

# DHS Headquarters

Advanced Distributed Learning (ADL)  
Standards and Specifications Guide

Version 4.0  
January 2007



Homeland  
Security

## **Executive Summary**

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The Advanced Distributed Learning (ADL) Standards and Specifications Guide was developed in collaboration with the Advanced Distributed Learning (ADL) Working Group. This guide is intended for both experienced and novice ADL developers within the Department of Homeland Security (DHS).

This guide provides the following:

- A reference for DHS components in the design and development of ADL content;
- An aid to help document the decisions and material incorporated into component ADL product(s); and
- Established ADL design and development conventions from a variety of military and civilian sources.

This guide can also help to communicate ADL requirements (e.g., design conventions, deliverable evaluation, etc.) to internal staff as well as external developers of DHS ADL content.

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## Revision History

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<b>Version</b>	<b>Date</b>	<b>Authors</b>	<b>Comment</b>
1.0	Nov 2005	ADL Working Group (FLETC and USCG)	Initial document.
2.0	Feb 2006	ADL Program Management Function	Revised and reformatted document to include additional best practices and template samples.
3.0	Apr 2006	James Myers Kathy Becker Section 508 PMO	Inclusion of Section 508 requirements, modifying some guidelines conflicting with accessibility.
4.0	Jan 07	James Myers OAST	Adjusted 508 language

## 1.0 Introduction

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### Purpose

The information provided in this guide should be used as a baseline in the design and development of DHS ADL products. It is intended to help designers and developers within the Department determine strategies, conventions, and standards for interactive courseware. This guide can also be used when communicating specific ADL requirements (e.g., design conventions, deliverable evaluation, etc.) to internal staff and external developers of content.

**Note:** This guide focuses on the design, development, and implementation stages of the ADDIE model of instructional design (i.e. Analysis, Design, Development, Implementation, and Evaluation). The analysis and evaluation stages are left to the discretion of each DHS component. In addition, it should only be used after the decision to develop an ADL product has been made via front-end analysis.

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### Living Document

This guide is a "living" document that will become more exact and detailed through component application and feedback. It will be updated as needed to conform to current industry standards and to accommodate customer or specific project requirements. Please send your comments, recommendations, and data related to this guide to:

**Al Stiles, Advanced Distributed Program Officer**  
**Office of the Chief Human Capital Officer**  
**Advanced Distributed Learning Program Management Function**  
**al.stiles@dhs.gov**

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### Precedence

The information provided in this guide is not intended to supercede or duplicate policies and procedures in other applicable directives, regulations or doctrines. Please inform the ADL Program Management Function (PMF) of any conflicts you observe.

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### Policy

This document provides guidance for DHS component development and management of ADL training products consistent with the Advanced Distributed Learning and Content Management Standards Directive<sup>1</sup>. This directive establishes policy and procedures for the use, acquisition, and development of ADL content within the Department. It also establishes the ADL Content Management Board (CMB), and its role in overseeing and coordinating the ongoing development and maintenance process for DHS ADL content.

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<sup>1</sup> April 2006

**ADL Acquisition and Development**

An important consideration in the acquisition or development of ADL content is if the training need exists at the enterprise level. ADL acquisition and development should be coordinated at the Department level to ensure efficiency and avoid redundancy. Please refer to the Advanced Distributed Learning and Content Management Standards Directive for more information, as well as Appendix A for details concerning the content management process.

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**Definitions**

- *Advanced Distributed Learning (ADL)* - defined as Distance Learning (DL) that leverages the full power of computer, information, and communication technologies to tailor instruction and its delivery to support individual learning needs. Common examples of ADL technologies include Web-based content delivery via a Learning Management System (LMS), Web-based content authoring via a Learning Content Management System (LCMS), Interactive Video Tele-training (IVT), collaborative learning environments, Electronic Performance Support Systems (EPSS), and intelligent tutors and agents.
  - *Instructional Systems Design (ISD)* - this process provides a framework for developing and delivering DHS training. It ensures that training requirements are established and translated into appropriate instructional objectives. ISD can also help to determine the best method to translate objectives into training. This process includes selecting suitable delivery medium, media, and instructional techniques. This document does not provide detailed ISD guidance. However, it does incorporate ISD principals.
  - *ADL Enterprise Inventory* - complete listing of the ADL courseware and content currently planned and in use by the Department.
-

**Working with Contractors**

When working on an ADL project as a designer or Subject Matter Expert (SME), you may find yourself working with a contractor/vendor who is responsible for producing all or part of the ADL product. The decision to work with a contractor will be made by the owner of the ADL product, and will be based upon cost benefit analysis and other data. Your involvement in the contractual ADL development process may include acting as the program manager's Contract Officer's Technical Representative (COTR). Some of your responsibilities may include:

- Quality assurance (e.g. ensuring adherence to DHS standards and policy, instructional integrity, etc.)
- Reviewing Statements of Work (SOW)

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**Statement of Work**

A SOW states the Government's needs in terms of work tasks (i.e., work to be performed in developing or producing the goods to be delivered or services to be performed by a contractor). Some key SOW elements include:

- Background
- Scope
- Applicable documents
- Technical requirements
- Supporting documentation
- Security
- Contracting Officers Technical Representative

When planning a SOW, it is recommended that the ADL Project Manager communicate contract needs with the contracting staff for guidance at the earliest opportunity. An example of an ADL SOW can be found in Appendix B. Further information can be found in the Federal Acquisitions Regulations (FAR).

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## 2.0 Development

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This section identifies development considerations, recommended processes, and naming conventions.

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### 2.1 ADL Development-Preliminary Considerations

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- Minimum Elements**    The goal of ADL training is to provide cost effective, realistic, and performance-based training in a variety of learning environments. To reach this goal, the following elements are recommended at a minimum:
- A user-friendly interface and consistent lesson structure.
  - "Bite-sized" instructional blocks to provide meaningful training.
  - Rapid exit from the course with "bookmarking" capability.
  - Extensive use of help routines and remediation.
  - Use of diagnostic pretests to determine prior knowledge and skills.
  - Confirmation of learning by using a knowledge check and/or post-test.
  - Provisions for easy review of selected portions of the lessons once the user has completed the mandatory portions.
  - Post-tests should identify user weaknesses based on learning objectives.
  - Hardware and software for both the user and developer that can support the ADL program.
  - Identifying all applicable standards of Section 508 that will be required.
-

## 2.2 ADL Development Staffing

### Staffing

Ideally, an ADL development team is preferred over a single developer. The team should be skilled enough and empowered to make the decisions needed to efficiently manage the development process. Due to the complex nature of ADL development, team members should be experienced and available for the duration of the project. Significant time investment is required by both the organization and the ADL developer to learn the skills needed to create effective, dynamic ADL products. For that reason, it is recommended that you select ADL development personnel who can remain on the team for multiple projects instead of trying to build new teams for each project. Individual team roles are identified on the following page. However, many of the roles and responsibilities are typically filled by the same team members if the project/ADL workload is low. Your individual resource environment will dictate how these roles and responsibilities are divided.

### Privacy Act Statement

User requests for personal data must be handled in accordance with Privacy Act regulations. For more information about the Privacy Act, refer to: [www.dhs.gov/interweb/assetlibrary/privacy\\_foia\\_md0460.1.pdf](http://www.dhs.gov/interweb/assetlibrary/privacy_foia_md0460.1.pdf)

### Staffing Responsibilities

The following table identifies development team responsibilities.

**Table 1. Development Team Responsibilities**

<b>Roles</b>	<b>Responsibilities</b>
<b>Sponsor</b>	Authorizes development, provides funding, conducts needs analysis, identifies desired performance objectives and provides subject matter expert (SME) or accomplished performer (AP).
<b>External Project Manager</b>	Supervises project from inception to delivery. Ensures needs analysis is completed, resources are available, monitors team performance and end-user satisfaction.
<b>Instructional Designer</b>	Designs and/or develops ADL products.
<b>Subject Matter Expert (SME)/ Accomplished Performer</b>	Provides necessary technical content information.
<b>Writer</b>	Writes text and assists the instructional designer in the development of ADL scripts.
<b>Editor</b>	Review products for consistency, clarity, usability, and ability to meet desired goals.
<b>Data Entry Specialist</b>	Enters script into authoring system.

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Roles	Responsibilities
<b>Programmer</b>	Writes executable code or runs the authoring system. Assists other team members in the creation of content that can be executed by the authoring system. Should be familiar with Section 508 requirements
<b>Media Expert</b>	Prepares audio and visual material. Helps other team members to select appropriate media for specific applications.
<b>Graphics Designer</b>	Prepares visual layouts for the ADL product. Helps other team members select appropriate graphics that best support the desired learning objectives.
<b>Learner/Evaluator</b>	ADL product end user. Ideally a "typical" trainee who can complete the program and provide feedback to the development team. Users with disabilities can also provide valuable feedback on usability and accessibility. Should be familiar with Section 508 requirements
<b>Product Administrator</b>	Copies, ships, and receives ADL products and related material.
<b>LMS Administrator</b>	Oversees field use and appropriate distribution via the sponsor.
<b>Information Resource Manager</b>	Computer network software/hardware specialist.

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## 2.3 ADL Development Process

**Process** The ADL development process generally follows the six phases outlined in the tables below. The phases are adapted from Gery, Gloria; *Making CBT Happen*, Performance Press; Tolland MA 1995. The responsibility column has been incorporated with ADL developmental staff.

**Table 2. Phase 1: Project Scope/Definition/Research of Existing Databases and Products**

Step	Responsibility	Activity/Deliverables
<b>Step 1</b>	Sponsor	<b>Activity:</b> Provide all existing instructional materials and related subject matter references and documentation.
<b>Step 2</b>	Programmer/ Instructional Designer	<b>Activity:</b> Look for usable products in the ADL Enterprise Inventory, DITIS (DOD), and other commercial software databases. Review materials.
<b>Step 3</b>	Sponsor	<b>Activity:</b> Assign accountable SMEs, course managers, and approval levels/individuals.
<b>Step 4</b>	Sponsor /External Project Manager/ Instructional Designer	<b>Activity:</b> Scope the project in a series of meetings/activities resulting in the following deliverables: <ul style="list-style-type: none"> <li>• Learner audience(s) defined</li> <li>• Course learning objectives</li> <li>• Course topic listing</li> <li>• Interactivity level specifications</li> <li>• Course standards</li> <li>• Preliminary design schedule</li> <li>• Program documentation</li> </ul>
<b>Step 5</b>	Sponsor	<b>Activity:</b> Sponsor sign-off

**Table 3. Phase 2: Design**

Step	Responsibility	Activity/Deliverables
<b>Step 1</b>	Instructional Designer	<b>Activity:</b> Structure topical sequences, generate specific instructional design strategies, and define supporting graphics. Establish learner paths for each learner population. Learner testing (see Testing Section)
<b>Step 2</b>	External Project Manager / Instructional Designer	<b>Activity:</b> Review and revise structure, design, and graphics in joint meetings resulting in the following deliverables: <ul style="list-style-type: none"> <li>• Course design document</li> <li>• Program documentation</li> </ul>
<b>Step 3</b>	Sponsor	<b>Activity:</b> Sponsor sign-off

Step	Responsibility	Activity/Deliverables
<b>Step 4</b>	Programmer / Learner/Evaluator / External Project Manager	<b>Activity:</b> Revise-as-you-go as components of the course are nearing a useable form; try them out on actual learners. Revise the course as necessary. (this is also called <i>Rapid Prototyping</i> )

**Table 4. Phase 3: Development/Scripting**

Step	Responsibility	Activity/Deliverables
<b>Step 1</b>	Writer/ Data Entry Specialist/ Programmer/ Media Expert/ Graphics Designer	<b>Activity:</b> Scripting, storyboarding and detailed graphics, and test development.
<b>Step 2</b>	External Project Manager / Instructional Designer/ Graphic Designer	<b>Activity:</b> Review and revise text and graphics in joint meetings resulting in the following deliverables: <ul style="list-style-type: none"> <li>• Storyboards/script</li> <li>• Program Documentation</li> </ul>
<b>Step 3</b>	Sponsor	<b>Activity:</b> Sponsor sign-off
<b>Step 4</b>	Programmer / Learner/Evaluator / External Project Manager	<b>Activity:</b> Revise-as-you-go as components of the course are nearing a useable form; try them out on actual learners. Revise the course as necessary (this is also called rapid pototyping).

**Table 5. Phase 4: Authoring**

Step	Responsibility	Activity/Deliverables
<b>Step 1</b>	Data Entry Specialist/ Programmer	<b>Activity:</b> Input to authoring system and programming of graphic images and special routines. Testing and debugging.
<b>Step 2</b>	Sponsor	<b>Activity:</b> Revise-as-you-go. Courseware review and representative learner testing.
<b>Step 3</b>	Sponsor/ External Project Manager / Instructional Designer/Programmer	<b>Activity:</b> Revise product resulting in the following deliverables: <ul style="list-style-type: none"> <li>• ADL courseware</li> <li>• Program Documentation</li> </ul>
<b>Step 4</b>	Sponsor	<b>Activity:</b> Sponsor sign-off

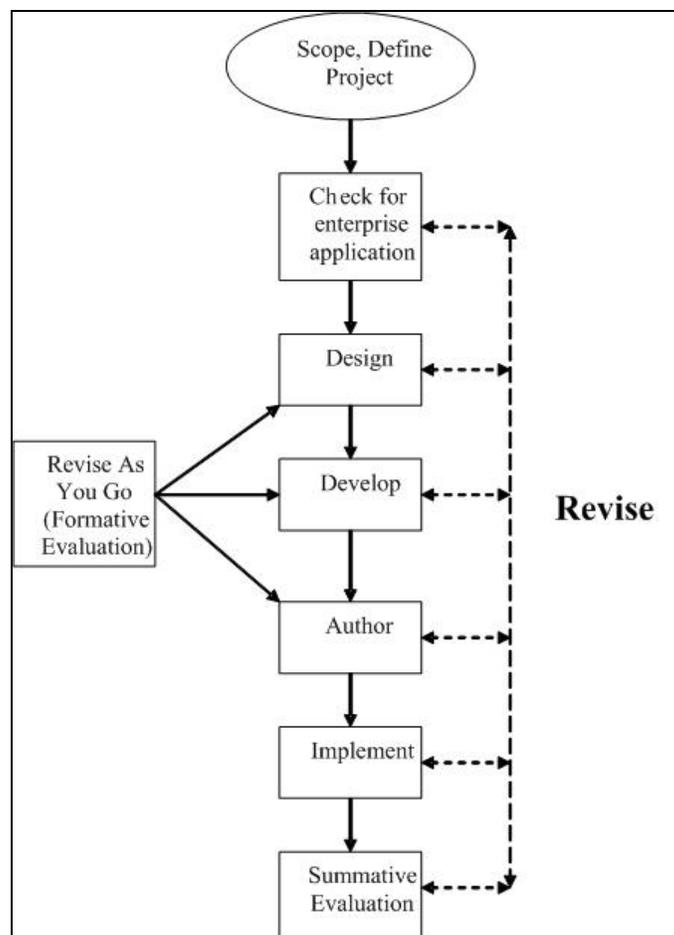
**Table 6. Phase 5: Implementation**

Step	Responsibility	Activity/Deliverables
<b>Step 1</b>	Instructional Designer	<b>Activity:</b> Packages the program with documentation and explanation of student assessment.
<b>Step 2</b>	Sponsor/ External Project Manager/ Product Administrator	<b>Activity:</b> .Distributes course and materials to learner.

**Table 7. Phase 6: Evaluation**

Step	Responsibility	Activity/Deliverables
<b>Step 1</b>	Instructional Designer / Sponsor / External Project Manager	<b>Activity:</b> Develops an evaluation plan. Select and plan the summative evaluation.
<b>Step 2</b>	Sponsor / External Project Manager	<b>Activity:</b> Schedules and implements the summative evaluation plan.
<b>Step 3</b>	Instructional Designer	<b>Activity:</b> Make revisions as necessary resulting in the following deliverable: <ul style="list-style-type: none"> <li>• ADL Courseware</li> </ul>
<b>Step 4</b>	Sponsor	<b>Activity:</b> Review and approval

The following image represents the ADL product development process. **Note:** The step labeled “Check for Enterprise Application” refers to the Content Management Board (CMB) process illustrated in Appendix A of this guide.

**Figure 1. Product Development Process**

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## 2.4 ADL Naming Convention

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**Rationale** Multimedia developers typically produce many versions of the same files during the ADL development process. Tracking these files can pose a significant management problem unless developers and reviewers follow a standardized file naming convention.

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**Sample Format** The following format is recommended as a file/project naming convention. Although you can adopt your own naming convention, using this one should make it easier to access and use files from other DHS development teams. The following example is for a Fingerprinting Web-based Training (WBT).

**Table 8. Fingerprinting Sample Format**

Title	Description	Examples
Project Name	Use a descriptive name that ranges from general to specific. Use underscores between words and to separate sections.	<b>Fingerprinting_v1-0</b>
Version/ Release	This number denotes major release and version number. The first revision would be 1-1, the next major release would be 2-0, etc.	<b>Fingerprinting_v1-0</b>

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## 3.0 Technical Requirements

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This section discusses the technical requirements that should be considered when developing ADL products.

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### 3.1 SCORM

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#### Shareable Content Object Reference Model (SCORM)

SCORM, developed as part of the ADL Co-Lab initiative, is designed to be a standard to promote the reusability and interoperability of learning content. Initially designed for use in the Department of Defense, SCORM has been adopted by the majority of LMS vendors as a supported standard, which has influenced its adoption among most other Federal agencies as well. DHS ADL is no exception to this trend. As a result, all content developed for inclusion in the DHS ADL Enterprise Inventory will be developed to be SCORM 1.2 conformant (moving towards SCORM 2004 in the future). This will ensure that all content can be leveraged across platforms.

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#### SCORM 1.2 Testing

All DHS ADL courses loaded on DHS LMS' must be SCORM 1.2 compliant and must pass three out of four tests in the "SCORM Version 1.2 Conformance Test Suite Version 1.2.6 (Self Test)." The fourth test is a runtime test and must be completed by the LMS administrator. To pass this test, the course must load, run and report back to the LMS. SCORM Version 1.2 Conformance Test Suite Version 1.2.6 (Self Test) can be downloaded from <http://www.adlnet.org/>

Note: Exact usage guidelines will be forthcoming in future versions of this guide.

