NTED Style Guide

Training Support Package

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FEMA

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1.0 Introduction

The purpose of the National Training and Education Division (NTED) Style Guide is to provide the Training Partners and other DHS content providers and developers with recommended instructional guidelines for improving the capacity of state and local entities to respond to acts of domestic terrorism and catastrophic events. Establishing consistent style guidelines provides uniformity across multiple training partners' courses, and applying lessons learned and best practices in new mediums and modes of instructional delivery helps leverage new and effective techniques among the entire DHS community. The Style Guide is also intended to help increases course development efficiency by avoiding duplicative design, development, and evaluation of key course elements. Finally, this style guide is intended to support the Design, Development, and Implementation phases of NTED instructional development and delivery.

1.1 Audience

The NTED Training Partners are the principal audience for the Style Guide. More specifically, content developers including institute directors/deputies, project managers, content designers and developers, graphic artists, and programmers. However, the Style Guide is also intended as a reference for non-NTED content developers (e.g., state and federal sponsors)

1.2 Training Solutions & Using this Style Guide

Since the late 1990s, training solutions have been categorized predominantly into two main categories: Instructor-Led Training (ILT) and Web-based Training (WBT). ILT has been a critical mainstay for DHS and the First Responder community, and is well recognized for its effectiveness and from both a learner and performer perspective. It provides social interaction with immediate feedback (e.g., learners can ask the instructor a question and get an immediate response), is scaleable for different sized audiences, and provides instructors with an opportunity to incorporate various instructional strategies and media into the training to tailor content to a specific group of learners or adjust the content while presenting the training. And, of course, ILT typically removes learners from the work environment so that they can focus on the content free from distractions. For this reason, Section 2.0 (page 2) of this Guide focuses on recommended NTED approaches for Instructor-Led Training Course Design Standards, including Training Support Package (TSP) templates for developing ILT materials.

In contrast to the well-established and unchanging fundamentals of ILT, advances in Web-based technology have brought new elements and components to Web-based learning and performance. Perhaps more correctly termed "Advanced Distributed Learning," it includes 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 include Learning Management and Learning Content Management Systems (LMS/LCMS), collaborative learning environments (both synchronous and asynchronous), Performance Support, and intelligent tutors and agents. From a DHS and First Responder perspective, Web-based Training (WBT) courseware has been prevalent for quite some time within the community, and this Guide contains considerable guidance and best practices for implementing WBT courseware effectively for all First Responders. In addition, it also addresses some of the more recent advances in Web collaboration (such as Web casts and Blogs) that are becoming new components in modern blended training initiatives. In fact, it is becoming common for a comprehensive training initiative to incorporate aspects of ILT, WBT, and ADL within a given program of study. The various aspects of WBT and ADL development and delivery are addressed in Section 3.0 (page 8) through Section 5.0 (page 34).

2.0 Instructor-Led Training Course Design Standards

This section presents an overview of NTED ILT course development. Specifically, this section discusses criteria for using ILT as a training solution, best practices for developing an ILT, and the Training Support Package (TSP).

2.1 Criteria for Using ILT

The following list provides general criteria which may indicate that ILT is the most appropriate training delivery solution:

- Content is not necessarily stable
- Learners have a need for face-to-face interaction with the instructor
- The content focuses on psychomotor learning rather than cognitive and/or affective learning
- The audience is a small group, or the training will be delivered once
- Instructor and learners are in the same location
- There are travel funds available for the instructor and learners

2.2 Best Practices for Developing ILT Materials

Live (instructor-led) training, whether in the classroom or delivered through a variety of technologies, remains the cornerstone of any effective training program. For learners to gain the most out of live training, instructors should:

- Gain and keep the learners' attention by beginning with an anecdote or interacting with learners by asking a thought-provoking question; this approach engages learners, both in the classroom or online, and prepares them for learning
- Make the training relevant to the learners' work or position so they remain focused (e.g., Incorporating examples or analogies familiar to the learners)
- Inspire confidence to keep learners motivated by making the training expectations clear, and giving learners enough time to practice their new skills
- Foster the learners' sense of satisfaction by providing learners with opportunities to use their new skills through activities like role-playing, hands-on exercises, or simulations

2.3 Training Support Package

The Training Support Package (TSP) contains materials for creating and delivering an ILT course. The TSP is comprised of seven templates that were designed to provide a consistent look and feel across all ILT courses created and delivered as part of NTED. Additionally, the TSP contains templates for creating the necessary packaging materials. Finally, the TSP includes examples of supporting materials and a Level 1 Evaluation Form.

