an alternative form of identification or activation, which does not require the user to possess particular biological characteristics, must also be provided.
- d. Where provided, at least one of each type of expansion slots, ports and connectors must comply with publicly available industry standards.

A7. Functional Performance Criteria

- a. At least one mode of operation and information retrieval that does not require user vision must be provided, or support for assistive technology used by people who are blind or visually impaired must be provided.
- b. At least one mode of operation and information retrieval that does not require visual acuity greater than 20/70 must be provided in audio and enlarged print output working together or independently, or support for assistive technology used by people who are visually impaired must be provided.

- c. At least one mode of operation and information retrieval that does not require user hearing must be provided, or support for assistive technology used by people who are deaf or hard of hearing must be provided.
- d. Where audio information is important for the use of a product, at least one mode of operation and information retrieval must be provided in an enhanced auditory fashion, or support for assistive hearing devices must be provided.
- e. At least one mode of operation and information retrieval that does not require user speech must be provided, or support for assistive technology used by people with disabilities must be provided.
- f. At least one mode of operation and information retrieval that does not require fine motor control or simultaneous actions and that is operable with limited reach and strength must be provided.

A8. Information, Documentation, and Support

- a. Product support documentation provided to end-users must be made available in alternate formats upon request and at no additional charge.
- b. End-users must have access to a description of the accessibility and compatibility features of products in alternate formats or alternate methods upon request and at no additional charge.
- c. Support services for products must accommodate the communication needs of end-users with disabilities.

Appendix B. – Website Resources

B1. Primary NPFC Product Vendors

- Access Adobe
<http://access.adobe.com/index.html>
- IBM/Lotus Accessibility Center
<http://www-3.ibm.com/able/>
- Microsoft Accessibility
<http://www.microsoft.com/enable/default.htm>
- Microsoft Accessibility Features Documentation
<http://www.microsoft.com/enable/products/microsoft.htm>
- Microsoft Accessibility Features in Windows
<http://www.microsoft.com/enable/products/chartwindows.htm>
- Oracle Accessibility Program
<http://www.oracle.com/accessibility/index.html>

B2. Test Sites and Validators

- Bobby HTML Page Analyzer
<http://www.cast.org/bobby/>
- W3C Accessibility Analyzer
<http://validator.w3.org/>
- W3C Web Content Accessibility Checking Service
<http://www.w3.org/2000/07/eval43/>

B3. Guidelines and Checklists

- Hardware Accessibility Checklist
<http://www-3.ibm.com/able/accesshardware.html>
- Java Accessibility API
<http://java.sun.com/products/jfc/index.html#access>
- Java Accessibility Checklist
<http://www-3.ibm.com/able/accessjava.html>
- Lotus Notes 4 Application Accessibility Checklist
<http://www-3.ibm.com/able/accessnotes.html>

- Lotus Notes R5 Accessibility Checklist
<http://www-3.ibm.com/able/accessr5.html>
- Microsoft Guides for Customizing Accessibility Options in Windows 2000
<http://www.microsoft.com/enable/products/windows2000/steps.htm>
- Microsoft Windows Guidelines for Accessible Software Design
<http://www.microsoft.com/enable/dev/guidelines/software.htm>

Appendix C. – Assistive Technologies

C1. Types of Assistive Technologies

Assistive technologies for computers are also called accessibility aids. These aids are added to computers by people who use them to make computers more accessible. Assistive technology will not work with a software application unless the application has been designed to meet accessibility requirements. Some common aids include:

- **Screen enlargers** help people with low vision. Also called screen magnifiers or large print programs, these utilities are like a magnifying glass. People using them are able to control what area of the computer screen they want enlarged, and can move that focus to view different areas of the screen.
- **Screen reviewers** are for people who are blind. These aids make on-screen information available as synthesized speech or a refreshable Braille display. Also called blind access utilities or screen readers, they can only translate information that is text. Graphics can be translated if there is alternative text describing the visual images.
- **Voice input aids** assist people with mobility impairments. Also called speech recognition programs, these enable people to control computers with their voice instead of a mouse or keyboard.
- **On-screen keyboards** are used by people who are unable to use a standard keyboard. An on-screen keyboard lets people select keys using a pointing method such as pointing devices, switches, or Morse-code input systems.
- **Keyboard filters** are used by people who have trouble typing, or who want to increase typing speed. The filters built into the Windows and Windows NT operating systems compensate somewhat for erratic motion, tremors, slow response time, and similar conditions. Other types of keyboard filters include typing aids, such as word prediction utilities and add-on spell checkers.
- **Alternative input devices** allow individuals to control their computers through means other than a standard keyboard or pointing device.

C2. Sampling of Assistive Products

IBM Home Page Reader - <http://www-3.ibm.com/able/hpr.htm>
Spoken Internet browser for blind and visually impaired users.

Lynx - <http://lynx.browser.org/>
Public-domain text-only browser.

Henter-Joyce JAWS - <http://www.hj.com>
A screen reader that uses Sun's Accessibility API to read Java applications. Sun's Accessibility API allows assistive technologies to interact and communicate with Oracle components. JAWS is recommended by Oracle.

GW Micro Window-Eyes - <http://www.gwmicro.com/>

A screen reader that supports most popular applications including Internet access and is compatible with Adobe Reader.

Microsoft Magnifier

A Windows tool which allows the user to magnify a portion of the screen which is then displayed in a separate magnifier window. Magnifier tracks the focus so it can automatically keep the active area in the magnifier window. Magnifier is available from Microsoft as part of the Software Development Kit (SDK) for MSA.

Teal Magnify – <http://www.tealpoint.com/softlens.htm>

A screen magnifier for Palm OS.

Freedom Scientific - <http://www.freedomsci.com/>

A vendor of many assistive technologies.

Microsoft Accessibility Aids Catalogue -

<http://www.microsoft.com/enable/products/aids.asp>

A catalogue of assistive aids designed for Windows available online or as a downloadable Word for Windows file.

Screen Magnifiers Homepage - <http://www.magnifiers.org/>

Information about information magnifier software for MS-DOS, Microsoft Windows, OS/2 and Macintosh.

Alternative Keyboard And Other Enhancements -

<http://www.utoronto.ca/atrc/reference/tech/altkey.html>

A general list of alternative keyboard vendors.