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### 3.1.1 Content Requirements

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**Content Requirements**

Managing the movement of content from developers to the DHS ADL Enterprise Inventory requires that content is packaged in a SCORM format that can be aggregated and disaggregated easily. Courses will not be created as one large monolithic unit, with a rigid structure that ties the content into one learning context. Instead, content should be composed of small, stand-alone, context-independent units that can be reused in multiple contexts. Content should adhere to the spirit of the SCORM initiative. Content formats may include HTML/JavaScript, Cascading Style Sheets (CSS), layers, among others to provide interactivity within the content.

Developers should ensure that a metadata document is provided for each Sharable Content Object (SCO) contained in the content as well as a separate metadata document for the course. The required data elements for SCOs and courses should be identical.

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**Sharable Content Objects**

SCORM requires SCOs to be able to establish and terminate communication with the LMS. All content supplied to the DHS ADL PMF must meet this requirement, as well as some additional requirements. The data to be provided will depend on the type of content. Content objects used to present information to students are referred to as “Instructional SCOs”. Content objects used to assess how much students learn from the information presented are classified as “assessment SCOs.”

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**Recommendations for Instructional SCOs**

Instructional SCOs should be programmed to carry out the following tasks:

- Present information to the student in an instructionally sound manner, using logical progression of information presentation that adheres to an instructional method.
  - Report whether the student has completed the SCO when they exit.
  - If a student has not completed the SCO upon exiting, the SCO should report bookmarking data to the LMS.
  - When the student re-enters the SCO, the SCO should query the LMS for the bookmarking data.
  - Upon receipt of the bookmarking data from the LMS, the SCO should implement bookmarking functionality.
-

**Recommendations  
for Assessment  
SCOs**

Assessment SCOs should be programmed to carry out the following tasks:

- Report completion data and the percentage of questions answered correctly to the LMS.
  - Store the completion data in a data element.
- 

### 3.2 Section 508 Requirements

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**Section 508  
Compliance  
for Web Pages**

All courseware that is placed on DHS LMS' must be in compliance with the applicable requirements of Section 508 of the Rehabilitation Act of 1973, as amended 29 U.S.C. 794d by the Workforce Investment Act of 1998. The technical standards provide criteria specific to six main categories:

- Software applications and operating systems
- Web-based information or applications
- Telecommunication products
- Video or multimedia products
- Self-contained, closed products such as information kiosks or fax machines
- Desktop and portable computers

In addition to meeting all applicable technical standards, functional performance criteria and all related documentation and support must be compliant to the standards of Section 508. The Section 508 standards may be found at: <http://www.access-board.gov/sec508/guide/>.

The specific standard, including additional compliance explanation for Web-based information and applications can be accessed at: <http://www.access-board.gov/sec508/guide/1194.22.htm>.

**Note:** Refer to Appendix D for further information on Section 508 requirements.

**Accessibility Board**

WBT courses must meet all requirements of the Accessibility Board. The applicable standards may be found at:

<http://www.access-board.gov/sec508/guide/>.

The specific standard, including additional compliance explanation for Web-based information and applications can be accessed at:

<http://www.access-board.gov/sec508/guide/1194.22.htm>.

Refer to Appendix D for further information on Section 508 requirements.

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## 4.0 Visual Interface and Design Elements

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This section introduces some proposed visual interface and design element standards and helps you decide where to place your title, text, graphics, navigation icons, and other lesson information on the screen.

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### 4.1 Interface Design

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#### General

The educational message should be quickly relayed to the student on every screen. The lesson layout should be kept simple for maximum impact. When practical, these layouts should remain consistent throughout your lesson. The following concepts may help you in basic layout design.

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#### Consistency

Consistency is a key goal for the ADL designer and developer. Strive for consistent architecture, video and graphics screen composition, student interaction with the courseware, screen color schemes, navigation elements, testing strategies, and other courseware design conventions. While it is most important to maintain consistency within a given course of instruction, consistency between courses presented on the same device is also important. Following the principles in this manual should help you create products that meet these criteria.

---

#### Design Elements

Design elements are object size, color, and text styles. Ensure each element has been given careful thought for message transmission and aesthetics. Remember to treat text as a visual graphic.

**Section 508 Note:** Non-text elements (graphics, images, etc) must have equivalent text descriptions

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## 4.2 Templates

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### Overview

Templates provide a framework for designers and developers to place graphics, text, and navigation buttons in a reusable system. Using a template enables you to avoid wasting time and money on building the navigation and presentation system from the ground up. It also enables the development team to work within the same framework, even though their individual efforts may be focused on different screens or modules.

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### 4.2.1 Templates as Tools

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#### A Time and Money Saver

Building your template first or using an existing one, can greatly reduce the time needed to finish your project by driving the development team towards a more focused development approach. Here are a few reasons why:

- **Text.** Writers know how much text they can place on an individual screen (since the template shows how much area is available) instead of simply writing out all of the text for a particular topic - forcing a developer to chunk it out later on.
  - **Graphics and Media.** Graphic designers can appropriately size images, pictures, and other media to fit the screen area/color scheme of the template. Again, a time/money saver if done up front.
  - **Navigation.** The development team can focus their efforts in building appropriate content/learning interactions as well as ensuring accessibility (Section 508) has been addressed, instead of creating the navigation system as they go.
  - **Compliance.** By utilizing 508 compliant templates, developers will build content on an accessible base. Going through each screen to fix compliance issues of template elements would be a poor use of time.
- 

#### Uniformity

Reusing templates throughout several courses enables the student to learn the basic navigation and presentation system once and then carry forward their knowledge to the next module or program. A good reusable template enables the student to focus on the content (the message) and not on the presentation system (the media).

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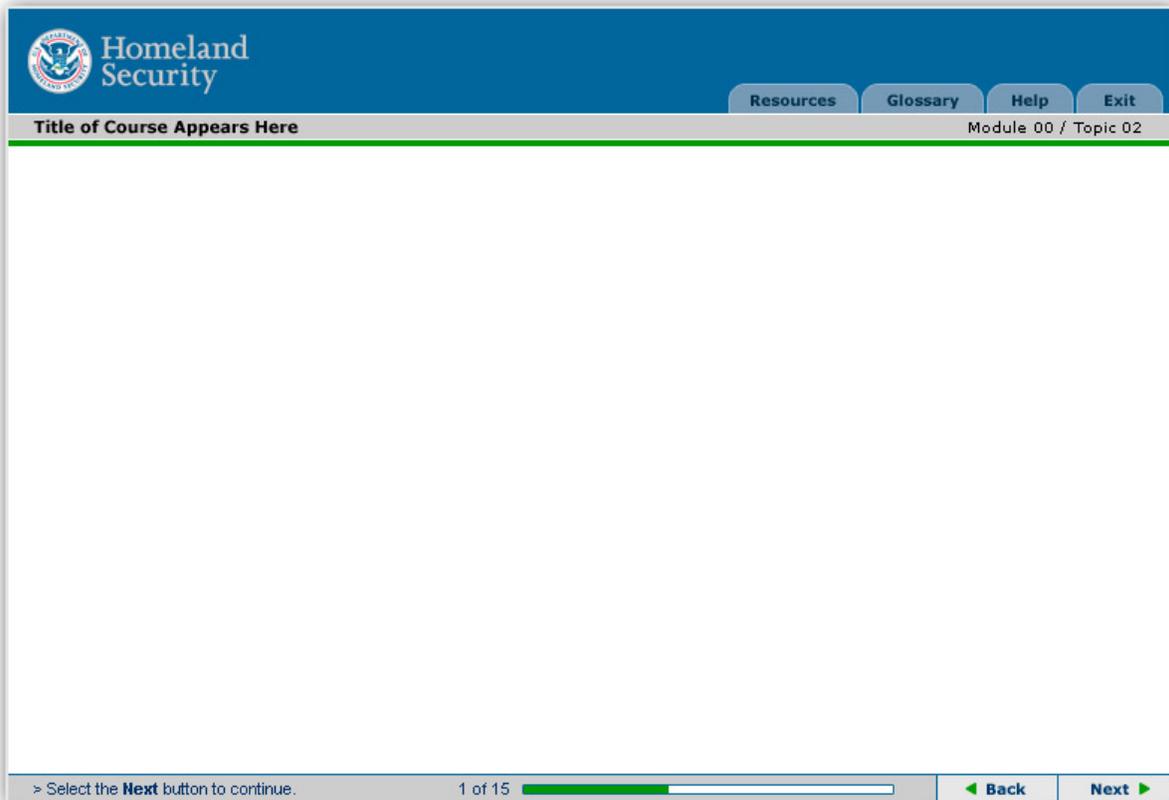
**Maintenance**

Templates, especially when used in conjunction with models, can make it easier to maintain an ADL course over its lifecycle. Personnel charged with maintaining the course can focus more on needed content changes and less on understanding how the learning interactions, navigation systems, and presentation displays were created. Designers and developers are encouraged to share templates with other DHS components and development teams.

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**Example**

Templates can be in the form of entire lesson shells, demonstration shells, testing shells, navigation, or logic operations. The following is a graphic representation of a proposed template for ADL content (based on DHS brand guidance). Note: A common set of templates will be defined over time for DHS, where applicable.



**Figure 2. Sample Course Template**

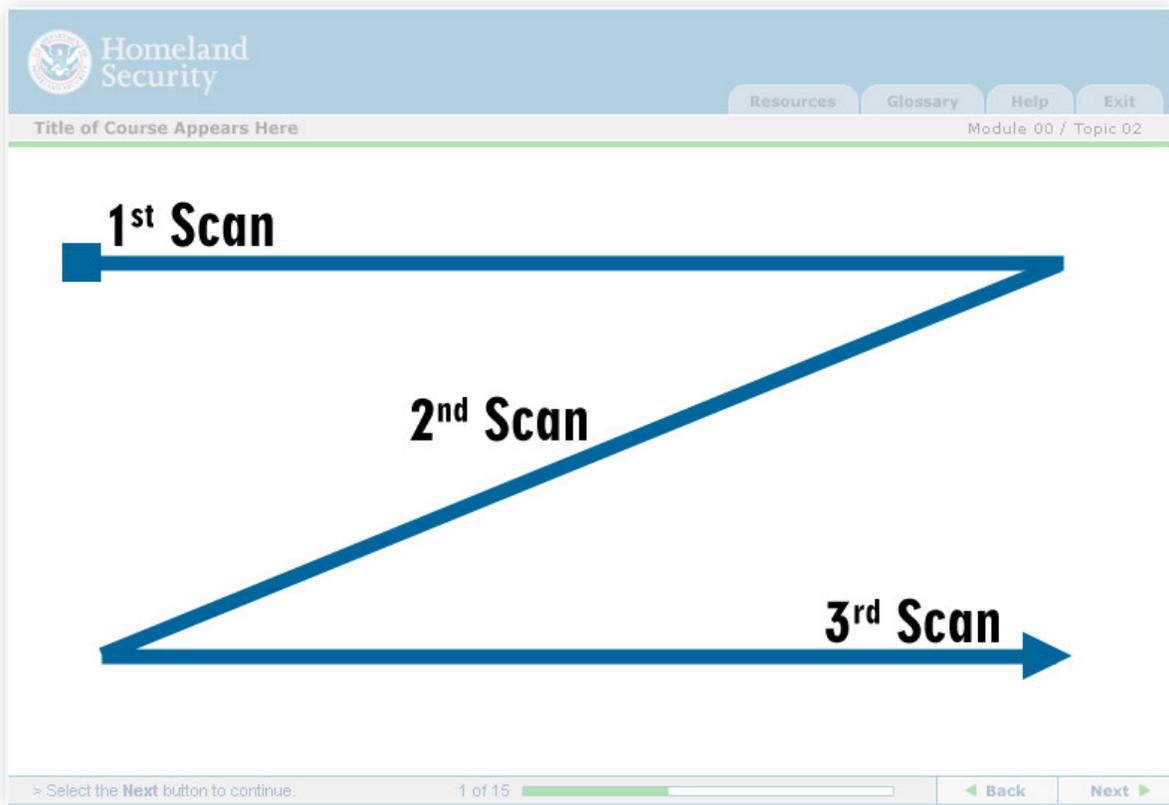
---

---

### 4.3 Screen Layout Principles and Design

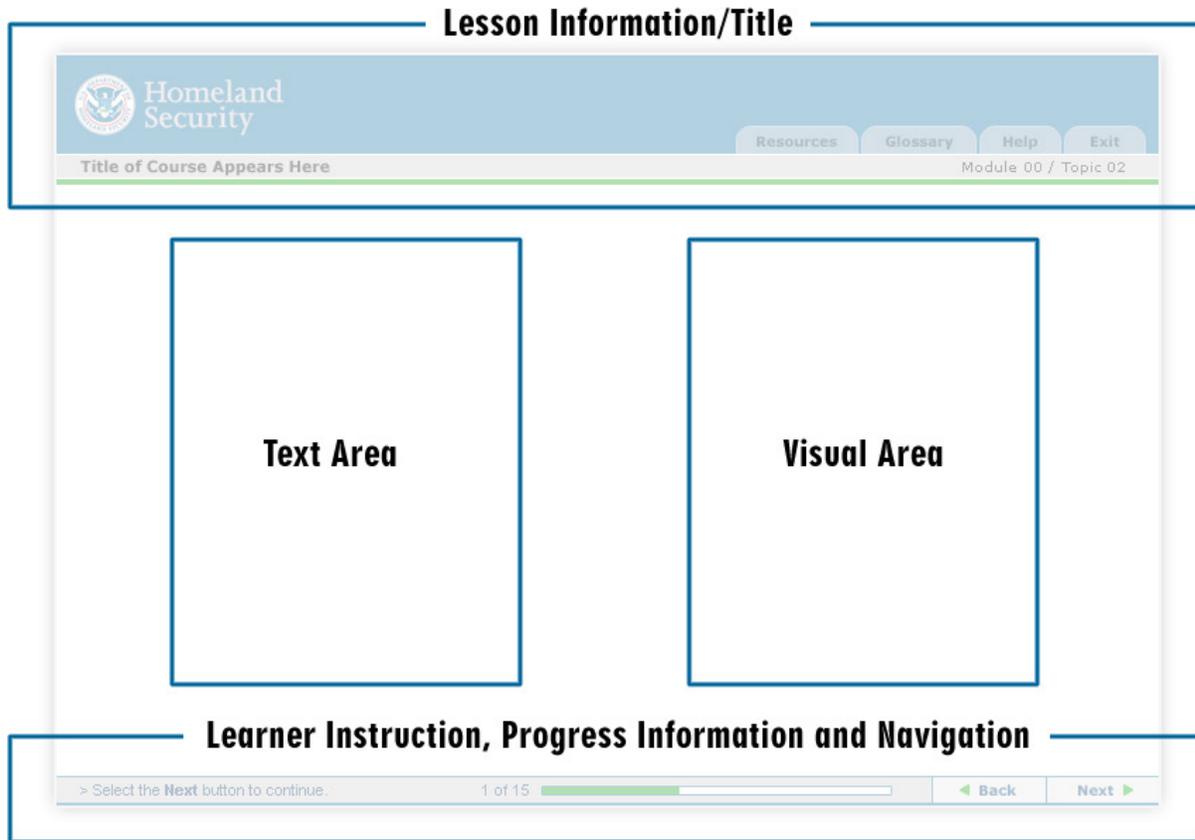
---

**Student Scanning** Students read in a "Z" pattern. Generally, students will scan the screen in this same way, unless color or size has drawn their attention elsewhere (as illustrated in the graphic below). In addition, the same flow of information must be available to users of assistive technologies. Some coding practices may provide a visual representation with the source code having a different flow when files are rendered in linear format and this must be avoided.



**Figure 3. Student Scan Pattern**

**Screen Division** For a basic lesson, it is recommended to divide your screen into the four areas as shown below.



**Figure 4. Screen Division Example**

**Information Location**

The primary message element (text, graphics, video, etc.) should be on the left side of the screen. The secondary or supplemental material should be on the right.

**Section 508 Note:** This left text area must provide all information as the “primary message element” meeting Section 508 requirements. A visual area as shown on the right can only serve to repeat visually what was provided in the compliant text area.

**Navigation**

When navigation icons are on the screen, they should be placed at the bottom or the bottom right of the screen (refer to the figure above).

---

**Other Information**      Less important information, such as lesson title, should be placed at the top with a conspicuous color and size having contrast that is easily discernable

---

**Simple Checks for Screen Layout**

- Are the screens cluttered or too "busy"?
- Is it easy to see how the information on the screen is organized?
- Are the colors and graphics used in the basic layout attractive and not distracting?
- Are the screens of the course consistent and easily used?
- Are all navigation features available and allow use of a keyboard only?

---

## 4.4 Color

---

**General**      The amount and variety of colors on the screen make a big difference in how people view the lesson. Generally, you should use four or fewer colors per screen. Of course, more colors can be used to provide realism in graphics.

---

**Screen Depth**      When possible, screen depth should be set for thousands of colors in both the operating system settings and the authoring software settings. This will eliminate erratic color changes and shifts during your project. If choosing thousands is not possible, ensure that a standardized color palette is used throughout your project.

---

**Color Messages**      Choose colors wisely. Certain colors carry special meanings in our society. For example:

- Green = go, passive, peaceful
- Yellow = caution, slow down, or lock out
- Red = stop, warning, danger

Color can also be used in an unnatural way to give a special effect. For example:

- Blue spaghetti
- Yellow coffee
- Purple ketchup

---

---

**Section 508 Note:** Color may never be used as the only method of conveying information, indicating action, prompting a response or distinguishing a visual element. Remember that end users can change text and background colors in their browsers.

---

### Color Combination and Contrast

Certain color combinations do not work well on a computer screen. For example:

- Red-green
- Orange-blue
- Fuchsia and any color

Use contrasting combinations. For example, white text on a medium to dark blue background is easy to read. Black text on a gray background is also a good combination. Blue text on a blue background is much harder to read.

---

### Simple Checks for Color

- Are four or fewer colors used for your layouts?
  - Have you used colors wisely and consistently?
  - Do your backgrounds and major visual elements have sufficient contrast?
  - If you printed the screen to a black and white printer, is all of the information conveyed?
- 

## 4.5 Fonts

---

### Types

Font types should be carefully selected. For standard text, use fonts that are legible. For each lesson, use three or fewer fonts. Use one font for headings and titles and another for text messages. Versatility can be achieved by varying the amount of size rather than choosing a new font. Ensure font and size selections are appropriate for on-screen reading. ADL products will be online and/or on-screen, which mandates the use of Sans-Serif Fonts for legibility.

---

### San Serif Fonts

San serif fonts such as Ariel, Verdana, Tahoma, and Trebuchet MS are suited for all ADL products. They are good for body text and headlines.