2.3.1 Templates

The templates are accessible from the Library section of the RTDC. Table 1 – Training Support Package Templates (below) provides an overview of the templates available to course developers. The templates were designed to ensure consistency across all ILT courses created and delivered as part of NTED. The following list provides tips and recommendations for using the templates:

- Download a template(s) from the Library section of the RTDC (be sure to save it as a .dot file in a convenient place on your computer)
- Always start a new document by opening the appropriate template (i.e., double-click the template (.dot) file)
  - Once a .dot file is opened, it automatically becomes a Microsoft Word (MS Word) document.
- Always use the Paste Special\Unformatted Text feature in MS Word when including content from a different source.
- Complete all editable fields as appropriate and remove those that do not apply.
- Adhere to the styles defined on the Style Page (first page of each template).
- Remove the Style Page prior to delivering the materials for review.

Table 1 – Training Support Package Templates

Template	Description
Course Design Document (CDD)	The template used to capture the Course Description, Course Structure/Content Outline, Course Design Matrix, and the Course Agenda.
Procedure Based Instructor Guide	The template used to create a procedure based instructor guide and includes the following sections: Introduction, Administration Page, and the course content.
Non-Procedure Based Instructor Guide	The template used to create a non-procedure based instructor guide and includes the following sections: Introduction, Administration Page, and the course content.
Procedure Based Participant Guide	The template used to create a procedure based participant guide and includes the following sections: Introduction, Administration Page, and the course content.
Non-Procedure Based Participant Guide	The template used to create a non-procedure based participant guide and includes the following sections: Introduction, Administration Page, and the course content.
Practical Exercises	The template used to create practical exercises.
PowerPoint Template	A template used to create training and/or presentations.
Packaging Materials	Several templates used for packaging ILT materials: Cover, Binder Spine, Binder Section Pages, CD Label, and VHS Label.

2.3.2 Course Design Document

The purpose of the CDD (previously known as the Plan of Instruction (POI)) is to serve as the blueprint for developing the ILT materials. The CDD typically includes:

- Course Description
- Course Structure/Content Outline
- Course Design Matrix
- Course Agenda

Note: The CDD template is available in the Library section of the RTDC.

2.3.2.1 Course Description

The Course Description provides a detailed description of the course and typically includes:

- A short course overview that states the course purpose, overall outcomes to be achieved by the course, and the main course topics
- A statement concerning the course scope
- A description of the target audience
- A list of prerequisite courses or knowledge/skills required before taking the course
- The estimated amount of time required to complete this course
- The course materials, technology, or facilities required to deliver the course
- The testing strategy to include pre/post tests, certification, mastery requirements, final tests, and the required score/percentage for passing
- A list of resources the instructor will need for developing the course
- An overview of the formative and summative course evaluation strategy

2.3.2.2 Course Structure/Content Outline

Establishing a logical and organized structure is an important design strategy that supports learners completing the course and eliminates frustration and confusion. By dividing content into logical and manageable pieces, a content hierarchy is established that gives the learner a mental framework on which to build. The NTED course structure consists of modules/lessons/topics. The information gathered during the Content Analysis is used to complete this section of the CDD. Please note that not every course contains lessons. A description of the NTED Course Structure/Learning Taxonomy can be found in the Design Phase.

2.3.2.3 Course Design Matrix

The Course Design Matrix provides an overview of each proposed module/lesson within the course and includes objectives, lessons/topics, instructional strategy, evaluation strategy, and practical exercises. The Course Design Matrix includes:

- A brief statement concerning the scope of the lesson
- A description of what learners will be able to do at the end of the module (Terminal Learning Objective (TLO))

- The skills, knowledge, and behaviors that learners must master to successfully achieve the TLO (Enabling Learning Objective (ELO))
- A list of lessons or topics
- An overview of how the content will be presented, to include how learners will interact with the content (e.g., tutorial, drill and practice, practical exercise, case study etc.)
- Assessment descriptions (as necessary)
- Practical exercise descriptions (as necessary)

Note: Each module/lesson needs to have its own matrix.

2.3.2.4 Course Agenda

The ILT Course Agenda provides an account of what will be covered on what day. The information captured on the agenda includes the day on which a given module/lesson will be covered, the module/lesson title, and the length of time required to complete the module/lesson (in hours/minutes).

2.3.3 Instructor Guides

Instructors use an Instructor Guide during an ILT to assist them with delivering the training. The TSP assists course developers with creating the appropriate materials to support the ILT course and contains two Instructor Guide templates:

- Procedure Based Instructor Guide
  The procedure based template is for writing step-by-step training and is a good tool for developing systems training.
- Non-Procedure Based Instructor Guide
  The non-procedure based template is for writing training that is not step-by-step.

Table 2 (below) includes the different components comprising an Instructor Guide.

Table 2 – Instructor Guide Components

Components	Description
Cover Page	Provides a cover page for the Instructor Guide.
Course Introduction	Provides an introduction to the course (e.g., overview, course goal, course purpose, major topic areas, etc.).
Administration Page	Lists the administrative items pertaining to the course (e.g., Duration, Objectives, Resources, etc.).
Course Content	Contains the course content to include the necessary support materials (e.g., objectives, textual content, visual aids, review exercises, handouts, etc.).
Special Instructor Notes	Provides a place to insert special directions for the instructor - common icons are included to highlight specific directions for the instructor
Instructor Notes	Provides a place for the instructor to write any desired notes not already included
Practical Exercise	Provides a location to insert exercises that are applicable to a lesson

In addition to the Instructor Guide components, the course developer should also develop the appropriate packaging materials as highlighted in Section 2.3.4.3 Packaging Materials of this document.

2.3.4 Participant Guides

The Participant Guide contains training material which includes the course content and supporting information in booklet or handout form that the learner has available for future reference. The TSP contains two Participant Guide templates:

- Procedure Based Participant Guide
  The procedure based template is for step-by-step training and is a good tool for developing systems training.
- Non-Procedure Based Participant Guide
  The non-procedure based template is for training that is not step-by-step.

Table 3 (below) includes the different sections comprising an Instructor Guide.

Table 3 – Participant Guide Components

Components	Description
Cover Page	Provides a cover page for the Participant Guide.
Course Introduction	Provides an introduction to the course (e.g., overview, course goal, course purpose, major topic areas, etc.).
Administration Page	Lists the administrative items pertaining to the course (e.g., Duration, Objectives, Resources, etc.).
Course Content	Contains the course content to include the necessary support materials (e.g., objectives, textual content, visual aids, review exercises, handouts, etc.).
Participant Notes	Provides a place for the participant to write any desired notes not already included.
Practical Exercise	Includes an exercise(s) that is applicable to a lesson.

In addition to the Participant Guide components, the course developer should also develop the appropriate packaging materials as highlighted in Section 2.3.4.3 Packaging Materials of this document.

2.3.4.1 Practical Exercises

The Practical Exercises is a template for developing activities, table-top exercises, case studies, or other materials that support the course.

2.3.4.2 PowerPoint Template

The PowerPoint template is used to present the content to learners, develop instructor and participant guides, and to deliver presentations/briefings. This template is comprised of the following:

- Title page
- Sample content page

2.3.4.3 Packaging Materials

The Packaging Materials templates are used for consistent presentation and delivery of the course materials and developed per the needs of a specific course. The course developers need only use those templates applicable to the specific course on which they are working (e.g., there may not be a video requirement for the course, so the course developer would not need to create a VHS label).

Table 4 (page 7) includes the different templates comprising the Packaging Materials.

Table 4 – Packaging Materials

Template	Description
Cover Page	This template is for creating the cover for the binder, Instructor Guide, and/or Participant Guide. It is consistent with the visual standards applied across NTED courses.
Binder Spine	This template is for creating the binder spine and corresponds to the cover.
Binder Section Pages	This template is for creating the binder pages which are used to separate the primary sections of the binder. The section pages are color coded for easy identification.
CD Label	This template is for producing CD label.
VHS Cover Label	This template is for producing the VHS label.

2.3.5 Support Materials

The Support Materials detail the audio/visual components that are part of any learning module, session, or lesson or that support the overall training being delivered.

Table 5 (below) includes the different types of Support Materials.

Table 5 – Sample Support Materials

Section	Description
PowerPoint Template	This template is a visual mock up of a course title slide and text slide to develop PowerPoint presentations.
Job Aid Examples	The job aid examples include job aid elements and samples.
Assessment Questions	The assessment questions provide examples of different questions types to be used for assessing learner knowledge.

2.3.6 Level 1 Evaluation Form

The Level 1 Evaluation Form is a standard NTED form used to evaluate an ILT. Instructors distribute the form to learners at the end of a course to evaluate the training. Learners complete the form and then give it to the instructor.

3.0 WBT/ADL Design Considerations & Standards

WBT and ADL often comprise media-rich training environments, fully capable of evaluation, adaptation, collaboration, remediation, and participation across various computer platforms. Typical media elements used in this environment include text, graphics, photographs, animations, video, and audio.

Web-based Training (WBT) and other emerging Web-based technologies are very popular for a number of reasons:

- ***Flexible and convenient*** – users can access training when they want and at their own pace
- ***Multiple platform support*** – training can be accessed from traditional computing platforms, as well as Personal Digital Assistance (PDA), cellular phones, and Apple iPods.
- ***Greater Reach*** – large numbers of distributed learners can participate and collaborate without incurring travel expenses.
- ***Less expensive to maintain and distribute*** – since the content is normally centrally managed and delivered, modifications need to be applied in a single location requiring less maintenance resources. Web delivery also is less expensive and complex than distributing source files via CD-ROM.

Since WBT is still the leading Web-based training method, a large portion of the Style Guide addresses standards and approaches for constructing and delivering the necessary components for effective WBT. However, the Style Guide also addresses audio and video development considerations that become critical for new Web delivery methods such as Web and Podcasting. These emerging methods will also be noted in this section from a design perspective, and addressed in later sections as well (Development and Delivery).