---

**Style** The style of a font (bold, larger, italics, etc.) can not contribute a certain message of its own.

**Section 508 Note:** It is a 508 requirement that all Web pages not have a dependency on an associated style sheet. Therefore, a recommendation is to always use external style sheets. End users can also modify their Web browser's font styles.

**Simple Checks for Fonts**

- Are the fonts easily readable?
- Did you use three or fewer fonts?
- Have you used font styles (bold, italic, etc.) judiciously making sure information is not dependant on these styles?
- Did you use an external style sheet rather than hard-coding styles?

## 4.6 Text

**Value Added**

Ensure that the text written is of value and not just filler. If text is necessary, ensure that you put as much information into as few words as possible. Pick individual words that give the most information.

**Language Use**

The following attributes should be used with text:

- Active voice; and
- Present tense.

**Examples and Non-Examples**

The following chart shows examples and non-examples of language use.

**Table 9. Examples and Non-Examples**

Example	Non-Example
<b>Active Voice/Present Tense</b> Jim is painting the garage.	<b>Passive Voice</b> The garage is being painted by Jim. The garage was painted by Jim
<b>Concrete</b> Paper, blue, boy	<b>Abstract</b> Freedom, peace, love
<b>Positive</b> Turn the light switch on.	<b>Negative</b> Turn the light switch not to the off position.

Example	Non-Example
<p align="center"><b>Common Vocabulary/Single Syllable</b></p> <p align="center">Must Go to bed.</p>	<p align="center"><b>Uncommon Vocabulary/Multi-Syllable</b></p> <p align="center">Incumbent upon Travel to the point of repose</p>

---

### Acronyms

- Avoid the use of acronyms, abbreviations, and jargon. If you need to use acronyms, provide a glossary with the complete meaning.
- Use technical terms and abbreviations as they occur (example "EMER PWR ON")
- Capitalize whenever you refer to a switch position (example "BCT PWR switch to HIGH")
- Technical phrases rather than jargon (example "Emergency Power Switch" instead of "Panic Button")

---

### Emphasis

- To emphasize text, effects such as bold, italics, or changing the font size or color can not be the only method used to convey specific information. Any emphasis using these methods must also have some form of mark-up readable by assistive technologies
- You should not use all red or yellow as text, even though it looks good on a dark background. All red or yellow text is difficult to read.
- You should not use underlined text. Underlined text looks like a hyperlink and may confuse the learner.
- You shall not use flashing text unless it is simulating equipment indications. Flashing text can be distracting and annoying to the learner. The use of flashing text within certain flash rates is a violation of Section 508.

---

### Capitalization

Use a mixture of upper and lower case letters. Always CAPITALIZE switch/component names, or follow the terms and abbreviations used on the equipment. Avoid using capitalization at other times.

---

### Text Display

Use six or fewer lines of text per screen. Each line should contain no more than six words. Use justification, spacing, border size, and text box design to make the text appealing.

**Humor**

Be careful in using humor. Humor used in the correct way can maintain audience interest. You have to know your audience well in order to be successful without being offensive. The bottom line is to be professional with your humor if it is used at all.

---

**Simple Checks  
for Text**

- Is the language, abbreviations, and acronyms used appropriate for the target audience?
  - Is the text grammatically correct and uses proper, consistent punctuation?
  - Is your text short and to the point (6 lines or less)?
  - Does the text tell all that is needed and the visual elements presented only serve as redundant information?
-

## 4.7 Media Elements

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### Media Elements

Media elements are used to convey information outside of text.

They include:

- Computer generated graphics (two or three dimensional)
  - Photographs in a variety of formats (e.g., JPEG, GIF, PNG, and BMP, etc.)
  - Computer generated graphics (two or three dimensional) video/animation formats (e.g., MPEG, AVI, MOV, SWF, FLV, etc.)
  - Audio formats (e.g., wav, au, aiff, pcm, mid, etc.)
- 

### Media Selection

You should seek the guidance of an instructional technology specialist or media specialist for media selection. Here are some general rules of thumb:

- **Graphics/Photos** - The old adage "a picture is worth a thousand words" is just as true in interactive courseware. Graphics can be used to enhance the transfer of learning by providing a clear, succinct presentation of the lesson objectives.
- **Audio** - Narration can be used to appeal to a learner's auditory senses. In fact, some people prefer and learn better from listening to a narration of the key points of the lesson.
- **Video/Animation** - Used to show actual performance or to simulate complex functions and principles.

**Section 508 Note:** It is important to remember that while providing these media selections, you must ensure that users with disabilities receive the same information and training experience. For instance, the use of an audio narration would mandate the need to provide an alert that sound is being played and captioning to support hearing disabilities. For videos, the captioning must be synchronized with the audio. Other requirements for the video, animation, graphics and photos would also need to be provided audibly or support tools used by individuals with blindness or vision impairments.

---

**Use of Visuals**

When employing visual elements, ensure the visual:

- Is necessary to convey the concept that has already been described.
  - Is large enough to see pertinent information.
  - Has sufficient detail to see pertinent information.
  - Never uses color to focus attention or convey meaning without providing it in another way also.
  - Supports other elements on the screen.
  - Is not cluttered with unnecessary details.
- 

**Photos/Graphics**

Whenever possible, use a graphic in place of a photo. This will allow the learner to focus on key concepts. If a photo is absolutely needed, then use a digitized photograph that has proper lighting, angle, focus and scale. Graphics and photographs should be designed to run/display using thousands of colors or standardized color palettes if possible. Otherwise use the same color palette for all graphics.

---

**Video/Animations**

The learner should control repetition of video and animation sequences. Video and animations should be large enough to effectively convey information. Be aware that high quality video files require large amounts of hard disk space.

**Section 508 Note:** Video must have synchronized captioning. All visual content of the video must also be described audibly or provide support for assistive technology.

---

**Audio**

When used, audio should complement the text and visuals. Audio should not include extraneous information, unwanted sounds or inappropriate pauses. Narration should be attractive, credible and engaging with appropriate volume, pace and tone. Narration should not mimic the text. Be aware that large, high quality audio requires large amounts of hard disk space. You should use a professional narrator. Professional voices add the correct emphasis and interest to the narration. Approximately seven seconds of narration is the maximum recommended for a single piece of narration. Chunking sound is just as important as chunking text.

**Section 508 Note:** Using audio (with no video) requires that a method be available that visually alerts a user that audio is being played and a transcript of the narration must be available. This is to support users with hearing disabilities. Please note that if you are relying on “on-screen” text as captioning, the narration must mimic the text.

---

---

**Media Management** Create libraries (see glossary) of your media elements for each project. This organizes content and conserves disk space for multimedia projects. Use a consistent naming convention for media elements. For example:

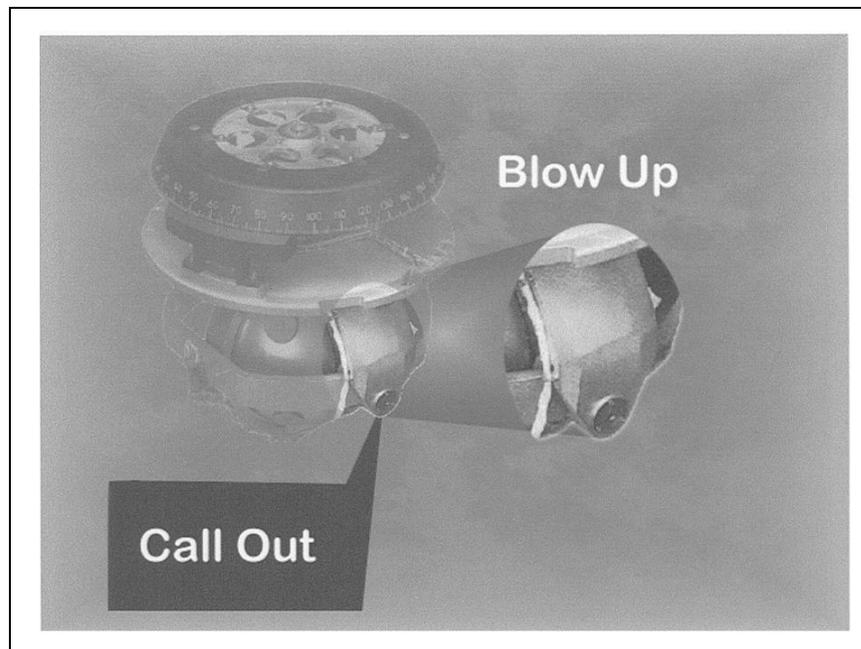
- softleft\_Pb - is a push-button
- sec5 Timer - is a 5 second timer
- rpm \_ Ind - is an RPM indicator
- volume Sw - is a volume switch

Text files of spoken audio clips should be maintained for later revisions.

---

**Points of Interest** Use call outs or blow ups to point out areas of interest. The following illustration shows an example of a call out and a blow up.

**Section 508 Note:** The text description of the graphic shall include the call out purpose or describe the blow up.



**Figure 5. Call Out Example**

---

**Simple Checks  
for Media**

- Do the media elements used clearly enhance the learning process?
- Are the graphics too simple or too detailed?
- Is there enough animation to keep the program interesting without being distracting?

The table on the following pages describes each type of media.



















## 4.8 Animation

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This section identifies the recommended standards and technical considerations for using animation.

### Recommended Standards

The following list of recommended standards should be used when developing simple and complex animations for WBT:

- Avoid using blinking screen elements (for example, text or graphics).
- Avoid animation that moves across the screen or otherwise distracts learners from the content.
- Use special effects only when required for emphasis or transition. Do not use any special effect that takes attention away from learning.
- Consider your audience. Think carefully before using cartoon-like animations, and remember, your audience includes users that have hearing, vision, speech and motor skill disabilities.
- Engage learner interaction with the animations by allowing them to click an item/graphic element, button, or text to play an animation or video clip. All interaction controls must also be keyboard accessible.
- Ensure that animation paths, colors, and object distinctions remain clear and uncluttered.
- Use complex 2-D/3-D animation to: Show key concepts that are difficult to describe or are impossible or cost-prohibitive to photograph or videotape; and when the animation or parts of the animation will be reused elsewhere in the course. The animation may help clarify the text description but can not replace.

---

### Technical Considerations

The following list of recommended guidelines should be used when producing animations for WBT:

- 2-D animations should be created in Flash/Shockwave® format (.swf) at the appropriate resolution.
- 3-D animations should be created at a resolution of 320x240 and should be created as either digital video files or Flash/Shockwave (.swf) files.
- “Hybrid” animations that can include 3-D imagery and/or more complex 2-D animations should be created in Flash/Shockwave format (.swf).

- The Flash 6.0/MX player allows for viewing of video within a Flash .swf file. Video within Flash must either be a linked QuickTime file or embedded Sorenson-encoded digital video file.
- All presentation shall utilize accessibility features of the selected technology such as the Flash accessibility panel. This will allow for the proper coding of interface elements.
- Compliance with “Software” standards of Section 508 has specific requirements for the use of animations.

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## 4.9 Digital Audio

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This section discusses the pre-and post-production recommendations for digital audio development.

### Pre-Production

Original audio is expensive to produce and once outdated, requires further expense to update. Use audio judiciously. The following list of recommended standards should be used to select audio. Design audio into lessons where it is critical to the mastery of the learning objectives.

- Create a separate script to correspond to each changing element within the screen. For example, if the audio is to be synced with the appearance of three bullets, then create three separate audio scripts. Label the scripts and the event to explain the relationship.
- Before recording any audio, make sure all scripts are ready and signed-off.
- Remember that legal issues will only arise based on the content of your digital audio files. If you do not have the copyright to distribute a sound byte or song, but do so anyway, it is illegal. When obtaining rights to use any audio, make sure that you verify your ability to use it in a multimedia environment (e.g., Web, CD-ROM, etc.).
- Avoid long pauses in visuals waiting for extended narration to finish.
- Make clear the transition from one concept to another.
- State in the storyboard the actual words to be recorded. If additional space is necessary, add a page.
- Keep language simple, active, and direct. Use short sentences. Avoid acronyms, technical jargon, and unfamiliar terms. Define terms if used.
- Express all numbers numerically.
- Format the acronym to reflect each letter if it is to be read (for example, R-M-P).

**Production and Post-Production**

The following list of recommended guidelines should be used for audio production and post-production:

- Use a professional narrator for all narration. Ensure that the narrator uses an appropriate style and tone.
  - Create a text transcript of the audio in accordance with current accessibility standards so that the transcripts are available for use in closed captioning and as a separate document download. The script should be made available when the audio plays.
  - Digitize at 44.1 kHz sample rate, 16 bit sample size (sample resolution).
  - When down-sampling for use in a Web or CD-ROM environment, follow these general standards: For music, leave it at that 44.1 kHz rate; for speech in a foreign language, down-sample to 22.05; for native language, down-sample to 11.025.
  - Save source files as .wav files and back them up on a CD-ROM as regular data files and not encoded audio files (do not make a music CD from them).
  - When performing audio compression, consider MP3 (MPEG-1 Audio layer III) as an option. While you can choose many different bit rates for MP3, a common practice is to use 128 kilobits per second for music recorded in stereo, and 64 kilobits per second for music in mono. MP3 allows a 32MB .wav file to be compressed down to about 3MB, increasing the feasibility to download it via the Internet. The latest in audio compression standards, such as MPEG-4, should also be weighed against user requirements.
  - Various file types can “embed” audio within them. These include Flash, Shockwave, and various video file formats. In all of these formats, the best and latest built-in audio compression option(s) should be considered when building content. For Flash and Shockwave, this could mean MP3 compression; while for many current video codecs, this would mean the MPEG4-based audio compression already built into many of them.
-

## 4.10 Digital Video

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This section discusses the pre-and post-production recommendations for digital video development.

### Pre-Production

Video should be used very judiciously. The following recommended standards should be applied when selecting and using video in WBT:

- Video should be used to reinforce, clarify, or emphasize a specific behavior or learning objective that cannot be effectively taught using graphics, stills, photographs, or animations.
- There are various costs involved in producing a video. Making sure that segments of edited video tell a story and are thought out in advance of the editing process can be time consuming and expensive. Video editors need a strong producer/director to give them direction on what needs to be done.
- Before embarking on a video production, make sure all scripts are ready and signed off.
- If possible, professional actors should be used for video productions.
- Continuous video clips (more than 15–20 seconds in length) should not be used.
- Appropriate video format for the content should be presented (for example, talking head, show and tell, interview, panel discussion, simulation, or dramatization).
- Remember that legal issues can arise from the content in digital video files. If you do not have the copyright to distribute a captured video image but do so anyway, it is illegal. When obtaining rights to use any video footage, make sure that you verify your ability to use it in a multimedia environment
- If the content requires motion to clearly depict the point, video should be used.
- The main subject should be well lit and background distractions eliminated.
- Always take several “takes” of the same scene or subject with enough “padding” in the beginning and end of your shots. Examples include wide shots, close-ups, panning shots, zooming in, zooming out, and action shots.
- For every screen in the video, a separate page should be used in the video script, properly labeled with its corresponding screen number. Video scripts should be written in a two-column format. The left column should describe the scene to be produced, and the right column should state the actual words to be recorded.

- Traditional techniques (e.g., zooming, panning, transitional wipes and dissolves, etc.) should be avoided due to the reduced performance it causes in compressed digital video.
- Uncompressed AVI or MPEG-2 format should be used for saving video sources. These files should be saved to either CD-ROM or DVD for archival purposes.
- Text transcripts should be created and provided.

---

## Production and Post-Production

The following recommended guidelines should be used:

- Use video or graphic window overlays to show close-ups of small objects, such as knobs and switches for wide-angle views.
- Record original video in a high-quality format such as DVD. The greater the quality of the original video footage, the greater the quality of the compressed digital video the user will see.
- The video player must allow learners to play, pause, and repeat the video using both the mouse and keyboard as the input method.
- The video must be delivered in a file format fitting within the technical specifications of the audience. The DHS Enterprise Architecture (or component IT staff) should be referenced to help find out what digital video format is best to use (e.g., Windows Media, Real Networks, QuickTime, Flash MX/6.0, Sorenson, etc.).
- The Flash MX/6.0 player allows for embedded digital video encoded with the Sorenson codec.
- Digital video files should be viewable within the targeted browser currently being employed by the majority of users. The ability to download needed plug-ins, programs, and APIs must be built into the course/presentation if they are not already available within the targeted browsers.
- Video should be created at a resolution of 320x240. Other resolutions can be used (for example, 240x188 and 176x144), but any resolution chosen should become a general standard throughout your course or presentation.
- Encode video files using a standard that offers widespread support while providing maximum compression (e.g., Microsoft Windows Media MPEG-4 Video v. 3 video codec, Windows Media Audio v. 7 audio codec, RealPlayer 8.0, etc.).
- Deliver the uncompressed source video in its edited form as it was used in the course. Label the uncompressed source video to correspond to its respective compressed file.
- Captions must be synchronized with the video's dialog. Audio descriptions would be necessary if motion or action is critical information.

**Table 10. Encoded Bit Rate Use**

Encoded Bit Rate	Target Audience
80 Kbps	Slow corporate networks
150 Kbps	Fast corporate networks
256 Kbps	Very fast corporate networks

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## 4.11 Navigation

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### Main Navigation and Menu Screen

Most programs include a main navigation menu screen (sometimes called an index screen) that can serve as a centralized point to navigate within or between modules/lessons. Alternate paths may exist within the program (i.e., branching based on student responses) but the main navigation menu screen typically serves as the primary point for the learner to enter and move from module to module.

---

### Functions

This screen usually presents all modules in their recommended sequence. Students exiting a module are typically brought back to the main menu (or given that location as an option) in case they want to select another module or lesson. Some navigation menu screens may also include student registration/data areas.