3.1 WBT Template Introduction

Training templates have been developed for both HTML-based WBT courses as well as Flash-based courses. The templates are provided as a starting point for creating DHS branded NTED courseware and contain a set of source files organized around the following interface elements:

- Header
- Content area
- Footer

The templates also contain a code structure that addresses navigation, Sharable Content Object (SCO) details, and basic functionality on the page level (See Section 3.2.1, page 9, for more information on SCORM and SCO construction). The goal of providing both HTML and Flash templates is to create a means for both entry-level and advanced instructional developers to enter into the development (screens) phase sooner, while providing a flexible environment to contain a variety of content.

3.2 Designing for the Technical Environment

To use the templates, instructional developers should have a certain level of experience and knowledge regarding to the core technologies (HTML, JavaScript, CSS, and/or Flash). The templates use a variety of scripting languages while meeting various needs. They were designed with the following target environment in mind:

- Use with Web Browsers consistent with Version 6.0 or higher of both Microsoft Internet Explorer and Netscape Navigator browsers
- Flash 6 (or later) plug-in[1]
- Desktop resolution set to 800 x 600 pixels or higher
- Support for JavaScript is not disabled

3.2.1 Interoperability and SCORM

The Sharable Content Object Reference Model (SCORM) developed and sponsored by the Advanced Distributed Learning (ADL) initiative, is a set of interrelated technical specifications built upon the work of the AICC, IMS, IEEE and others to create one unified "reference model." These specifications and guidelines have been integrated and adapted within the SCORM to meet DOD high level requirements of accessibility, interoperability, durability and reusability of Web-based learning content and systems. The main focus of the SCORM at this time is the interoperability of learning content with learning management systems and consists of three main components:

1. **Content Packaging** - provides a mechanism for identifying and packaging all necessary components of learning content so that they can be ported from system to system. In addition, it provides a way to describe the organization and structure of the learning content to achieve a particular learning context.
2. **Run-Time Environment** - provides a common Application Program Interface (API) and Data Model to allow for consistent and interoperable communication of learning content to learning management system at run-time.
3. **Meta-data** - provides a mechanism to describe learning content at various levels that include content aggregations, sharable content objects (SCOs) and assets.

It is important to note that the current SCORM (version 2004) addresses only interoperability issues between content and learning management systems, and does not address content accessibility issues covered by Section 508 (though it may be included in the future). Based on the general acceptance of SCORM and its inherent benefits, DHS is committed to adhere to SCORM principles for all of its WBT and ADL content.

[1] Certain functionalities may be better supported by a later version of the Flash plug-in. If developers choose to use a newer plug-in, a link to the plug-in download page should be included in the OBJECT and EMBED tags. In general, implementing content that requires version 7 of the plug-in is likely a safe approach, whereas the use of version 8 is discouraged since it is used by a smaller percentage of the market. For data regarding player distributions, please refer to this Adobe page that summarizes third-party studies.

For each SCORM deliverable (e.g., WBT courseware), developers should develop an Instructional Definition Document (IDD) that describes how SCORM compliance will be addressed for each deliverable, including the following:

- Content Aggregation Model
- Generation and storage of meta-data;
- Content structure and packaging
  - Developers should define the appropriate Sharable Content Object (SCO) granularity -- the smallest logical size practical for the client to track reuse. This "atomic" collection of SCO assets can then be combined and re-aggregated in a variety of ways to contribute to differing higher-level objectives (i.e., they are context-free and reusable). Descriptive SCORM-compliant meta-data, used to facilitate search, discovery, and reuse, will be developed for each media asset, SCO, and content aggregation. Developers should conform to the IEEE P1484.12.1 Learning Object Meta-data (LOM), draft standard version 6.4.[2]

While 2004 is the latest version of SCORM, it is recognized that there is a natural "adoption period" that it takes before developers and LMS solutions alike fully embrace the new features and functionalities of this standard.

For these reasons, the current WBT templates have been designed and tested for SCORM 1.2. This includes:

- Creation of sample manifest
- Validation with the ADL SCORM conformance Test Suite (version 1.2.3)
- Loading of Manifest and sample content into the Plateau 5.5 environment

At the time of this writing, there is no final best practice guidance from NTED regarding how to format manifests and the metadata vocabulary. The supplied manifest is a representative approach and should not be treated as a required format.

3.2.2 Accessibility and Section 508

Most government organizations are now requesting that content be developed and delivered in accordance with the 1998 amendments to the Rehabilitation Act (informally known as Section 508).[3] This is a very important characteristic for both WBT and ADL to reach the broadest possible audience and maintain its broad appeal. To facilitate the requirements of the Section 508 Guidelines, certain functionalities are built into the templates:

- Tab indexes for interface buttons
- Alt equivalents for appropriate images
- Frame titles
- JAWS screen reader tests to verify ease of readability
- Additional steps taken to enable a passing "grade" with a 508 validation tool like Bobby.

[2] The IEEE Review Committee accepted this revision on May 3, 2002.
[3] See http://www.access-board.gov and http://www.Section508.gov for more information.

It is the responsibility of the instructional developer to ensure that media and information added to the content areas of the WBT Templates meet the Section 508 requirements. For example, elements in the content area should also be assigned tab indexes to indicate navigation via the keyboard. Elements should also have Alt equivalents.

Concerning the use of Flash animations (SWF files), while most 508 compliance software is not able to assess Flash content, it is recommended that a screen reader like Jaws or Window Eyes is used to check for readability and navigation. It is recommended that Flash source code is compiled (or published) to Flash Player version 6 or later to fully support Section 508 features and functionality.

The following is a high level checklist of some design considerations before developing content. This is only a partial list of talking points and should be used for discussion between developers, customers, and project managers.

- A text equivalent for every non-text element is provided. All interface images and navigation buttons have "Alt" description text tags.
- All navigation functions and interactive elements are keyboard accessible by tabbing to the desired button and pressing the Enter key. In addition, accelerator keys are assigned to all navigational elements that allow the user to quickly access the function without the use of a mouse/pointer device. (For example, "Alt-n, Enter" will display the next content page.)
- All Image mapping and pop-up layering scripting are client-side, allowing for "reading" by assistive technologies for the blind.
- All interface graphical elements including navigation button images have passed tests with graphical tools designed to test for readability/visibility problems experienced by people with color-blindness.
- All frames used have names that indicate purpose and/or function. Specifically, the frames are named "Logo", "Content", and "Navigation."
- Java applets are not to be used.
- If Flash movies or other elements requiring plug-ins are used, the code should be designed to provide links to download the plug-ins if they are not already installed in the user's browser.
- All text, interface elements, and content can be displayed without the use of a style sheet, if necessary.

3.3 Template Design

The interface templates illustrate the best practices and recommendations for screen design. Figure 1 (below) illustrates the newest design for the NTED WBT content screen template.

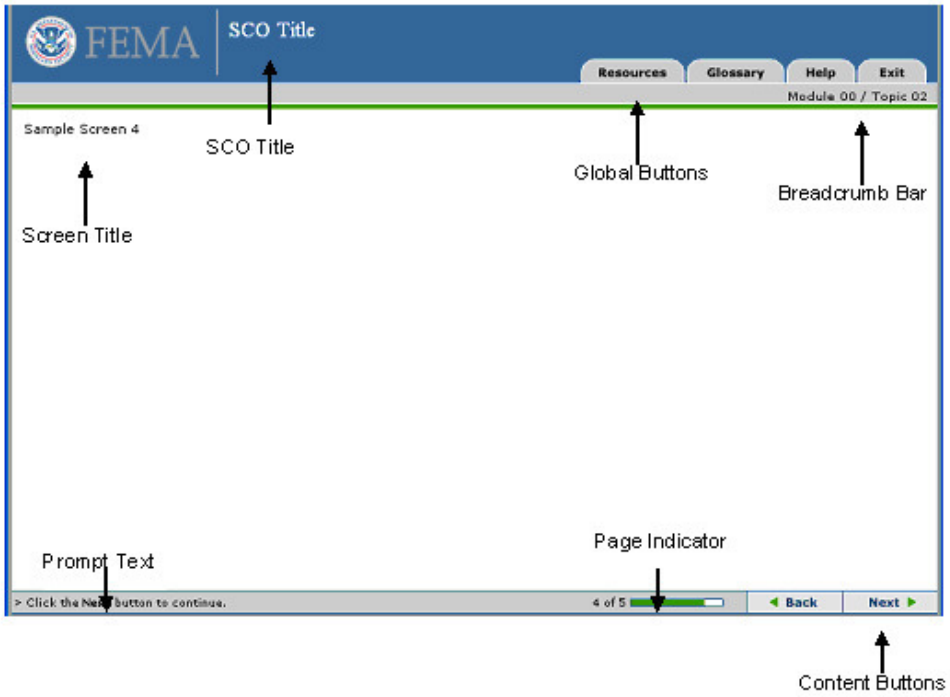


Figure 1 - Sample Content Screen

3.3.1 Interface Design

Table 6 (below) identifies the characteristics of the HTML and graphical elements of the interface illustrated in **Error! Reference source not found.** (**Error! Reference source not found.**). All finished graphics should be saved as 16-bit compressed .jpg /.gif files. The table also contains recommendations and best practices.

Table 6 – Interface Design Elements

Interface Element	Description
Global Interface	All screens will use a standard background and top bar banner layout, logo, and course title. The global interface will display as Page background color: bin hex code
Global Buttons	Global buttons will be placed in the top right portion of the course window layout. The global buttons will display as three possible states, Normal, Selected (highlight) or disabled (grayed out). Global buttons will be displayed as: • .jpg/.gif graphics • Button names may be overlaid as part of the graphic