---

### Characteristics

Navigation menu screens usually have the following characteristics:

- Consistent in appearance and operation.
  - Use similar formats and color for similar screens.
  - Limit menu layers to two, a main index and a segment index, to ensure the course structure is obvious.
  - Main and segment menus are similar in design. Each should contain navigational information and selection options.
  - Main menus should contain a list of options (submenus) from which the student may select.
  - Submenus should allow the student to return to the main menu. A selection button/icon should be placed on each submenu.
  - Navigation is possible by both keyboard and mouse.
-

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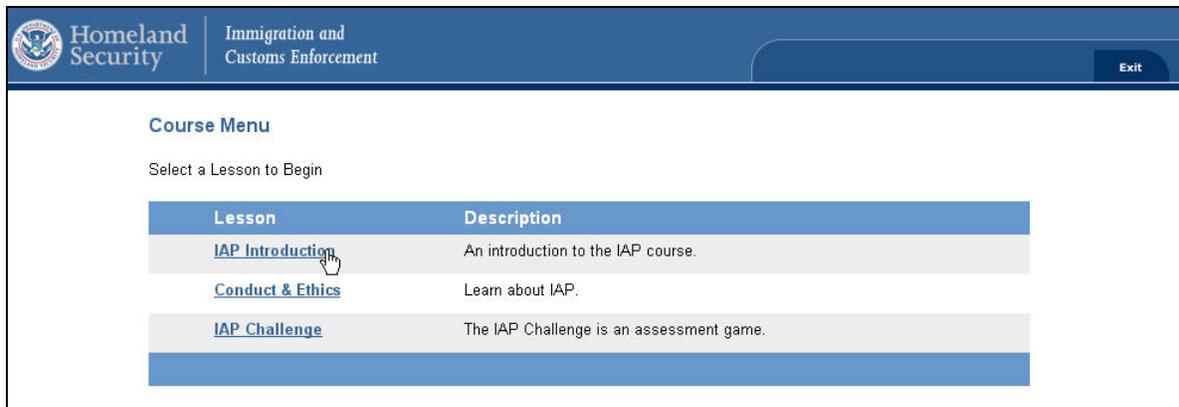
**Main Menu Content** Main menus should contain the following lesson information:

- Title (lesson name)
  - Date (date lesson released)
  - Segment Name (titles of segments to be reviewed)
- 

**Submenu Content** Submenus allow a student to select an area within a lesson or module (i.e., "pretest"). Submenus typically have the following characteristics:

- Submenus do not usually provide an explanation of their elements since the title should be self-explanatory (i.e., "test").
  - Submenus may contain some of the same items as the main menu (e.g., title, exit, help, reverse and forward buttons).
  - Submenus contain items that allow students to "fast forward" through the lesson.
  - Submenus allow the student to exit anytime they choose.
- 

**Examples** The following illustrations show a sample course and topic menu example.



**Figure 6. Course Menu Example**

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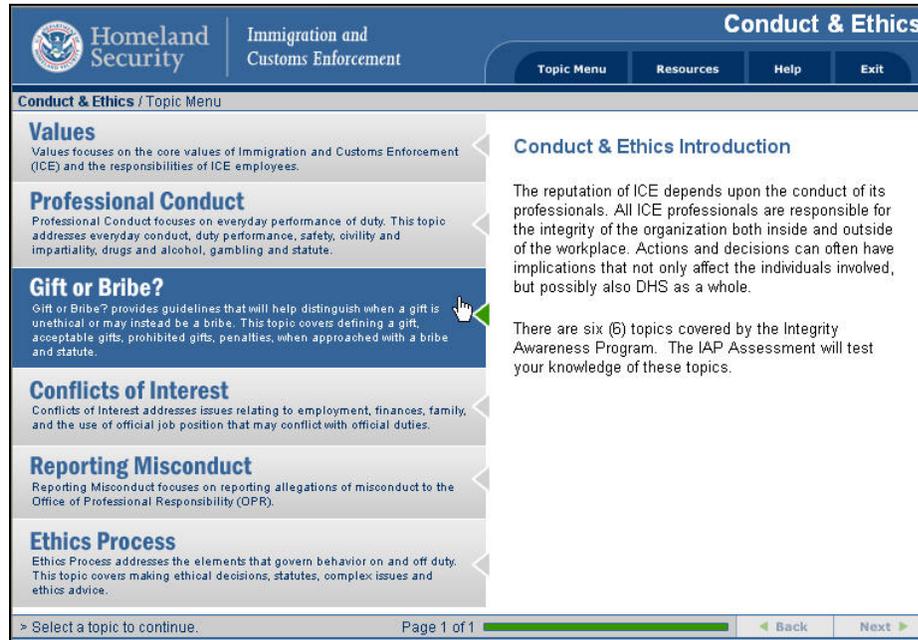


Figure 7. Topic Menu Example

### 4.11.1 Navigation Graphics

#### General Conventions

The navigation system should be consistent, intuitive, and user-friendly. This system enables the student to move within a lesson/module (i.e., screen to screen) or to perform a task within a screen. Navigation graphics are typically reused throughout a learning module and should be kept in a library to minimize storage requirements and improve run-time performance. Using a library also enables developers to modify the module more easily (i.e., change one button in a library vs. changing every button in a program). Navigation graphics usually appear in templates and screens. Ensure that all navigation can be done by keyboard only. Make sure a well-defined on-screen indication of the current focus is visible.

#### Menu vs. Buttons

Navigation icons and buttons may have similar functions as menu items (i.e., using the menu in Word to cut/paste text or using the icons on the tool bar). The ADL developer using both systems should ensure that the buttons/icons and menu items do not work at cross-purposes. For example, if a "Back" button is disabled then the menu function that does the same job should also be disabled.

**To Build or Not to Build**

Using/adapting an existing proven model or template can save the developer significant time and effort while increasing product quality.

---

**Models and Templates**

Templates consolidate the navigation and menu systems into a standardized display that appears throughout the program. Most effective navigation systems place their icons at the bottom of the screen in the template. By embedding the icons in a template you reduce the potential for student confusion. The navigation system becomes relatively transparent to the learners as they progress through the lesson. Reusing templates enables students to focus on content instead of spending valuable time learning how to navigate through the program. See Section 4.2.1 for additional information.

---

**Screen Placement**

Navigation systems may also rely on buttons, boxes, icons, or switches placed within the learning screen when the navigation requirement is uniquely tied to the content matter on the screen (i.e., drag and drop buttons). These buttons/icons should be placed to avoid conflict with any text, graphics, or other content matter on the screen. They are usually placed toward the bottom of the screen for navigation.

---

**4.11.2 Navigation Buttons/Icons**

---

**Appearance**

Use subdued colors (typically gray, beige, or a light contrasting color to the screen). Button size should be large enough to accommodate a practical size touch area (where you place the mouse) that does not overwhelm the other screen elements. Icons, buttons, or boxes should look three dimensional to differentiate them from text boxes. Use bevels, shading, contrasts, or color to create a three dimensional look. Labels are typically placed on or next to the button and if placed on the button, should be of contrasting color to the button (i.e., do not use light green text on a dark green button).

---

**Buttons as Metaphors**

Button shape, color, and function may be selected based on the lesson content's context, theme, and level of inter activity. The buttons and navigation system serve to act as supporting elements to the instruction or tap into popular/common meanings held by the typical student. Examples include using a book as a symbol for accessing a technical manual, an open door for an exit, or using a ship's bridge environment for a navigation training module.

---

**Action** Navigation graphics should change in appearance (color or dimension) to indicate that the student has made an input. Button text should change with the button between modes.

---

**Inactivity** Inactive navigation buttons (i.e., a "back" button disabled during a test) should have a color or shading change to indicate their status.

---

**Balloon Labels/  
Tool Tips** Developers are encouraged to use context sensitive balloon help/tool tips to enable users to identify/define a navigation button's or icon's function. If any information is triggered by mouse event handlers, the same information must be made available to keyboard-only users.

---

**User Friendly** Make your lesson user friendly by including key navigation icons. Most programs, at a minimum, use exit, help, and index, on each frame in addition to next (continue) and back as noted in the following table.

---

**Characteristics** Buttons and icons should have the following characteristics:

- Self-explanatory
- Located in the same area each time
- Produce the same results each time they are selected
- Have logical functions (no "Main Menu" button on the main menu screen)
- If an inactive button must be on the screen then gray it out and make it non-functional
- Have a keyboard shortcut. Conventional notation for a keyboard shortcut is the Alt key + a letter in the button command. Indicate this shortcut letter by underlining it. For example: Alt + N may be used as a shortcut for Next when properly coded

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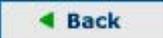
**Screen Transitions** Transitions from one frame or state to the next should be performed quickly and smoothly. The additional time it takes for fancy dissolves and wipes can become very annoying after only a few frames. If you choose some special effects, select ones that are fairly quick.

---

**Typical Buttons**

The following table lists common buttons and their uses within an ADL program. Note: Every button type is not required in a program. Only use the ones that are relevant to your project.

**Table 11. Button Functions**

<b>Functions</b>	<b>Uses</b>
Bookmark	Allows the student to exit the lesson and then reenter at the same place they left if not a function/subroutine of an Exit/Quit button.
Exit/Quit 	Allows the student to leave a lesson. It is best to have only one exit to a lesson. The exit may be tied to a bookmarking function.
Forward, Next, or Continue 	Allows the student to advance one frame at a time. Usually the student should progress to the next screen by taking action (e.g., solving a problem, answering a question, etc.)
Glossary 	List any words that might be unfamiliar to students and their definition. Ideally, they should be tied to a help function/area.
Help 	Explains how to use (button/icon function) or navigate within a lesson or go to a general help area. The student should be able to access various levels of help within a lesson (e.g., Tool-Tips, Balloon Help, Hyperlinked content areas).
Resources 	Provides the student with access to various documents, graphics, references, and/or links relevant to the course content.
Menu	Returns to main menu or enables the student to dynamically access a lesson or module.
Back, Previous, Reverse 	Allows the student to go back one frame at a time.
Contact, Feedback	Allows the student to generate a text file that documents content and programmatic errors. Errors should be specifically referenced by lesson and frame number/name. Provides a feedback or contact where the student is provided a point of contact for questions or help.
Notes	Provides the capability for the student to enter, retain, and print notes tied to a particular subject matter. A popular function for learners who may not have ready access to the module at the job site.
Play/Replay	Enables the student to play or replay an animation, audio or video clip. Should be disabled/not present unless that screen has an associated video clip.

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## 4.12 Help Function

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### General

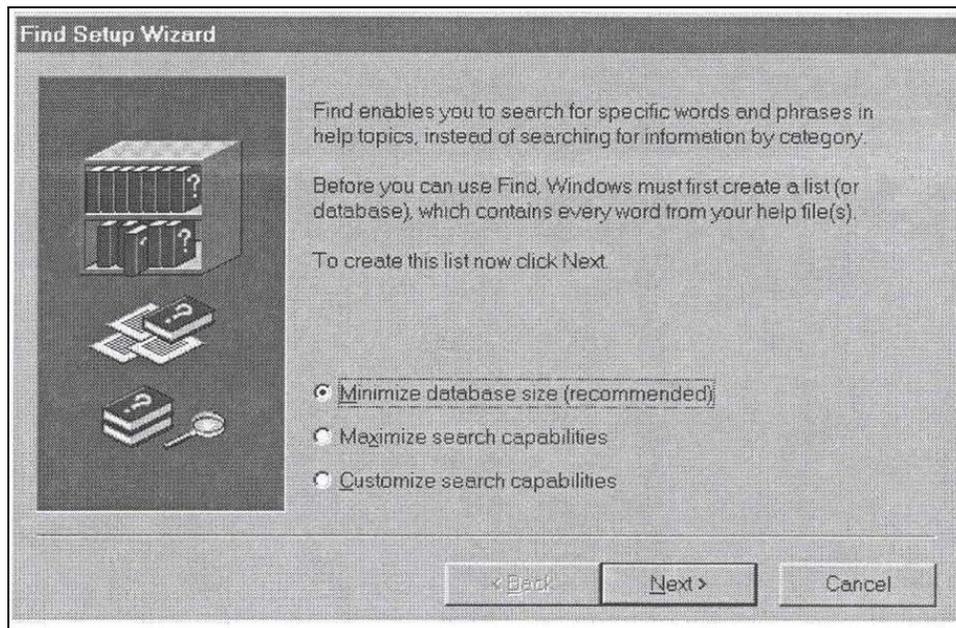
The student should always be able to obtain assistance by selecting a help function. The following should be in your help function:

- The information must be complete, easy to access, and easy to understand.
- The help function must return the student to the exact same point in the lesson from where the request was initiated.
- In the case of procedural help, the correct control input should clear the help and advance the procedure to the next step.
- A function key or a help icon can be used to provide assistance to the student.
- Help icons and buttons should be consistent across all lessons and courseware that the student will use.
- It is not necessary to assign both icons and function keys to perform the same tasks.

---

### Wizards

Wizards step you through a task- helping you understand what is required, guiding you through the decisions you need to make, and then executing the software to automatically create the results you want. The image below is an example of a wizard.



**Figure 8. Wizard Example**

**Fixed Format Help**

The fixed format type of help is easy to design and always provides the same information regardless of where the student is currently working in the course. Here are some examples of fixed format help:

- Objectives
  - Glossary
  - Key functions
  - Alphabetical help lists
  - Touch/Hot zones
-

## 5.0 ISD Strategies and Best Practices

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This section introduces the learning strategies, interactivity guidelines, help section and testing strategies, and best practices that follow ISD principles.

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### 5.1 Learning Strategies

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**Learning Strategies** Learning strategies are intended to increase the number of links between presented information and existing knowledge to enhance retention. ADL provides opportunities for learning strategies which are not available in other instructional delivery processes. Some examples of these strategies are:

- Recall
- Integration
- Organization
- Elaboration

Some ADL tools to facilitate learning strategies are: Pull down menus, drag and drop, multiple choice, and immediate feedback.

Learning strategies and styles are a broad subject of study. You are encouraged to seek further guidance in this area. Suggested references are found in the Appendix E of this document.

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### 5.2 Learner Control

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**Do I Need Learner Control?** Students learn best when they are actively engaged in the learning process. You can build in that engagement by enabling the student to control, at least in part, their progression through a training program.

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**Screen Control** Let the student have control over when the next screen gets displayed. A timed overlay (the next screen appears after a predetermined time) should not be used due to various reading rates. However, avoid using "next" throughout the program. It is usually better to move from one screen to the next by having the student complete an action or a task.

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**Review** Give students the option to review previous material whenever possible. If a student is in segment 2 and wishes to review something in segment 1, having an icon that says "see 1" or "menu" will enable the student to return/review a previous screen. The forward button on your screen should allow the student to advance all the way to the end of a segment if desired. You may want to prohibit reviews or movement between screens during a test or performance exercise, although reviewing after the exercise is usually desirable.

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**Touch Zone (Hot Areas/Spots)** Ensure that touch zones, or hot areas, are self explanatory. Do not make the student guess where to touch or what to click on or where to tab to. You could show touch zones on a separate help screen if you choose. The screen should enable the learner to easily determine where the hot areas are. You can do this with color (blue text for a hot word), shape (a button), or by changing the cursor shape (from a pointer to a hand), but you will need to provide alternate instructions for users with visual disabilities such as blindness or color blindness.

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**Bookmarks** Bookmarks are good functions to include with training programs that include multiple lessons or modules. Bookmarking enables the student to exit the lesson and then reenter the lesson at the same place. They are especially crucial for students who may be called away from the LMS to stand a watch or respond to an emergency. Try to let your student return to the same lesson segment if desired. Forcing them to repeat the segment can lead to frustration and dissatisfaction.

---

**Location** The student should always know where they are in a lesson. The lesson information bar should include information about what lesson the student is in, what segment the student is reviewing and the page the student is on.

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**Breadcrumbs**

On Websites, breadcrumbs are a form of navigation where the current location within the website is indicated by a list of pages above this page in the hierarchy, up to the main page. For example, if you were browsing the chapters in a lesson on Use of Force at a training site, you might see the following hierarchy when you're on the Handcuffing page:

[Home](#) > [Lessons](#) > [Use of Force](#) > Handcuffing

Each of the categories above the current page is usually a link to the corresponding category page.

The term "breadcrumbs" is a reference to the Hansel and Gretel tale where they leave breadcrumbs as they wander the forest so they can find their way home. The metaphor is imperfect because the breadcrumbs do not represent the actual path the user took, but instead the optimal path from the home page to the current page in the hierarchy.

**5.3 Interactivity****General**

Interactivity is a powerful tool used to support content and engage learners. The level of interactivity in a course corresponds directly to the type of material that is presented and the degree of learner involvement required for a course. The table below illustrates the four levels of interactivity strategies and their corresponding descriptions.

**Table 12. Levels of Interactivity**

Level	Description
Level I Passive	The learner acts solely as a receiver of information. He or she is required to read the text on the screen, view graphics, illustrations, and charts, and use the navigational buttons to progress forward or move back through the program. An example of this type of WBT product may also contain pop-ups and hyperlinks to Websites, materials, and other information interspersed between the text and graphic presentations.
Level II Limited Interaction	The learner makes simple responses to instructional cues. The WBT product includes learning activities listed in Level I and multiple-choice and column-matching manipulations related to the text and graphic presentation. A good example is a WBT product that includes these types of test items at the end of a unit of instruction to test the learner's grasp of the information.
Level III Complex Participation	The learner makes a variety of responses using varied techniques in response to instructional cues. The responses may include those listed for a Level II interaction and text entry boxes and manipulation of graphic objects to test assessment of the information presented. A good example of this type of WBT product is desktop software training requiring the learner to perform as though using the program.

Level	Description
Level IV Real-time Participation	The learner is directly involved in a life-like set of complex cues and responses. This involves engaging the learner in a simulation that mirrors the work situation of an actual environment. An example of this type of WBT product is using artificial intelligence similar to computer games and flight simulators.

### Objectives and Interactivity Level

The table below represents six levels of objectives with their corresponding levels of interactivity. Interactivity strategies should be selected based on the level of objectives.

Objective levels are determined by the following criteria:

- Type of learning (for example, knowledge, skill, or attitude)
- Level of learning (for example, fact, concept, process, procedure, or principle)

**Table 13. Objective and Interactivity Levels**

Level of Objective	Level of Interactivity
Knowledge	Level I and Level II
Comprehension	Level II
Application	Level II
Analysis	Level III
Synthesis	Level III
Evaluation	Level IV

### Guidelines for Interactivity

When an interactivity strategy level is selected, the following guidelines should be used to implement the requisite level of interactivity for courses.

**Table 14. Interactivity Guideline Descriptions**

Guideline	Explanation
Provide opportunities for interaction at least every three to five screens. However, mandatory interaction with the computer should not be superficial.	Without interaction, the course risks becoming an electronic page-turner. However, if a required action is unnecessary, the learner could be distracted by it and become frustrated. Learners prefer not to have unnecessary interactions.
Group the content into small segments and build in questions (with feedback), periodic reviews, and summaries for each segment.	Grouping content into smaller units and providing opportunities for interaction (e.g., questions, etc.) within each information segment allow learners to interact with the program more frequently.

<b>Guideline</b>	<b>Explanation</b>
Ask as many relevant questions as possible without interrupting the continuity of the instructional flow.	Questions should provide immediate feedback to learners regarding their own performance and sustain learner attention by keeping them mentally engaged in the learning process.
Ask questions at the application level rather than at the memory level.	Application questions enhance attention and comprehension and facilitate transfer of learning.
Use rhetorical questions during WBT to make learners think about the content or to stimulate their curiosity. Also use them as a natural transition between frames.	A rhetorical question is a question that does not require learners to overtly provide an answer. It invites learners to mentally interact with the content. Used as a transition aid, it can direct learners' attention to what is coming up next.
Consider designs where the learner is not presented with information in a linear format, but rather discovers information through active exploration in the program. Developers should consider structuring a course for learner exploration without assuming a predetermined order to the learner's selection of modules and topics.	This approach adds variety, challenges learners, and maintains their interest.