Interface Element	Description
Breadcrumb Title	The breadcrumb bar should display the specific learners' location within the course. The breadcrumb bar displays as: • HTML text • Arial or Verdana font • Left-justified
Screen Title	The title bar contains the screen title. The screen title is displayed as: • HTML text • Arial or Verdana • Left-justified
Content Body Text	The body text consists of the main text area content for any given screen. This text displays as: • HTML text • Arial or Verdana 12-14 pt. usually black font • Left-justified
Content Hyperlinks	Hyperlinks link learners to pop-up content within the course, and should include indications of the following states: • Normal • Visited • Rollover
Content Bullets	Bullets are used to separate, organize, and chunk information. Bullet text is displayed as: • HTML text • Arial or Verdana Bullet Shape can be customized according to course needs.
Page Indicator (i.e., Page X of Y)	The page indicator is displayed as: • HTML text • Arial or Verdana • Left-justified
Course Content Navigation Buttons	Course content navigation buttons (e.g., "Back" and "Next") will have three states: • Normal • Selected • Disabled The buttons will display as: • .jpg /.gif graphics • Futura Md Bold 8 pt. font overlaid as part of the graphic
Prompt Text	Prompt text is instructional text informing learners of how to proceed. Prompt text displays as: • HTML text • Arial or Verdana font (bold font when referring to a button), • Left-justified

Interface Element	Description
Content Specific Buttons	Content-specific buttons can have three to four states: Normal, Highlighted, Selected/Down, and Disabled. Content-specific buttons may include any or all of the following: • More • Scenarios • Questions • Print (Certification)
Pop-up Text	The storyboard design may include references to linked text within the course content area that will display in a window specific to that word or phrase; this is referred to as a "pop-up". The pop-up link will display as: • Underlined HTML text (hyperlink) The pop-up text box will display as: • HTML text • Window will be sized appropriate to amount of text content and will be color coordinated to match the course look and feel
System Alert Boxes	System alert boxes will follow the standard MS Windows layout including a close window "X" control. An example of this window would be if the user selects a module from the main menu that they have not been through and is out of sequential order. This box may be color coordinated to be similar to pop-up windows.

3.3.2 Course Control Elements

3.3.2.1 Navigation

Learners will navigate through the course content using the Next and Back buttons. When learners reach the end of a topic in a module, they will be returned to the main menu. Learners will then need to select the next module (whether sequential or learner determined will depend on course) from the main menu to continue.

Table 7 – Suggested Global Navigational Buttons

Button	Description
Menu	The Menu button returns learners to the main menu screen and is disabled when not needed.
Exit	The Exit button displays an alert box asking learners if they are sure they want to exit. If learners click yes the course closes.
Back	The Back button returns learners to the previous content screen (disabled on the first screen of content).

Button	Description
Next	The Next button forwards learners to the next content screen (disabled on the last screen of content).
Glossary	The Glossary button opens a new window containing an alphabetical list of glossary terms.
Help	The Help button opens a new window containing help content.

3.3.2.2 Course Indicators

Course indicators are those screen elements that are part of the interface providing learners with prompts and their location within the course.

The control elements listed in Table 8 (below) can be programmed into the course:

Table 8 – Control Elements

Element	Description
Prompt Text	Prompt text displays instructions (e.g. Click the Next button to continue.).
Page Indicator	The page indicator displays current page number and total number of pages in the specific lesson (e.g., 2 of 23).
Progress Indicator	The progress indicator is a visual cue indicating module progress.
Breadcrumb Bar	The breadcrumb bar displays module and topic progress.

3.3.2.3 Course Content Layout

The course content area is defined as content contained within the global interface. Table 9 (below) lists examples of different layouts that can be used to display course content.

Table 9 – Course Content Layouts

Layout	Description
Text Only	The text only content area will contain only text (e.g., practice question).
Text on Left, Graphic on Right	For text on left, graphic on right, text and graphics will be placed in HTML table cells side by side.
Text on Bottom, Graphic on Top	For text on bottom, graphic on top, text and graphics will be placed in HTML table cells on top of each other.

3.3.2.4 Course Content Graphics

Courses will include both graphics and text that will be detailed and described in the course storyboard. Graphic specifications should include:

- Source art for screen graphics originating from royalty-free sources or client supplied graphics /photographic images.

- Screen graphics adhering to one of the course content templates described in the previous section but may contain either one or a collage of images dependent upon source artwork and how to best support the storyboard content.
- Screen graphic artwork should have a consistent look and feel to help the image standout in the screen layout. An example would be a black border (2pt) with a 30% black drop shadow.

3.3.3 General Screen Development Standards

General screen development standards provide recommendations for developers to follow when creating screens. This section discusses Text Layout, Text Appearance, Visual Elements, and Media Types.

3.3.3.1 Text Layout

The following list contains the recommended standards for text presentation:

- Limit the amount of text on screen.
- Use short lines of 40-60 characters.
- Avoid long segments of text wherever possible. Convert full text documents or long text segments requiring more space than is available on a single screen to PDF format.
- Use short sentences and paragraphs. Use bullets, numbered lists, tables, and charts to break up lengthy sentences.
- Provide generous white space to separate blocks of text (typically paragraphs are separated by double spaces (i.e., a <P> tag)).