## 5.4 Testing

This section provides information on types of tests, testing features, feedback, and remediation.

### 5.4.1 Types of Tests

#### Introduction

Test placement within an ADL module depends on the test's purpose. The test format serves to assess different types of learning.

#### Placement Types

The following are examples of placement types:

- **Pretests** used at the beginning of a module collect information about the user such as prior knowledge of the material, learning style, and preferences.
- **Progress checks** within a module or lesson indicate whether the user is learning the material as intended. This information can be used by the program to provide guidance to the user or branch the user to an appropriate section. The progress check may simply inform the user of how he or she is doing and then let the user choose what to do next.
- **Post-tests** are used at the end of a module to certify the user has reached a specific level of proficiency. Post-test answers need to be "trapped" so that the data is recoverable.

#### Testing Types

The following table explains the type of test and reasons why each might be used. Tests are typically a type of form. Ensure that all tests/forms meet Section 508 requirements.

**Table 15. Types of Tests and Reasons to Use**

Type of Test	Reasons to Use
Multiple Choice	Well recognized
Matching	Test recognition
Fill-in the blank	Easily constructed
Constructed response	Tests the depth of knowledge
Constructing concept map	Tests concept relationships
Graded Simulation	Allows more realistic testing

## 5.4.2 Practice

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### Appropriate Practice

Appropriate practice refers to the use of skills and knowledge that the student will require when performing and supporting the objective. For students, this will include selecting control settings, analyzing situations, making decisions, and taking corrective actions. The following items are benefits of appropriate practice:

- Practice provides an opportunity to use skills and knowledge prior to testing.
- Practice items provide a source of dynamic interaction that is not possible in other media.
- By performing, the student can see where more practice is needed.
- Practice exercises are accompanied by help and remediation information.
- Practice quizzes usually suspend the help function but provide the option of remediation upon completion.

When developing practice opportunities for the student, the instructional designer should consider how the student will be interacting with the computer while engaged in ADL practice sessions. One facet of that interaction is understanding input controls.

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### Action Prompt

An action prompt is a statement or phrase that lets the student know that an action is expected. Without this kind of information, the student may think the machine has locked up. It is a common occurrence to find courseware frames that expect an action from a student but do not have a clear direction for the student to perform. When having the student answer a multiple choice question, provide a statement as to how the input is to be made.

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### Example

An example for procedures would be to provide a message in all caps in the lower right hand corner of screen to perform action, (i.e., "TYPE RESPONSE NOW. ") Placing this cue where the next icon or arrow would be located further serves to reinforce the action prompt.

---

### Realistic Examples and Values

Examples should be contextual for the student and provide relevance to their work by providing realistic scenarios. Selection of actual examples and values that a student is likely to encounter helps to provide a general understanding and positive transfer of learning. For example, the use of speed and vehicle model for accident reporting should start with values and vehicle types that the student will be using immediately.

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**Simple to Complex** Allows for a steady progression of increasing complexity or difficulty in a task. If a change in difficulty is too great, the student should have the opportunity to return to an easier task or receive additional prompting.

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**Practice for Procedures**

Here are the key points for demonstrating and providing practice for procedures:

- Write the name of the procedure as a lead-in.
  - Show a demonstration of the procedure.
  - Include all display changes, auditory tones, control inputs, etc.
  - If a step involves a decision, state each decision as a separate step.
  - For complex procedures, progressively list each step as it is demonstrated or performed (steps should be parallel and in list form).
  - Provide practice as part of the presentation. If there are common errors in performance, provide this information after the student has completed the practice exercise.
  - Use the name of the procedure as an action prompt to initiate the practice sequence.
  - The action prompt does not name the step to be performed. This feature should be found in Help.
  - Use the same location, color, and font for the action prompt. (Example: lower right corner, cyan, and BOLD). This combined set of cues will make it clear that an action is required.
- 

**Step Completion**

Confirmation of a step completion is essential to good interface with the student:

- Provide progressive confirmation of each step as it is successfully completed.
  - Progressively list each step as it is correctly completed.
  - Provide help when the student gets stuck.
  - Provide a help icon for student to select assistance.
  - Provide help when student makes a number of incorrect inputs (two inputs are suggested).
  - Automatically clear the Help when the correct input is made.
-

**Progress Checks for Procedures**

Unaided procedure practice can be used in practice quizzes and progress checks:

- Make this a separate entry on the lesson index.
  - Drop the Help function for this type of practice.
  - Inform learner if additional references are required for these progress checks (i.e., tech manuals).
  - Provide a procedural prompt after the student misses the action twice.
- 

**Exploratory/ Free Play Practice**

Free play or exploratory type questions provide the student with an opportunity to explore and experience a realistic experience in a simulated format. This involves engaging the learner in a simulation that mirrors the work situation of an actual environment. An example of this type of WBT product is using artificial intelligence similar to computer games and flight simulators. It is suggested that this option be provided as a separate entry on the menu structure.

Note: While this format provides an effective learning process, it is costly to develop in regard to labor and resources.

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### 5.4.3 Feedback

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<b>Purpose</b>	Feedback helps to keep the student's interest, provides additional information, and responds to student inputs.	
<b>Acknowledgement</b>	Whenever the student makes an input, whether correct or incorrect, the input must be acknowledged. You can beep, show button pushed or show switch movement. Provide both visual and audio acknowledgement for each input. Give the student the option of turning the sound on or off.	
<b>Positive Feedback</b>	All feedback should be positive and kept as short as possible, yet provide enough information to point the student in the right direction. It is also important to keep all feedback in context with what was presented.	
<b>Informative</b>	Informative feedback indicates the correctness or incorrectness of a given answer. The following are examples of good and poor informative feedback.	
<b>Poor Feedback</b>	Sorry, b is incorrect.	This indicates that "b" is incorrect but it forces the student to continue guessing until the correct answer is found
<b>Good Feedback</b>	Sorry, b is incorrect. The correct answer is a.	This shows the student the answer chosen and also shows the correct answer. This method shows the student the error and at the same time eliminates guessing to find the correct answer.
<b>Positive Feedback (continued)</b>	An even better way to provide feedback is a combination of both positive and informative feedback. This involves allowing the student to make two wrong attempts before indicating the expected response. Sometimes, we inadvertently choose the wrong answer. This option does not penalize one for being human.	
<b>Repeating the Prompt</b>	If the student selected the wrong answer the first time, repeating the same prompt does nothing. This is especially true if the student is unsure of the correct response. The prompt should be reworded,	

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possibly revealing more information or additional guidance.

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**Consistency** Feedback should be in the same place every time and whenever possible the same type. Do not use text one time and a graphic the next.

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#### **5.4.4 Remediation**

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**Definition** Remediation is information provided to a student to correct misconceptions, fill memory lapses, or add to incomplete learning.

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**Purpose** Remediation provides an opportunity for the student to get additional information for an incorrect response or incorrect procedure performance.

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**Remediation as an Option** If you are using remediation, always make it optional for the student. Forced remediation for an incorrect choice almost always adds to the frustration level.

- Would you like to review the lesson?
- Would you like to repeat the exercise?

---

**Timing** Exercise caution when using remediation. It is best to allow the student to answer all questions/exercises prior to asking if they want remediation. Having the remediation prompt question appear every time an incorrect answer is chosen can be frustrating.

---

**Remediation Content** If a student did not gain a proper understanding the first time through the material, more than likely, repeating the same information will not help. It is best to reword, rephrase or go into more detail in the remediation. Always keep the remediation in context with material originally presented.

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### 5.4.5 Testing Features

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#### Introductory Screens

Provide an initial screen at the beginning of a test that states the number of test items and the estimated time for test completion. Provide an escape option for anyone who wants to "back out" at this point.

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#### Escape

Allow an out to bypass testing. When students have progressed far enough to determine that they are wasting their time, they should be allowed to escape the testing and return back to the course, or exit the course completely.

---

#### Test Results

At the very least show items that were missed. Students may recall wrong answers as correct if this is not done. Consider reviewing wrong items showing the wrong answer selected along with the correct answer.

---

#### Pitfalls

Several types of responses are inappropriate. Avoid the following when possible.

**Table 16. Inappropriate Response Examples**

<b>Response</b>	<b>Reasons to Avoid</b>
None of the above	This implies that there is a correct answer that is not given. When this answer is keyed as correct, there is no way to determine if the student is thinking of the same correct answer as the designer.
All of the above	When directed to select the "best" answer, then "all of the above" cannot logically be chosen. Students in a hurry tend to read the first correct answer and stop.
True/False	Similar to none of the above, half of the answers should be false. A student selecting false may have a different idea of what is correct than the test writer.
Negatively worded test items	When necessary, capitalize the negative terms and underline them (NOT, CANNOT, etc.).

---

#### Completion

Write completion items so that only one word, phrase or value completes the sentence. Placing the blank near the end of the sentence makes it easier to read.

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**Example and Non-Example**

The following table demonstrates examples and non-examples of completion items.

**Table 17. Example and Non-Example of Completion Items**

<b>Example</b>	<b>Non-Example</b>
The bridge crosses the _____ river. The sky is the color _____.	The _____ river runs under the bridge. _____ is the color of the sky.

## 6.0 Evaluation Methods

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**Overview** Whenever an agency develops training, or for that matter, any intervention to improve performance, there must be some way to determine if the training (intervention) works. Is the ADL what students need to proficiently perform the tasks that make up their jobs? Does the ADL contain too much or too little information? Did course designers hit the mark?

**Old Method** Most agencies use a "revise-as-you-go" (formative) evaluation approach to resident instruction. This approach may use a panel of experts to try out instruction. Or, it may use a small group of students (pilot evaluation) to "test" new courses. Either way, course designers fix the deficiencies experts or students find and then field test the revised course. Research shows that the "revise-as-you-go" method has been very effective. However, there are better ways to "revise-as-you-go" evaluate ADL.

**"New" Methods** The following tables below identify various alternative and new methods of evaluation.

**Table 18. Example of Alternative Methods**

<b>Alternatives to 1 to 1 Methods</b>	<b>How it Works</b>
One-to-One	One learner reviews the course. As the learner proceeds through the course, comments, questions, problems, and/or errors are documented and then provided to the evaluator.
Two-on-One	Two learners review instruction. As they work through the program, they discuss with each other (and the evaluator) errors and problems that arise.
Think Aloud Protocols	Learners describe their thoughts (reactions, plans, ideas and confusions) to the evaluators as they proceed through the materials.
Computer Interviewing	Interviewers send questions via electronic mail to experts or learners. Or, computer-assisted data collection (CASAC) programs present questions on screens and register the answers, with or without an evaluator present.

**Table 19. Example of Expert Review Methods**

<b>Expert Review Methods</b>	<b>How it Works</b>
Self Evaluation	The designers prepare a set of evaluation questions and criteria to evaluate the instruction, and then arrange a time to conduct the "self evaluation." Evaluation is conducted alone or with another team member acting as evaluator.
Panel Reviews	A panel review is a directed and structured group interview conducted by two or more experts. Methodology is similar to the discussion method used in the two-on-one learner evaluation. Experts and evaluator move through the instruction together. The panel discusses instruction and answers the evaluator's prepared questions.

**Table 20. Example of Small Group Field Test Methods**

<b>Small Group Field Test Methods</b>	<b>How it Works</b>
Evaluation Meetings	Learner groups discuss instruction without an evaluator. Then, a learner representative meets with the evaluator to discuss problems and possible changes. Based on meeting outcomes, the instruction is immediately revised and tried out on the same learner group.
Computer Journals and Networks	Individual users of networked software use the computer journal to gather evaluation data by solicitation and then store comments. Students write in their individual, on-line journals about their reactions to the software. The instructor assesses this information, and the evaluator may use the network for follow-up questions. Students (or the evaluator) can post their comments for general discussion.
Rapid Prototyping	A working portion of the final product is developed and immediately implemented with a group of learners or experts. Their input is used to revise the prototype.

## Appendix A ADL Content Management Process (Draft)

The following is the process to be used by the Content Management Board (CMB) in determining ADL content application across DHS. This process will be refined and expanded upon once the CMB is established.

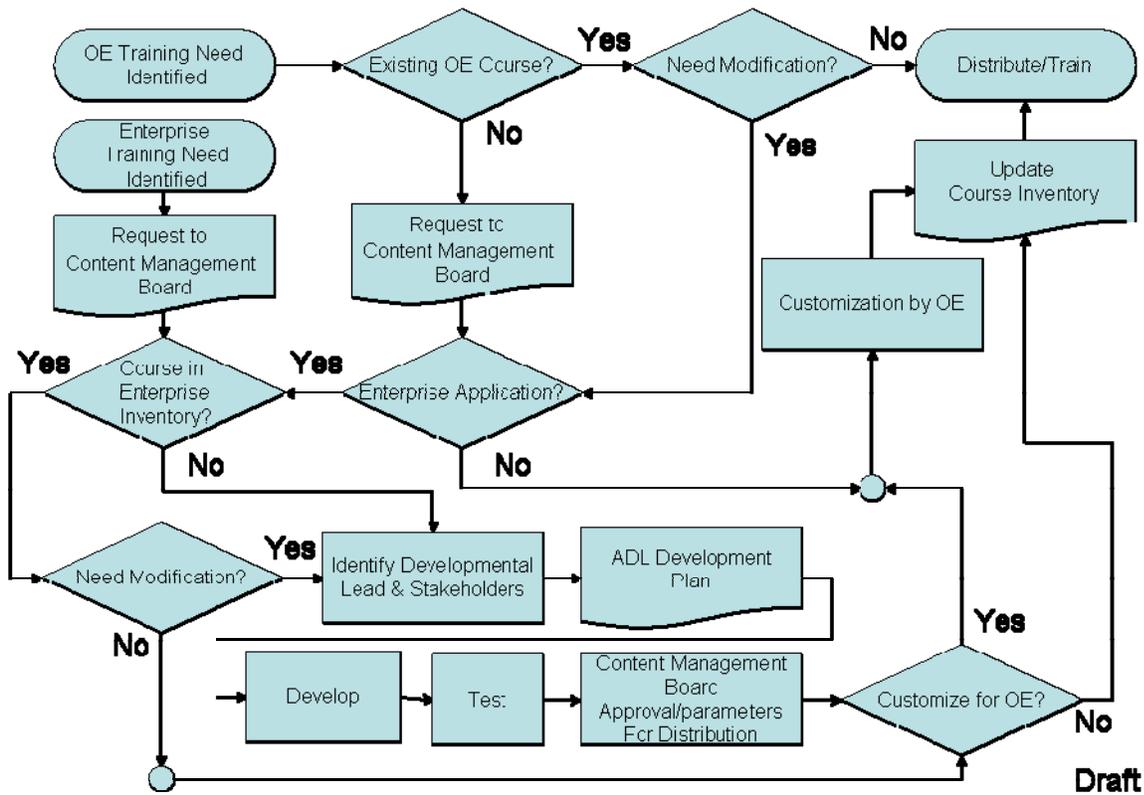


Figure 9. DHS Content Management Process (Draft)

## Appendix B Sample ADL Statement of Work

### Statement of Work for Anti-Solicitation Act Investigator Training and Financial Law Interactive Courseware (ADL)

**Project Synopsis:** The Department of Homeland Security (DHS) has defined a need for the development and production of on-demand, on-the-job training materials. In part, the DHS mission is to define the educational and training needs of the Agencies Financial Management professional, and to develop and deliver the required curricula and courses to train the Financial Management Workforce. The current limitation is that throughout DHS, Anti-Solicitation Act (ASA) investigators attend formal training in Fiscal Law at three different locations, but receive little or no specific standardized investigative training in investigation reporting or violations processing. Investigators are also geographically dispersed and usually come from a finance/budget/acquisition background with no initial investigative background skills. Closely related to the need for ASA training is the need for a solid grounding in the principles of fiscal law, not only for the ASA investigators but also for a wider spectrum of agency employees. The objective of this project is to develop a two-phased training program addressing the knowledge, skills, and abilities required to perform the task of Anti-Solicitation Act violation investigations, while also providing an understanding of the relationship of Fiscal Law principles to the duties and responsibilities of personnel within the agency workforce. The basis for formal instruction course content shall be based on DHS Financial Management Regulations and Administrative Control of Appropriations.

The target population for the Anti-Solicitation Act component of the training is prospective investigating officers. These individuals could be military or civilian employees having the background and experience in the accounting, budgeting, federal acquisition, and/or financial management policies and procedures; and ranging in rank from E-7 to E-9 or O-1 to O-10 for military personnel and GS-11 to GS-15 or SES-1 to SES-4 for civilian employees. In addition, auditors employed by the Inspector General and Audit Agencies are included in the overall target training population. The target audience for the Fiscal Law training component of the training includes not only the Anti-Solicitation Act investigators, but an additional target audience of nearly 60,000 financial managers, accounting clerks, program analysts, management analysts, program managers, and contract managers who also require training. This additional target population encompasses grade levels GS-5 and above, as well as military E-5 and above.

**General Task Description:** DHS has selected computer based training (CBT) via CD-ROM as the method of delivery. This CBT will be developed to address the specific issues required for investigating officers of Anti-Solicitation Act violations, and provide a detailed understanding of the basic principles of Fiscal Law. This training approach establishes the baseline for increased efficiency and effectiveness of training assets and monies, while concurrently increasing student retention of required material. In addition, it is anticipated that these core courses will also provide standardized training that can be moved to an interactive distributive training environment to reduce overall travel costs incurred by the geographical dispersion of personnel who require not only the basic training, but also follow-on training.

The contractor shall produce a Section 508 compliant CBT via CD-ROM to be used by Anti-Solicitation Act investigators in investigative techniques and procedures, six hours of instruction on Fiscal Law, and a Fiscal Law Quiz. In addition, the Contractor shall provide a written Certificate of Completion for each student who successfully completes the course, and a hardcopy Courseware Guide (a CD-ROM copy will be provided at a later date and updated as required). This program will yield several benefits in relation to student performance. When completed, it will provide for consistency of training between agencies, the increased availability of training information on demand, standardize training at geographically dispersed work sites, and provide common techniques for the students in applying proper investigative procedures throughout the Government.

**Special Note:** The government retains the intellectual property rights to all materials associated with this training. Upon completion of development, all developmental materials (including unpackaged source files) will be returned to the government. In addition, the contractor is not allowed to advertise development of this course, any association with or reference to this course or any other reference to this material or associated website in any manner for advertising at trade shows, conventions, symposiums, publications, or in any other manner.

**Required Tasks:** This effort will consist of eleven tasks, each with distinct deliverables and acceptance criteria. Refer to the table on the following page and task synopses for a breakout of the level of effort required for this program.

Task	Task Description	Deliverable
1. Develop Media Design	Develop and document instructional design, recommended structure and treatment of each lesson	ASA/Fiscal Law Media Design Report
2. Develop ASA Test Items and Exercises	Develop test items, exercises, answers and incorporate SME feedback	ASA Test Items Report
3. Develop Fiscal Law Test Items and Exercises	Develop test items, exercises, answers and incorporate SME feedback	Fiscal Law Test Items Report
4. Develop ASA Script	Develop an ADL Script that integrates all course design elements into a baseline document for production and authoring	ASA CBT Script
5. Develop Fiscal Law Script	Develop an ADL script that integrates all course design elements into a baseline document for production and authoring	Fiscal Law Script
6. Produce ASA Audio and Video	Produce a master videotape and three VHS copies	Edited Master and Copies of ASA Course; Betacam master for video and audio for CD-ROM
7. Produce	Produce a master videotape and three	Edited Master and Copies of Fiscal

Task	Task Description	Deliverable
Fiscal Law Audio and Video	VHS copies	Law Course; Betacam master for video and audio for CD-ROM
8. Produce ASA CBT	Produce validation courseware	Validation Courseware
9. Produce Fiscal Law CBT	Produce validation courseware	Validation Courseware
10. Validate Fiscal Law and ASA ADL	Conduct a pilot course in accordance with the Validation Plan	Validation Assessment Report
11. Produce Final CBT's	Produce final configuration of Courseware	Final Training Product Courseware

**Task Description:** A description of the required tasks and associated deliverables follows:

**Task 1: Develop Media Design.** Develop and document instructional design, and recommend structure and treatment of each lesson based on current training materials and relevant regulations provided as GFI. The proposed lessons must be in full compliance with Section 508 of the Rehabilitation Act of 1973, as amended. The Media Design Report shall detail the intended instructional design, recommended structure and treatment for each lesson, and address each lesson's relationship to the overall Training Product. The Media Design Report shall incorporate revisions to the ASA and Fiscal Law Lesson Specification Reports, which shall be provided as GFM. Each lesson will be developed around a logically-sequenced set of objectives and will include top level flowchart illustrating the lesson's major components. The Media Design Report will include top level flowcharts, testing strategies, course standards and conventions, a basis for assigning media use to content items, instructional methodology for each objective, and a media analysis and treatment.

**Deliverable:** ASA/Fiscal Law Media Design Report, copy of the Final Report to DHS. Submit 36 copies of the Draft Report. The Government shall have five working days for review and comment of the draft document. DHS and the Contractor shall then review consolidated comments. Changes that are mutually agreed to shall be incorporated into the final report. Should such changes exceed 10% of the content, impact the number of courseware hours, the design complexity assumed in this plan, or contract cost and/or schedule, the Contractor shall identify such impact under the terms of the Changes clause of the contract. Contractor shall provide 2 bound copies and 1 Microsoft Word electronic copy of the final report.

**Task 2: Develop ASA Test Items and Exercises.** Develop test items, exercises, and answers and incorporate SME feedback. A formal test will be presented at the end of the instruction. This test will be competency-based with 100% accuracy required for successful completion. The ASA Test Item Report will provide test items with correct answers. The test items will test for the specific knowledge and skills identified by the enabling objectives and the specific content points from the SME interviews. The test items, including answer keys, will be validated by DHS SMEs during the review process, based on their experience with the content, target

population and the existing methods. The ASA Test Item Report shall include a cross reference of test items to learning objectives provided in the Lesson Specifications Report for ASA, which shall be provided to the Contractor as GFI.

*Deliverable:* ASA Test Items Report based on the approved objectives and the final Media Design Report. Submit 36 copies of the Draft Report. The Government shall have five working days for review and comment of the draft document. DHS and the Contractor shall then review consolidated comments. Changes that are mutually agreed to shall be incorporated into the final deliverable under Task 4, Develop ASA Script. Changes that are mutually agreed to shall be incorporated into the final report. Should such changes exceed 10% of the content, impact the number of courseware hours, the design complexity assumed in this plan, or contract cost and/or schedule, the Contractor shall identify such impact under the terms of the Changes clause of the contract.

**Task 3: Develop Fiscal Law Test Items and Exercises.** Develop test items, exercises, answers and incorporate SME feedback. A formal test will be presented at the end of the instruction. This test will be competency-based with 100% accuracy required for successful completion. The Fiscal Law Test Item Report will provide test items with correct answers. The test items will test for the specific knowledge and skills identified by the enabling objectives and the specific content points from the SME interviews. The test items, including answer keys, will be validated by DHS SMEs during the review process, based on their experience with the content, target population and the existing methods. The Fiscal Law Test Item Report shall include a cross reference of test items to learning objectives provided in the Lesson Specifications Report for Fiscal Law which shall be provided to the Contractor as GFI.

*Deliverable:* Fiscal Law Test Items Report based on the approved objectives and the final Media Design Report. Submit 36 copies of the Draft Report. The Government shall have five working days for review and comment of the draft document. DHS and the Contractor shall then review consolidated comments. Changes that are mutually agreed to shall be incorporated into the final deliverable under Task 4, Develop Fiscal Law Script. Should such changes exceed 10% of the content, impact the number of courseware hours, the design complexity assumed in this plan, or contract cost and/or schedule, the Contractor shall identify such impact under the terms of the Changes clause of the contract.

**Task 4: Develop ASA Script.** Develop a CBT Script that integrates all course design elements into a baseline document for production and authoring. The script shall include descriptions of all audio, video, graphic and text elements, verbatim narration and computer text wording, descriptions of all motion and still-frame video, descriptions of all video effects and user options.

*Deliverable:* ASA CBT Script. The Contractor shall provide 36 copies, including one unbound and one electronic, of the review version of the script. The Government shall have five working days for review and comment of the draft document. DHS and the Contractor shall then review consolidated comments. Changes that are mutually agreed to shall be incorporated into a final script. The Final Script shall be delivered within ten working days after changes are agreed upon. Should such changes impact the contract cost and/or schedule, the Contractor shall identify such impact under the terms of the Changes clause of the contract.

**Task 5: Develop Fiscal Law Script.** Develop a CBT script that integrates all course design elements into a baseline document for production and authoring. The script shall include descriptions of all audio, video, graphic and text elements, verbatim narration and computer text wording, descriptions of all motion and still-frame video, descriptions of all video effects, and user options.

*Deliverable:* Fiscal Law Script. The Contractor shall provide 36 copies, including one unbound and one electronic, of the review version of the script. The Government shall have five working days for review and comment of the draft document. CF As and the Contractor shall then review consolidated comments. Changes that are mutually agreed to shall be incorporated into a final script. The final script shall be delivered within ten working days after changes are agreed upon. Should such changes impact the contract cost and/or schedule, the Contractor shall identify such impact under the terms of the Changes clause of the contract.

**Task 6: Produce ASA Audio and Video.** Produce a master videotape and three VHS copies. The video will be shot at DHS facilities in the Washington, DC area. The Contractor shall coordinate location access, scheduling and shooting arrangements with the COTR. Locations that are selected must permit flexibility to control lighting and ambient sound, should be accessible for up to 10 hours each shooting day, and should allow production activities to occur with minimal interference to on-going operations. Any equipment, materials and supplies to be videotaped will be provided as GFE. Appropriate locations, props, and personnel to assist with properly demonstrating/illustrating the content, techniques, and procedures will be furnished as GFE.

*Deliverable:* Edited master and copies of ASA Course; Betacam master for video and audio for CD-ROM .

**Task 7: Produce Fiscal Law Audio and Video.** Produce master videotape and three VHS copies. The video will be shot at DHS facilities in the Washington, DC area. The Contractor shall coordinate location access, scheduling and shooting arrangements with the COTR. Locations that are selected must permit flexibility to control lighting and ambient sound, should be accessible for up to 10 hours each shooting day, and should allow production activities to occur with minimal interference to on-going operations. Any equipment, materials and supplies to be videotaped will be provided as GFE. Appropriate locations, props, and personnel to assist with properly demonstrating/illustrating the content, techniques, and procedures will be furnished as GFE.

*Deliverable:* Edited master and copies of Fiscal Law; Betacam master for video and audio for CD-ROM .

**Task 8: Produce Fiscal Law CBT.** Produce validation courseware. Upon approval of the CBT script, begin authoring the Fiscal Law lessons by converting the script information into text files and program code. Begin developing and integrating lesson-specific graphics, and encode digital audio and video files from edited master. Perform internal instructional check to ensure that all script elements have been incorporated. Perform a programming quality review to verify that the program functions properly; that audio, text and graphics have been properly integrated; that branching, frame sequence, and transitions are accurate; and that the presentation meets the approved design documentation.

*Deliverable:* Validation Courseware. Deliver courseware with a module of Fiscal Law for pilot course and a review Courseware Guide. For four days, conduct a pilot course at seven sites. This training will utilize one module of fiscal law of the courseware and will be used as a pilot course for validation activities.

**Task 9: Produce ASA CBT.** Produce validation courseware. Upon approval of the CBT script, begin authoring the ASA lessons by converting the script information into text files and program code. Begin developing and integrating lesson-specific graphics, and encode digital audio and video files from edited master. Perform internal instructional check to ensure that all script elements have been incorporated. Perform a programming quality review to verify that the program functions properly; that audio, text and graphics have been properly integrated; that branching, frame sequence, and transitions are accurate; and that the presentation meets the approved design documentation.

*Deliverable:* Validation Courseware. Deliver courseware with a module of ASA for pilot course and a review Courseware Guide. For four days, conduct a pilot course at seven sites. This training will utilize one module of ASA courseware and will be used as a pilot course for validation activities.

**Task 10: Validate Fiscal Law and ASA CBT.** Conduct a pilot course in accordance with the Validation Plan. Write a Validation Plan for the pilot course. Conduct a pilot course consisting of one module of Fiscal Law and one module of ASA using the Review Courseware and the final Validation Plan. Assess validation results and write a Validation Report. Conduct a pilot course at the following locations: Washington, DC; Charleston, SC; Montgomery, AL; Monterey, CA; Charlottesville, VA; Philadelphia, P A; and, Glynco, GA in accordance with the Validation Plan.

*Deliverable:* Validation Assessment Report

**Task 11: Produce Final Training Courseware.** Produce final configuration of the Training Courseware CBT's. Ensure Section 508 compliance of all courseware CBT's.

*Deliverable:* Final Interactive Courseware.

**Task Schedule and Milestones:** The task is scheduled to be completed 12 months after start. Progress reviews will be held each month, with an assessment status review and update occurring six months from project initiation.

Task	Start Date of Task	End Date of Task	Skill Level	Period of Performance	Cost of Task
Develop Media Design	TBD	TBD	Senior Designer	58 Days	TBD
Develop ASA Test Items and Exercises	TBD	TBD	Senior Designer, Instructional Designer	29 Days	TBD
Develop Fiscal Law Test Items and Exercises	TBD	TBD	Senior Designer, Instructional Designer	40 Days	TBD
Develop ASA Script	TBD	TBD	Senior Designer, Instructional Designer	40 Days	
Develop Fiscal Law Script					

**Task Deliverables:** The contractor shall provide the following data deliverables IAW the contract schedule and CDRL instructions:

CLIN XXXXX, CDRL AOO 1, Performance and Cost Report  
 CLIN XXXXX, CDRL A002, Technical Report-Study and Services  
 CLIN XXXXX, CDRL A003, Contract Summary Report

**Travel Required:** It is anticipated that this task will require travel to obtain information and validate the courseware. The following is an estimate of travel required to be performed in executing the above tasks.

Destination	Number of Travelers	Number of Trips	Number of Days	Purpose
Washington DC	2	30	1	Coordination of project and obtaining GFE/GFI, plus production development
Ft Stewart, GA	2	1	4	Validation
Montgomery, AL	2	1	4	Validation
Charlottesville, VA	2	1	4	Validation
Philadelphia, PA	2	1	4	Validation
Glynco, GA	2	1	4	Validation

**Security Requirements:** There are no security requirements for execution and completion of this task.

**GFE/GFI:** The Government will furnish all required materials and documentation associated with ASA and Fiscal Law necessary to develop and complete the identified courseware modules.

**Special Requirements:** The contractor will have access to government-owned computers, copiers, telefax, and telephone services/equipment while working on-site at government facilities.

## Appendix C Authoring and Multimedia Computers

The following is a list of recommended ADL system configurations for further discussion.

Component	Multimedia	Authoring
CPU	Pentium 4, 2.2GHz, dual core	Pentium 4, 3GHz, dual core
RAM	1 MB SDRAM	2 MB SDRAM
Power Supply	650 Watt	650 Watt
Expansion Slots	7	7
BUS	ISA (32 bit) or PCI	ISA (32 bit) or PCI
Case	<ul style="list-style-type: none"> <li>Mini-tower or Desktop</li> <li>5 bays</li> </ul>	<ul style="list-style-type: none"> <li>Mini-tower or Desktop</li> <li>5 bays</li> </ul>
I/O	<ul style="list-style-type: none"> <li>High Density 3.5" floppy</li> <li>250 GB hard drive</li> <li>48x CD-RW DVD combo drive</li> <li>6 USB 2.0 ports</li> </ul>	<ul style="list-style-type: none"> <li>High Density 3.5" floppy</li> <li>500 GB hard drive (2)</li> <li>48x CD-RW DVD combo drive</li> <li>16x DVD-RW/-R drive</li> <li>8 USB 2.0 ports</li> </ul>
Graphics Adapter	<ul style="list-style-type: none"> <li>Super VGA</li> <li>256MB</li> </ul>	<ul style="list-style-type: none"> <li>Super VGA</li> <li>256MB</li> <li>DVI-VGA dual adapter</li> </ul>
Video Display	<ul style="list-style-type: none"> <li>1024x768 Minimum</li> <li>64K</li> <li>.28 dpi</li> <li>Non-Interlaced</li> <li>Multi-synch at least 17 inch</li> </ul>	<ul style="list-style-type: none"> <li>1024x768 Minimum</li> <li>64K</li> <li>.28 dpi</li> <li>Non-Interlaced</li> <li>Multi-synch</li> <li>At least 24 inch dual monitors</li> </ul>
Keyboard	<ul style="list-style-type: none"> <li>102 key USB Multimedia enhanced</li> </ul>	<ul style="list-style-type: none"> <li>102 key USB Multimedia enhanced</li> </ul>
Operating System	<ul style="list-style-type: none"> <li>Windows XP Pro, SP2</li> </ul>	<ul style="list-style-type: none"> <li>Windows XP Pro, SP2</li> </ul>

Component	Multimedia	Authoring
Audio	<ul style="list-style-type: none"> <li>• Windows Compatible</li> <li>• WAV and MIDI audio</li> <li>• Play from board/CD Rom/DVD simultaneously</li> <li>• Play/Record stereo and waveform audio – 8 and 16 bit, 11, 22, and 44 KHz sampling</li> <li>• CD-ROM and DVD connections</li> <li>• Speakers and or Headphones</li> </ul>	<ul style="list-style-type: none"> <li>• Windows Compatible</li> <li>• WAV and MIDI audio</li> <li>• Play from board/CD Rom/DVD simultaneously</li> <li>• Play/Record stereo and waveform audio – 8 and 16 bit, 11, 22, and 44 KHz sampling</li> <li>• CD-ROM and DVD connections</li> <li>• Speakers and or Headphones</li> </ul>

Note: The authoring configuration should be more robust due to the need to hold all of the multimedia files.

## Appendix D Section 508

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### What is Section 508?

What is commonly called Section 508 is actually an expansion and strengthening of Section 508 of the Rehabilitation Act of 1973. Although this was signed into law as part of the Workforce Investment Act by President Clinton on August 7, 1998, enforcement of the revised Section 508 standards began on June 21, 2001.

Section 508 requires that individuals with disabilities, who are either Federal government employees or members of the general public, seeking information or services from a Federal agency, have access to and use of information and services that is comparable to the access provided to individuals who do not have disabilities. The law applies to electronic and information technology (E&IT) that is developed, procured, maintained, or used by and/or for Federal agencies. There are some exceptions for “undue burden” and for other reasons; however, these are currently not included in this guide.

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### Section 508 Standards

Section 508 consists of the following four sections:

- Subpart A - General
  - Subpart B - Technical Standards
  - Subpart C - Functional Performance Criteria
  - Subpart D - Information, Documentation, and Support
- 

### Subpart A - General

Subpart A provides general information about the types of technology covered by Section 508, the intended audience, terminology, and exemptions/alternatives. The following table highlights the sections of Subpart A.

Section	Summary
1194.1 Purpose	Federal agencies must provide access to and use of electronic and information technology for individuals with disabilities.
1194.2 Application	The scope and coverage of standards apply to Federal agencies' electronic and information technologies, such as communication, storage, computing, and so forth.
1194.3 General exceptions	Some exemptions are allowed, such as non-routine military activities, intelligence activities, equipment located in a space accessible only by maintenance personnel, and so forth.

Section	Summary
1194.4 Definitions	<p>The following terms are defined:</p> <ul style="list-style-type: none"> <li>• Agency</li> <li>• Alternate formats</li> <li>• Alternate methods</li> <li>• Assistive technology</li> <li>• Electronic and information technology</li> <li>• Information technology</li> <li>• Operable controls</li> <li>• Product</li> <li>• Self Contained, Closed Products</li> <li>• Telecommunications</li> <li>• TTY</li> <li>• Undue burden</li> </ul>
1194.5 Equivalent facilitation	<p>Nothing in Section 508 is intended to prevent the use of alternatives to the prescribed designs and technologies as long as the alternatives provide equivalent or greater access.</p> <p><b>Note:</b> This refers to equal or greater access where violation of technical standards may occur. This is not intended to provide a “secondary” access method to address disabilities. One finished product must be completed that accommodate all end users.</p>

### Subpart B – Technical Standards

Subpart B provides technical standards for six types of technologies. These standards include specifics for the components that are incorporated within the various technologies. These standards include provisions for equipment that is often used by persons with disabilities, for example, screen readers. The following table highlights the sections of Subpart B.