3.3.3.2 Text Appearance

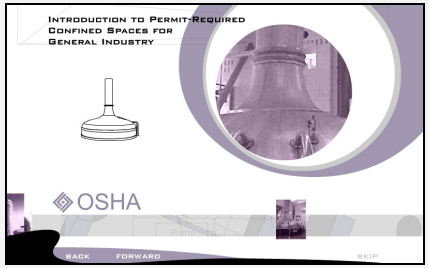
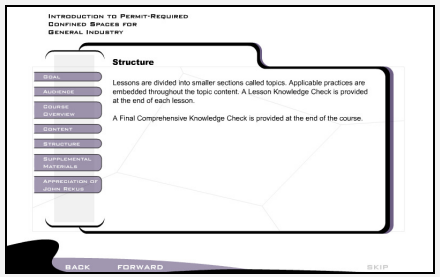
The following list contains the recommended standards for text appearance:

- Do not indent paragraphs.
- Use left justification for basic text.
- Reserve upper case words for certain titles, and even then, use sparingly.
- Do not use underlining except for hyperlinks. Glossary words and important terms and phrases are hyperlinked, providing learners with access to additional information. To emphasize a word or concept, use bold. Avoid using italics, all-capitals, or underlines.
- Hyperlinks will have three colors specified by graphic designers to indicate the hyperlinks states; normal state (link has not been accessed), rollover state (link is currently being accessed) and visited state (link has already been accessed).
- Do not use blinking text.

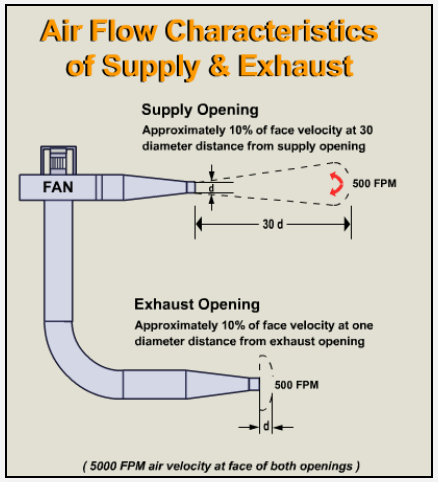
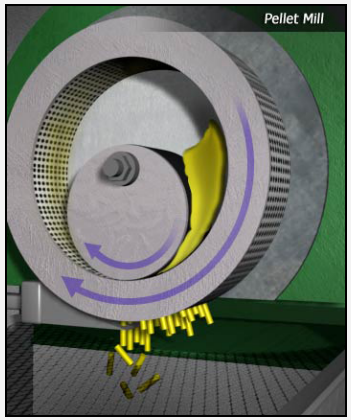
3.3.3.3 Media Types

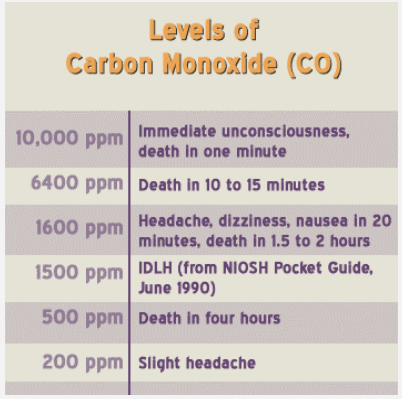
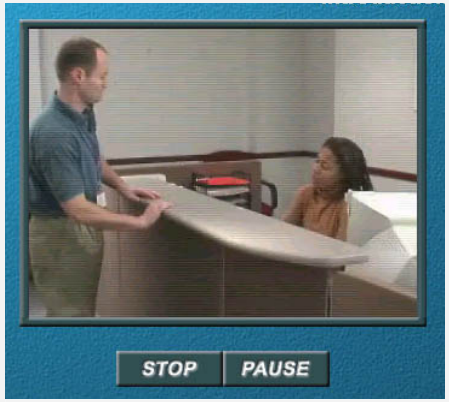
Table 10 (Media Types, page 17) presents different types of media for use in WBTs. The level of difficulty associated with each media type is based on a scale of 1-4 where 1 indicates a low level of difficulty, time, and effort required to create the element and 4 indicates a high level of difficulty, time, and effort to create the element.

Table 10 – Media Types

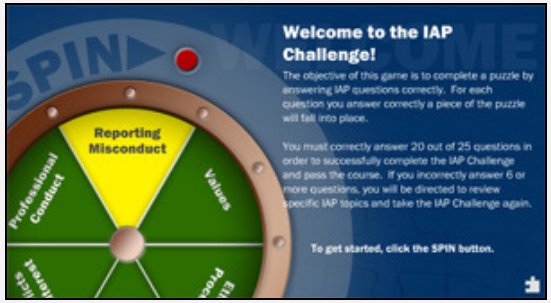
Media Type	File Format	Example	Description	Strategy	Level of Difficulty
Flash	.swf	 	The example media element illustrated here is an opening animation that introduces the learner to the course and gives the learner an overall feel of what they will be learning. A best practice is to include elements, such as photos, illustrations, 2D/3D graphics or any other visual element that can tell a story about the course in the opening animation or splash screen sequence. Animations may include embedded controls (e.g., back, forward, replay, and skip) so the learner can bypass the animation at any time and go directly to the Main Menu. Other optional information that can be included in a splash screen sequence includes: credits, history or background to the course.	This type of screen/media element is an excellent tool for engaging/motivating learners and giving them an overview of what they are going to learn in the course.	3-4