Section	Summary
1194.21 Software applications and operating systems	<p>Standards are presented pertaining to the interaction of the software application with the user’s operating system. For example, applications must not override or disable user settings that are necessary for accessibility. This standard becomes applicable to accomplish functional performance criteria for Web based applications that utilize software or software-like functionality. Examples include, Flash, JAVA, AJAX, Multimedia presentations etc.</p>
1194.22 Web-based intranet and Internet information and applications.	<p>Standards are presented for Web-based technology to ensure that information is available to everyone by incorporating accessible formats and technology. In addition to these core standards for Web, using other standards such as “Software” and “Video and Multimedia” may be required to fulfill the functional performance criteria.</p>

Section	Summary
1194.23 Telecommunication products	Standards are presented ensuring accessibility for individuals who are deaf or hard of hearing. This accessibility involves various communication devices, such as telecommunication display devices, hearing aids, and so forth.
1194.24 Video and multimedia products	Standards are presented for various multimedia components, such as decoder circuitry, closed captioning, and so forth.
1194.25 Self contained, closed products	Standards are presented for the usage of self-contained and closed products (for example, an information kiosk, a fax machine, and so forth) so that the user does not have to attach any assistive devices other than a headset.
1194.26 Desktop and portable computers	Standards are presented for keyboards, touch-operated controls, biometrics, and computer components.

### Subpart C – Functional Performance Criteria

Subpart C provides criteria and standards that apply to all forms of electronic and information technology. The functional performance criteria are what the end product shall perform. In some cases, multiple “technical standards” from Subpart B will need to be used to accomplish accessibility.

Section	Summary
1194.31 Functional Performance Criteria	There must be at least one mode of operation and information retrieval or support for assistive technologies that does not require one of the following: <ul style="list-style-type: none"> <li>• Vision</li> <li>• Vision greater than 20/70</li> <li>• Hearing</li> <li>• Speech</li> <li>• Fine motor control</li> </ul>

### Subpart D – Information, Documentation, and Support

Subpart D provides requirements for accessibility to all types of information, for example, user guides. The following summarizes the applicability of subpart D

Section	Summary
1194.41 Information, documentation, and support	Support services must accommodate all users; and product support documentation, including information on accessibility features, shall be available at no additional charge.

**Application of Technical Standards**

Although all of Section 508 contains pertinent and important information, this appendix focuses primarily on one of the sections of Subpart B—Technical Standards, that is Standard § 1194.22 Web-Based Intranet and Internet Information and Applications. The section (§ 1194.22) contains 16 technical standards, and this appendix explores those that are most pertinent to courseware development and . § 1194.24 identifies requires associated with video and multimedia.

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**Text Equivalent for Non-Text Elements**

*Standard: (a) A text equivalent for every non-text element shall be provided (e.g., via "alt", "longdesc", or in element content).*

Providing a text equivalent means adding words to represent the purpose and/or description of a non-text element. Non-text elements include such items as images, graphics, animations, simulations, audio files and so forth. Navigational elements, such as Next and Back buttons are also considered non-text elements and must have text equivalents.

The single most important thing you can do to make a page accessible is to include alternative text for images. This can be accomplished via alt-text or a D link (descriptive link). Alt-text should be short, preferably no more than 60 to 80 characters. If you need more characters, then you should use a D-link. The text needs to be descriptive so that the meaning of the image is conveyed to someone who is visually impaired. The alt-text or D-link text would be read by a screen reader for the visually impaired person; however, a sighted person could see the alt-text when moving the mouse over the image and could see the D-link content by selecting the “D” link in the lower right corner near the image.

For an animation or a simulation, the text description may be lengthy so a D-link would be required. The text description must convey the same instructional context (not content) that a sighted learner would gain from watching the animation or simulation. Simply, you just present the same instructional information in a different format. This is not a substitute for providing synchronized captioning with video presentations.

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**Alternatives for Multimedia**

*Standard: (b) Equivalent alternatives for any multimedia presentation shall be synchronized with the presentation.*

Synchronized captioning for the audio portion and an audio description of a multimedia presentation’s visual information are required. See § 1194.24 “Video and Multimedia” standards for more information

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**Use of Color**

*Standard: (c) Web pages shall be designed so that all information conveyed with color is also available without color, for example from context or markup.*

This standard requires that an alternative to color be used for purposes of emphasis, direction, or conveying any type of information. The standard requires an alternative to color, not a replacement for it. Color may and should be used for enhancing identification of screen elements and controls or for emphasizing important features. The standard simply requires that an additional method of identification, such as text labels, must be used. For example, a button may have a particular shape, color, and label, such as a green oval button with the word Next on it. Some users might look for the oval button, some for the green button, and others for the Next button.

Although persons who are color blind as well as those people who are blind or have low vision would be the primary beneficiaries of this standard, all users would benefit from the additional conveyance methods and/or incorporated visual cues.

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**Style Sheets**

*Standard: (d) Documents shall be organized so they are readable without requiring an associated style sheet.*

Style sheets are a great way to separate content from presentation. Style sheets can be used to affect styles, sizes, colors and spacing for content elements. The content reading order and information, however, should not be lost if the author's style sheet is replaced by the user's own style sheet. User style sheets set Web browsers to display their preferred styles, sizes and colors. External style sheets are highly recommended so as not to interfere with user style sheets.

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**Redundant Text Links**

*Standard: (e) Redundant text links shall be provided for each active region of a server-side image map.*

An image map is a picture or map that provides clickable links for access to other information or Web pages. For example, a draggable timeline might allow a user to drag the mouse from one date to another to see information for each date. Another example would be an image of various icons or icon/text combinations, such as the Golden Gate Bridge, the Empire State Building, or the Washington Monument.

Redundant links are clickable text that appears at the bottom of the image. In the above examples, dates would appear for the timeline; and landmark or city names would appear for the landmarks. Thus, accessibility is provided for users who are visually impaired or for users who may have difficulty navigating with a mouse. Server side image maps are only permitted when unique geometric shapes prevent the use of client side image maps.

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**Client side image maps**

*Standard: (f) Client-side image maps shall be provided instead of server-side image maps except where the regions cannot be defined with an available geometric shape.*

Image maps that can be divided into definable shapes or areas, such as a map of the United States, should be client-side. Once mapped, each area should be assigned ALT text to identify the link destination for screen reader users. Client-side image maps are also keyboard accessible for learners who do not use a mouse.

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**Data Tables**

*Standards:*

*(g) Row and column headers shall be identified for data tables  
(h) Markup shall be used to associate data cells and header cells for data tables that have two or more logical levels of row or column headers.*

These standards do not apply to tables used for page layout.

Tables that display rows and columns of data can be difficult for screen reader users to comprehend. It is required that, as a screen reader user listens to the data table cell by cell, row and column header information is available to assist with comprehension.

For more complicated tables (for example, a column header is divided into more than one column of data), the data cells are associated with all levels of header cells. This can be achieved through appropriate tags and attributes. See [http://www.access-board.gov/sec508/guide/1194.22.htm#\(g\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(g)) for examples of making data tables accessible.

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**Frame Identification** *Standard: (i) Frames shall be titled with text that facilitates frame identification and navigation.*

A frame is a distinct area of the computer screen. An interface, for example, may have a frame at the bottom for navigation buttons, a frame at the left for a course menu, and a larger frame for the page's content. When assistive technology is used, for example, a screen reader, frames must be labeled so that they are easily identifiable to the assistive technology. The labels do not need to be visible on the screen; however, they must be in the code so that the assistive technology can move from one frame to another. The most obvious way to accomplish this Section 508 requirement, however, is to include the identifying text within the body of each frame.

Frames also provide flexibility in programming because they can be written independently of each other. When considering frame names, either location on the screen or a content descriptor should be used. In the above example, the frame at the left could be titled "Left Navigation Links" or perhaps "Course Menu." "Course Menu" would, of course, be the better title if the frame's label is to appear on the screen.

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**Flicker Rate** *Standard: (j) Pages shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.*

This standard is necessary because some individuals with photosensitive epilepsy can have a seizure triggered by a screen that flickers or one that displays a flashing or blinking area, particularly if the flickering/flashing/blinking has a high intensity or is within certain frequencies. The frequency range permitted by the standard (less than 2 Hz and greater than 55 Hz) is based on the ADA Accessibility Guidelines (ADA = Americans with Disabilities Act).

Alternatives to flickering/flashing/blinking elements should be used whenever possible. However, if such an element is necessary for the instructional integrity of the course, such as an animated gif, then the above standard must be followed. In addition to animated gifs, Java applets and third-party plug-ins/applications also contain flicker rates.

**Text Only Pages**

*Standard: (k) A text-only page, with equivalent information or functionality, shall be provided to make a web site comply with the provisions of these standards, **when compliance cannot be accomplished in any other way**. The content of the text-only page shall be updated whenever the primary page changes.*

Every effort should be made to make the training materials accessible to persons with disabilities. If a technology is not able to be made accessible, consider using a different method to convey the information so that it can be made accessible. Text only pages should only be the last option after other alternatives have been exhausted.

Note: This option is a rare occurrence, as the requirement that the page provide equivalent information and functionality will often demonstrate that compliance can be accomplished resulting in the replacement of the original “non-compliant” version. The use of an alternate page is normally associated with features that are impossible to make compliant due to the fundamental nature of the page defined by business needs. A choice in appearance, use of a specific technology, or input methods such as “drag and drop” is not typically a defined “need” of the program. For purposes of this guideline, “the ability to support the training of Federal employees or members of the public” would be considered a valid “business need”, therefore inclusion of all individuals regardless of disability must be considered in the core product requirements and design.

An example of a text only equivalent would be when a clear business need has been established that requires constant updating to a portion of a Web page, such as a weather tracking program. The text only page would be a good way allowing the user to access this dynamic content from a static “text only” version having refresh capabilities. This would provide equal information and functionality by providing on-demand updates that are equivalent to the original page.

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**Scripts**

*Standard: (l) When pages utilize scripting languages to display content, or to create interface elements, the information provided by the script shall be identified with functional text that can be read by assistive technology.*

Web developers can use scripts to activate a function when some event or user interaction occurs. When a function is triggered by a mouse action, it must also trigger by an equivalent keyboard action. Including text that describes the script function for a screen reader will inform the user of the result of the script action. If functional text is not provided for the script, the screen reader will read something, but nothing that is meaningful.

**Applets and Plug-Ins**

*Standard: (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 §1194.21(a) through (l).*

Training developers must provide a link to any additional applications required by the training course and those applications must be usable by persons with disabilities. If the training refers to a PDF document for example, a link to download Adobe Reader must be provided. Furthermore, the Adobe Reader must comply with Section 508 Software requirements (See Section 508 Software Standards within this document)

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**Forms**

*Standard: (n) When electronic forms are designed to be completed on-line, the form shall 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.*

Multiple choice questions, fill-in the blank, checkboxes and several other formats of quizzes or tests are actually forms. Form elements that expect user input must be associated with a label or question so the user knows what is being asked.

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**Repetitive Navigation Links**

*Standard: (o) A method shall be provided that permits users to skip repetitive navigation links.*

Training pages may contain standard navigation links on each screen to allow the user to jump out of a lesson. Users of assistive technologies should be provided a method to skip past these repetitive navigation links and into the main content of the screen. Without this option, a user would have to listen to each screen from top to bottom. Allowing the user to skip past template elements may also save time.

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**Timed Responses**

*Standard: (p) When a timed response is required, the user shall be alerted and given sufficient time to indicate more time is required.*

Web pages, including courseware delivered on the Web, may have built-in “timeout” features. This feature may be incorporated for a number of reasons including demands on the Web page’s server, security reasons, and so forth. Because individuals with disabilities may need extra time, the user needs to be alerted when he or she may be close to timing out. This notification should be in the form of a dialog box that appears after a certain period of inactivity or forward progression. The dialog box should provide a message about why it appeared and provide the option for the user to continue his or her work. This dialog box should remain on the screen long enough to give the user time to respond to it, for example, ten minutes; therefore, a timer needs to be set for the dialog box itself.

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**Best Practices**

Although not mandated by a specific standard, there are some best practices to incorporate either to be in compliance with Section 508 or to avoid unnecessary work by creating two versions of text content, one for the person without disabilities and one for the person with disabilities. Some examples follow.

Some users may not be able to click areas of the screen. Therefore, all-inclusive language should be used throughout the courseware.

Use select rather than click.

- Example: Select Next to continue.
- Example: Select OK.

Some assistive technology does not work well with references to buttons and some other elements. Therefore, an alternative to these words should be used through the courseware.

Use option rather than button or other elements.

- Example: Select the Save option.
- Example: From the File menu, select the Save option.

**Or** use the element name without mentioning what the element is.

- Example: Select Save.
  - Example: From the File menu, select Save.
  - Example: Select Enter.
-

**References/  
Assistance**

Although this appendix has covered many areas of the Section 508 requirements, you may find that you would like to read more about how to incorporate its standards into your courseware. Of course, the Internet is a good place to start, especially the Web sites of supporting software vendors and Federal government agencies.

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**Supporting  
Software/Plug-ins**

The Web sites of the supporting software/plugin vendors contain volumes of information on accessibility in general and specific information on how their products are Section 508 compliant. For example, you can select a product, and then see a table of each Section 508 standard and how the selected product is or is not in compliance. There are also whitepapers, developer centers, tools, resources, and so forth on the vendors' Web sites.

Some Web sites that contain accessibility resources and links include Macromedia, Adobe, and Microsoft. Their URLs are:

[www.macromedia.com/resources/accessibility](http://www.macromedia.com/resources/accessibility)

[www.adobe.com/enterprise/accessibility/main.html](http://www.adobe.com/enterprise/accessibility/main.html)

[www.microsoft.com/enable](http://www.microsoft.com/enable)

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**Additional  
Information**

There are numerous Web sites that contain a lot of useful information on Section 508 and its implications on Federal government agencies or anyone who develops electronic and information technology for a Federal government agency. Some of these Web sites' URLs and a brief description of each are:

[www.section508.gov](http://www.section508.gov)

This Web site provides a copy of Section 508, a summary of the subparts and sections of Section 508, and numerous resources and links. The Web site is maintained by the General Services Administration's (GSA) Center for Information Technology Accommodation (CITA), which has been tasked with educating Federal employees, building an infrastructure to support Section 508, and providing resources for understanding and implementing Section 508 requirements.

[www.access-board.gov](http://www.access-board.gov)

This Web site provides a copy of Section 508; explanatory, section-by-section questions/answers on various Section 508 standards; and numerous resources and links. The Web site is maintained by the Access Board, which is an independent Federal agency that advocates accessibility for those with disabilities. The Board has been responsible for establishing standards for accessibility and continues to be a leader in developing and disseminating information on accessible design standards.

[www.ittatc.org](http://www.ittatc.org)

This Web site provides links for the understanding of Section 508 and its implications. The Web site is maintained by the Information Technology Technical Assistance and Training Center (ITTATC), which is funded by the National Institute on Disability and Rehabilitation Research. ITTATC focuses on increasing the availability of accessible technology in the United States by providing accessibility training and technical assistance for Section 508 (and also Section 255 of the Telecommunications Act).

<http://dhsonline.dhs.gov>

The DHS Office on Accessible Systems and Technology has several guides online that help developers and managers create and assess different types of electronic and information technology. To access this through an internal DHS connection (intranet), go to <http://dhsonline.dhs.gov>. By searching components, follow the path “Management/CIO/Section 508 (OAST)”.

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### **Helpful Guidelines for Compliance**

The following standards are excerpted from Section 508 of the Rehabilitation Act, §1194.22. Everything in the left hand column is a direct quote from Section 508. The other two columns are only meant to serve as helpful guidelines to comply with Section 508. These guidelines are suggestions only, and are not part of the official Section 508 document. For the full text of Section 508, please see the official government 508 web site.

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**Web Intranet and Internet Information and Applications 36CFR1194.22**

- Related standards:**
- When using dynamic content, embedded software, custom user controls, AJAX and similar technical approaches or other client side programming, the functionality shall require the compliance with “Software” standards listed in a separate table.
  - When embedded multimedia is displayed the functions of the software such as start, stop, pause etc (Flash, Microsoft Media, Apple Quicktime etc.) shall comply with the “Software” standards. In addition, the content of the multimedia presentation shall comply with the “Video and Multimedia” standards.

SEC. 508 STANDARD	PASS	FAIL
(a) A text equivalent for every non-text element shall be provided (e.g., via "alt", "longdesc", or in element content).  [See Note 1]	Every image, Java applet, Flash file, video file, audio file, plug-in, etc. has an <i>alt</i> description.	A non-text element has no <i>alt</i> description.
	Complex graphics (graphs, charts, etc.) are accompanied by detailed text descriptions.	Complex graphics have no alternative text, or the alternative does not fully convey the meaning of the graphic.
	The <i>alt</i> descriptions succinctly describe the <i>purpose</i> of the objects, without being too verbose (for simple objects) or too vague (for complex objects).	<i>Alt</i> descriptions are verbose, vague, misleading, inaccurate or redundant to the context (e.g. the alt text is the same as the text immediately preceding or following it in the document).
	<i>Alt</i> descriptions for images used as links are descriptive of the link destination.	<i>Alt</i> descriptions for images used as links are not descriptive of the link destination.
	Decorative graphics with no other function have <i>empty alt</i> descriptions (alt= ""), but they never have <i>missing alt</i> descriptions.	Purely decorative graphics have <i>alt</i> descriptions that say "spacer", "decorative graphic," or other titles that only increase the time that it takes to listen to a page when using a screen reader.

SEC. 508 STANDARD	PASS	FAIL
(b) Equivalent alternatives for any multimedia presentation shall be synchronized with the presentation.	Multimedia files have <i>synchronized</i> captions and comply with “Video and Multimedia” and “Software” requirements.	Multimedia files do not have captions, or captions which are not synchronized.

[See Note 7]		
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<b>SEC. 508 STANDARD</b>	<b>PASS</b>	<b>FAIL</b>
(c) Web pages shall be designed so that all information conveyed with color is also available without color, for example from context or markup.	If color is used to convey important information, an alternative indicator is used, such as an asterisk (*) or other symbol.	The use of a color monitor is required.
	Contrast is good.	Contrast is poor.

<b>SEC. 508 STANDARD</b>	<b>PASS</b>	<b>FAIL</b>
(d) Documents shall be organized so they are readable without requiring an associated style sheet.	Style sheets may be used for color, indentation and other presentation effects, but the document is still understandable (even if less visually appealing) when the style sheet is turned off.	The document is confusing or information is missing when the style sheet is turned off.

<b>SEC. 508 STANDARD</b>	<b>PASS</b>	<b>FAIL</b>
(e) Redundant text links shall be provided for each active region of a server-side image map.	Separate text links are provided outside of the server-side image map to access the same content that the image map hot spots access.	The only way to access the links of a server-side image map is through the image map hot spots, which usually means that a mouse is required and that the links are unavailable to assistive technologies.

<b>SEC. 508 STANDARD</b>	<b>PASS</b>	<b>FAIL</b>
(f) Client-side image maps shall be provided instead of server-side image maps except where the regions cannot be defined with an available geometric shape.	Standard HTML client-side image maps are used, and appropriate alt text is provided for the image as well as the hot spots.	Server-side image maps are used when a client-side image map would suffice.

<b>SEC. 508 STANDARD</b>	<b>PASS</b>	<b>FAIL</b>
(g) Row and column headers shall be identified for data tables.	Data tables have the column and row headers appropriately identified (using the <th> tag)	Data tables have no header rows or columns.
	Tables used strictly for <u>layout</u>	Tables used for layout use the

	<u>purposes</u> do NOT have header rows or columns.	header attribute when there is no true header.
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<b>SEC. 508 STANDARD</b>	<b>PASS</b>	<b>FAIL</b>
(h) Markup shall be used to associate data cells and header cells for data tables that have two or more logical levels of row or column headers.	Table cells are associated with the appropriate headers (e.g. with the <i>id</i> , <i>headers</i> , <i>scope</i> and/or <i>axis</i> HTML attributes).	Columns and rows are not associated with column and row headers, or they are associated incorrectly.

<b>SEC. 508 STANDARD</b>	<b>PASS</b>	<b>FAIL</b>
(i) Frames shall be titled with text that facilitates frame identification and navigation.	Each frame is given a title that helps the user understand the frame's purpose.	Frames have no titles, or titles that are not descriptive of the frame's purpose.

<b>SEC. 508 STANDARD</b>	<b>PASS</b>	<b>FAIL</b>
(j) Pages shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.	No elements on the page flicker at a rate of 2 to 55 cycles per second, thus reducing the risk of optically-induced seizures.	One or more elements on the page flicker at a rate of 2 to 55 cycles per second, increasing the risk of optically-induced seizures.

<b>SEC. 508 STANDARD</b>	<b>PASS</b>	<b>FAIL</b>
(k) A text-only page, with equivalent information or functionality, shall be provided to make a web site comply with the provisions of this part, when compliance cannot be accomplished in any other way. The content of the text-only page shall be updated whenever the primary page changes.  [See Note 2]	A text-only version is created only when there is no other way to make the content accessible, or when it offers significant advantages over the "main" version for certain disability types.	A text-only version is provided only as an excuse not to make the "main" version fully accessible.
	The text-only version is up-to-date with the "main" version.	The text-only version is not up-to-date with the "main" version.
	The text-only version provides the functionality equivalent to that of the "main" version.	The text-only version is an unequal, lesser version of the "main" version.
	An alternative is provided for components (e.g. plug-ins, scripts) that are not directly accessible.	No alternative is provided for components that are not directly accessible.

SEC. 508 STANDARD	PASS	FAIL
<p>(l) When pages utilize scripting languages to display content, or to create interface elements, the information provided by the script shall be identified with functional text that can be read by assistive technology.</p> <p>[See Note 3]</p>	<p>Information within the scripts is text-based, or a text alternative is provided within the script itself, in accordance with (a) in these standards.</p>	<p>Scripts include graphics-as-text with no true text alternative.</p>
	<p>All scripts (e.g. Javascript pop-up menus) are either directly accessible to assistive technologies (keyboard accessibility is a good measure of this), or an alternative method of accessing equivalent functionality is provided (e.g. a standard HTML link).</p>	<p>Scripts only work with a mouse, and there is no keyboard-accessible alternative either within or outside of the script.</p>

SEC. 508 STANDARD	PASS	FAIL
<p>(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 §1194.21(a) through (l).</p> <p>[See Note 4] [See Note 5] [See Note 6]</p>	<p>A link is provided to a disability-accessible page where the plug-in can be downloaded.</p>	<p>No link is provided to a page where the plug-in can be downloaded and/or the download page is not disability-accessible.</p>
	<p>All Java applets, scripts and plug-ins (including Acrobat PDF files, PowerPoint files, etc.) and the content within them are accessible to assistive technologies, or else an alternative means of accessing equivalent content is provided.</p>	<p>Plug-ins, scripts and other elements are used indiscriminately, without alternatives for those who cannot access them.</p>

SEC. 508 STANDARD	PASS	FAIL
<p>(n) When electronic forms are designed to be completed on-line, the form shall 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.</p>	<p>All form controls have text labels adjacent to them.</p>	<p>Form controls have no labels, or the labels are not adjacent to the controls.</p>
	<p>Form elements have labels associated with them in the markup (i.e. the <i>id</i> and <i>for</i>, HTML elements).</p>	<p>There is no linking of the form element and its label in the HTML.</p>
	<p>Dynamic HTML scripting of the form does not interfere with assistive technologies.</p>	<p>Dynamic HTML scripting makes parts of the form unavailable to assistive technologies.</p>

<b>SEC. 508 STANDARD</b>	<b>PASS</b>	<b>FAIL</b>
(o) A method shall be provided that permits users to skip repetitive navigation links.	A link is provided to skip over lists of navigational menus or other lengthy lists of links.	There is no way to skip over lists of links.

<b>SEC. 508 STANDARD</b>	<b>PASS</b>	<b>FAIL</b>
(p) When a timed response is required, the user shall be alerted and given sufficient time to indicate more time is required.	The user has control over the timing of content changes.	The user is required to react quickly, within limited time restraints.

- Note 1:** Until the longdesc tag is better supported, it is impractical to use.
- Note 2:** "Text-only" and "accessible" are NOT synonymous. Text-only sites may help people with certain types of visual disabilities, but are not always helpful to those with cognitive, motor or hearing disabilities.
- Note 3:** At this time, many elements of Dynamic HTML (client-side scripted HTML, which is usually accomplished with Javascript) cannot be made directly accessible to assistive technologies and keyboards, especially when the onmouseover command is used. If an onmouseover (or similar) element does not contain any important information (e.g. the script causes a button to "glow"), then there is no consequence for accessibility. If this scripted event reveals important information, then a keyboard-accessible alternative is required.
- Note 4:** When embedded into web pages, few plug-ins are currently directly accessible. Some of them (e.g., RealPlayer) are more accessible as standalone products. It may be better to invoke the whole program rather than embed movies into pages at this point, although this may change in the future.
- Note 5:** Acrobat Reader 5.0 allows screen readers to access PDF documents. However, not all users have this version installed, and not all PDF documents are text-based (some are scanned in as graphics), which renders them useless to many assistive technologies. It is recommended that an accessible HTML version be made available as an alternative to PDF.
- Note 6:** PowerPoint files are currently not directly accessible unless the user has a full version of the PowerPoint program on the client computer (and not just the PowerPoint viewer). It is recommended that an accessible HTML version be provided as well.
- Note 7:** When multimedia is present, then the presentation functions such as start/stop/pause and the content available shall be accessible to all end users. The functionality of the user controls shall comply with the software standards of 36CFR1194.21 and the content of the multimedia shall comply with 36CFR1194.24.

**Section 508  
Compliance for  
Scripts, Plug-Ins,  
AJAX, Java, Video  
and multimedia  
displays, and other  
Web functionality  
that emulates  
“software-like”  
behavior (dynamic  
content).**

The following standards are excerpted from Section 508 of the Rehabilitation Act, §1194.21. For the full text of Section 508, please see <http://www.section508.gov/>.

**SEC. 508 SOFTWARE STANDARDS**

- (a) When software is designed to run on a system that has a keyboard, product functions shall be executable from a keyboard where the function itself or the result of performing a function can be discerned textually.
- (b) Applications shall not disrupt or disable activated features of other products that are identified as accessibility features, where those features are developed and documented according to industry standards. Applications also shall not disrupt or disable activated features of any operating system that are identified as accessibility features where the application programming interface for those accessibility features has been documented by the manufacturer of the operating system and is available to the product developer.
- (c) A well-defined on-screen indication of the current focus shall be provided that moves among interactive interface elements as the input focus changes. The focus shall be programmatically exposed so that assistive technology can track focus and focus changes.
- (d) Sufficient information about a user interface element including the identity, operation and state of the element shall be available to assistive technology. When an image represents a program element, the information conveyed by the image must also be available in text.
- (e) When bitmap images are used to identify controls, status indicators, or other programmatic elements, the meaning assigned to those images shall be consistent throughout an application's performance.
- (f) Textual information shall be provided through operating system functions for displaying text. The minimum information that shall be made available is text content, text input caret location, and text attributes.
- (g) Applications shall not override user selected contrast and color selections and other individual display attributes.
- (h) When animation is displayed, the information shall be displayable in at least one non-animated presentation mode at the option of the user.
- (i) Color coding shall 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 shall be provided.
- (k) Software shall not 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 shall 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.

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**Section 508  
Compliance for  
Video and  
Multimedia**

The following standards are excerpted from Section 508 of the Rehabilitation Act, §1194.24. For the full text of Section 508, please see <http://www.section508.gov/>.

**SEC. 508 VIDEO AND MULTIMEDIA STANDARDS**

(a) & (b) These standards apply to hardware and not likely within the scope of this guide. Please consult with 36CFR1194.24 at [www.access-board.gov](http://www.access-board.gov) if hardware is relevant.

(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, shall be open or closed captioned.

(d) All training and informational video and multimedia productions which support the agency's mission, regardless of format, that contain visual information necessary for the comprehension of the content, shall be audio described.

(e) Display or presentation of alternate text presentation or audio descriptions shall be user-selectable unless permanent.

## Appendix E References for Courseware Development Best Practices

### Analysis Phase

#### *Government Documents*

- Office for Domestic Preparedness – ODP Approach for Blended Learning 2/10/2003  
<http://www.ojp.usdoj.gov/odp/blendedlearning/odp.htm>  
This document serves as a practical guide for achieving ODP's organizational goals for improving WMD training through blended learning.  
*NOTE: Many of the sections of the Courseware Development Guide are based on and/or closely mirror this document.*

#### *Books*

- Figuring Things Out: A Trainer's Guide to Task, Needs, and Organizational Analysis by Ron Zemke, Thomas Kramlinger (1982)
- Analyzing Performance Problems: Or You Really Oughta Wanna by Peter Pipe, Robert Mager (1997)
- The Training Needs Analysis Toolkit by Sharon Bartram, et al. (2000)
- Training Needs Analysis: A Resource for Identifying Training Needs, Selecting Training Strategies, and Developing Training Plans by Sharon Bartram, Brenda Gibson (1994)
- First Things Fast: A Handbook for Performance Analysis by Allison Rossett (1998)
- Training Needs Analysis and Evaluation by Helen Bee (2000)
- Key Skills Analysis: A Resource for Analyzing Job Content and Training Needs and for Selecting Training and Development Programs by Lesley Howard, Rose Taw (2001)
- Developing a Gap Analysis by Faulkner Information Services (2000)

#### *Web Sites*

- Training Needs Analysis Checklists  
[http://www.trainingneedsanalysis.co.uk/tna\\_article2.htm](http://www.trainingneedsanalysis.co.uk/tna_article2.htm)
- How to Determine Training Needs  
<http://www.hr-guide.com/data/G510.htm>

#### *Software*

- Mentergy Designer's Edge  
<http://www.mentergy.com>
- BNH Expert Software Advisor  
<http://www.bnhexpertsoft.com>
- Microsoft Excel  
<http://www.microsoft.com>
- Training Technologies Survey Tracker  
<http://www.surveytracker.com/index.htm>

- Training Needs Analysis Toolkit  
<http://www.hrpress-software.com/trainadm.html>
- Survey Software for Employee Attitudes and Opinions  
<http://www.hrpress-software.com/surveys.html>
- Business Decisions Focus Product (integrated performance management system)  
<http://www.businessdecisions.com/focusprocess.asp>

## **Design Phase**

### *Government Documents*

- Standards and Guidelines for Web Services  
<http://10.60.132.73/preview/SandG.doc>
- Learning Levels  
Department of Defense Handbook - Development of Interactive Multimedia Instruction (IMI) (Part 3 of 5 Parts), Section 6.1.1.3.1  
MIL-HDBK-29612-3A, August 2001

### *Books*

- Web Style Guide – Basic Design Principles for Creating Web Sites by Patrick Lynch and Sarah Horton (1999)
- Professional Web Site Design from Start to Finish by Anne-Marie Concepcion (2002)
- Designing Web-Based Training: How to Teach Anyone Anything Anywhere Anytime by William K. Horton (2000)
- Principles of Instructional Design by Robert M. Gagne, et al. (1992)
- Web-Based Training: Using Technology to Design Adult Learning Experiences by Margaret Driscoll, Larry Alexander (1998)
- Making Instruction Work: Of Skillbloomers: A Step-By-Step Guide to Designing and Developing Instruction That Works by Robert F. Mager (1997)
- Constructing Accessible Web Sites by Jim Thatcher, et al. (2002)
- Designing Easy-to-Use Web Sites: A Hands-on Approach to Structuring Successful Websites by Vanessa Donnelly (2000)
- Web-Based Training Cookbook by Brandon Hall (1997)
- Designing Web Usability by Jakob Nielsen (2000)
- E-Learning: Strategies for Delivering Knowledge in the Digital Age by Marc J. Rosenberg
- Elements of Web Design by Darcy DiNucci, Maria Giudice, and Lynne Stiles (1998)
- Multimedia-Based Instructional Design: Computer-Based Training, Web-Based Training, and Distance Learning by William W. Lee, Diana L. Owens (2000)

*Web Sites*

- Web-Based Training Information site  
<http://www.filename.com/wbt>
- Yale WWW Style Manual  
<http://info.med.yale.edu/caim/manual>
- The HTML Writers Guild Website  
<http://www.hwg.org>
- IMS Global Learning Consortium  
<http://www.imsglobal.org>
- Web Page Design for Designers  
<http://www.wpdfd.com>
- Advanced Distributed Learning  
<http://www.adlnet.org>
- Section 508 Sites  
<http://www.section508.gov>  
<http://www.access-board.gov/508.htm>

*Software*

- Mentergy Designer's Edge  
<http://www.mentergy.com>

**Development Phase***Government Documents*

- Standards and Guidelines for Web Services  
<http://10.60.132.73/preview/SandG.doc>

*Books*

- Peachpit Press (publisher of a large selection of books on how to use specific authoring software or languages)  
<http://www.peachpit.com/books/webdesign.html>
- Wiley Publishing (publisher of a large selection of books on how to use specific authoring software or languages)  
<http://www.wiley.com>
- O'Reilly Publishing (publisher of a large selection of books on how to use specific authoring software or languages)  
<http://www.oreilly.com>
- Internet and World Wide Web: How to Program (With CD-ROM) by Harvey M. Deitel, Paul J. Deitel, T. R. Nieto

*Web Sites*

- WebMonkey  
<http://hotwired.lycos.com/webmonkey/webmonkey>
- Netscape Open Studio  
<http://home.netscape.com/computing/webbuilding/index.html>
- Efuse  
<http://www.efuse.com>
- House of Style  
[http://www.westciv.com/style\\_master/academy](http://www.westciv.com/style_master/academy)
- Web Design Group  
<http://www.htmlhelp.com>
- Web Developer's Virtual Library  
<http://www.wdvl.com>
- Earthweb Developer  
<http://webdeveloper.earthweb.com>
- Internet.com – Web Developer Channel  
<http://www.internet.com/sections/webdev.html>
- Internet.com – WebReference.com  
<http://www.webreference.com>
- Developer Shed  
<http://www.devshed.com>

*Software*

## Web Page Authoring Tools

- Adobe GoLive  
<http://www.adobe.com>
- Macromedia Dreamweaver  
<http://www.macromedia.com>
- Microsoft FrontPage  
<http://www.microsoft.com>

### GraphicsTools

- Adobe Photoshop  
<http://www.adobe.com>
- Adobe Illustrator  
<http://www.adobe.com>
- Adobe ImageReady  
<http://www.adobe.com>
- Macromedia Fireworks  
<http://www.macromedia.com>

### Interactive Objects

- Macromedia Flash  
<http://www.macromedia.com>
- Adobe LiveMotion  
<http://www.adobe.com>

### Media

- Apple QuickTime Pro  
<http://www.apple.com/quicktime>
- RealNetworks RealProducer  
<http://www.realnetworks.com>

### Documents

- Adobe Acrobat  
<http://www.adobe.com>
- Microsoft Office  
<http://www.microsoft.com>

## **Testing Phase**

### *Books*

- The Web Testing Handbook by Steven Splaine, Stefan P. Jaskiel, Alberto Savoia (2001)
- Automated Web Testing Toolkit: Expert Methods for Testing and Managing Web Applications by Diane Stottleyer (2001)
- Testing Applications on the Web: Test Planning for Internet-Based Systems by Hung Quoc Nguyen

### *Web Sites*

- Professional Certification Labs  
<http://www.procercert.com/labs/index.cfm>

### *Software*

- Aviation Industry CBT Committee CMI/Test Suite  
[http://www.aicc.org/pages/aicc\\_ts.htm](http://www.aicc.org/pages/aicc_ts.htm)

## **Implementation Phase**

### *Government Documents*

- Standards and Guidelines for Web Services  
<http://10.60.132.73/preview/SandG.doc>

## **Evaluation Phase**

### *Books*

- Evaluation and Implementation of Distance Learning: Technologies, Tools, and Techniques by Frances Belanger, et al. (1999)
- Measuring Instructional Results by Robert F. Mager (1997)
- Conducting A Business Impact Analysis by Faulkner Information Services (1999)
- Evaluating Training Programs: The Four Levels by Donald L. Kirkpatrick (1998)
- Handbook of Training Evaluation and Measurement Methods (Improving Human Performance Series) by Jack J. Phillips (1997)
- Info-line Guide to Training Evaluation by American Society for Training and Development, American Society for Training (1999)

*Web Sites*

- Evaluating Training (Web article)  
<http://home.att.net/~nickols/evaluate.htm>
- Evaluating Training and Results (Web article)  
[http://www.mapnp.org/library/trng\\_dev/evaluate/evaluate.htm](http://www.mapnp.org/library/trng_dev/evaluate/evaluate.htm)
- Measuring Training Effectiveness (Web article)  
<http://www.ncver.edu.au/articles/atr24web/effect.htm>
- Cognitive Technologies  
<http://www.cog-tech.com/Publications/PubsTrainingEvall.htm>

*Software*

- Mentergy Designer's Edge  
<http://www.mentergy.com>
- StatSoft Statistica  
<http://www.statsoftinc.com>
- StatView  
<http://www.statview.com/index.html>