Media Type	File Format	Example	Description	Strategy	Level of Difficulty
Complex Animation	.mov .avi .mpg .swf .wmv	 	A complex animation is used to enhance a learner's experience by providing a visual to a scenario that is often difficult, impossible or cost prohibitive to photograph or videotape. Complex animations may be created in a 3D or 2D software package and can include special effects such as particle-driven fire, smoke or water, audio, animated characters, or highly-detailed environments. Complex animations are the most time-consuming media element to create and modify therefore detailed information and references are required from a SME. Use complex animations when the following conditions exist: 1) A situation can not easily be portrayed through other media elements. 2) Reuse of the animation or part of the animation on another screen icons or elements of complex 3-D animations when possible.	Complex animations provide a great way to re-create a scenario or environment that is difficult, impossible or cost prohibitive to photograph or videotape. Some examples are: • Dangerous work environments, where a 3D character can be put in potential harm. • To show scenes with explosions, fire, water or smoke damage • To show how a piece of machinery works or is damaged if used improperly.	3-4

Media Type	File Format	Example	Description	Strategy	Level of Difficulty
Simple Animation	.mov .avi .mpg .swf .wmv		A simple animation can be created in a 2-D or 3-D software package and usually shows a simple process by animating simple elements such as shapes, text, photos, or simple illustrations. These types of graphics are less time-consuming than complex animation and are sometimes used when less reference items are available.	Simple animations are a great way to get the learner to interact with a concept. Some examples of simple animations include: • A moving photo collage or montage • Morphing • Animated arrows in a diagram or schematic to show flow or a process.	1-3
2D/3D Illustration	.jpg .gif		2D and 3D illustrations are static graphics that are used to enhance and supplement reference materials that are provided by the SME. Illustrations help learners visualize a concept and further enforce instructional text.	Illustrations are helpful for providing: • A unique perspective on an environment or object • Detail unavailable in existing photos or graphics • A recreation of a photo or illustration that is	1-3

Media Type	File Format	Example	Description	Strategy	Level of Difficulty
				copyrighted	
Static Graphic	.jpg .gif	 	Static graphics usually include items that are provided by the client/SME for reference material. These items can include; photographs, clipart, charts and tables. They may also include royalty-free photographic material. Some diagrams and charts may need to be recreated if the reference material is not usable or does not fit in with the look and feel of the course.	Static graphics are useful to include because they provide real-life examples and context for learning content. Some examples are: • Photos • Clip-art • Tables of information • Documents • Diagrams	1-2
Digital Video	.mov .avi .mpg .wmv		Digital video can be time-consuming and more costly to produce if there is not "near broadcast quality source material" that has been previously shot and that aligns exactly with the storyboard content. When using existing video, written copyright permission is required and should be documented unless the video is obtained from one of the following sources:	Digital video is best used to: • Provide a "true-to-life" example of a work environment • Illustrate how to perform a task • Demonstrate how a piece of equipment works	4

Media Type	File Format	Example	Description	Strategy	Level of Difficulty
			• Royalty-free websites • Client-owned material • Government-furnished material		
Simulations	.exe .swf .html		Simulations allow the user to observe the impact of their choices without the outcomes having any impact on the real operation. Simulations can be created to simulate the use of certain hardware or machinery, or the use of software tools and applications. Users can learn how to respond to emergencies, how individual actions and decisions affect entire processes, and how to operate complex pieces of equipment. The example illustrated here allowed the user to make role-based decisions about a possible WMD situation.	Simulations are best used to: • Enable the learner to make choices and learn from their decisions • Demonstrate complex machinery or interactions	4

Media Type	File Format	Example	Description	Strategy	Level of Difficulty
Games	.exe .swf .html		Games are a high-level replacement for static knowledge checks. They can take many forms, including: • Trivia • Action • Decision-based • Problem solving • Timed events	Games challenge the learner and encourage active learning. Consistent active engagement contributes to higher levels of motivation, enjoyment, and learning retention.	4
Audio	.wav .aiff .mp3	Not applicable.	Audio can help users retain learning or to add supplementary information to a course.	• Do not use audio presentations in place of print materials • Avoid long presentations because of attention fatigue • When using audio, do not repeat/loop since learners can rewind/replay as necessary	

3.4 Graphics Development

This section discusses qualitative and technical considerations appropriate for graphic development.

3.4.1 Qualitative Considerations

The following list of recommended guidelines should be used when developing graphics and photos:

- Avoid using too many visual cues or too many colors at once.
- Ensure adequate contrast between text and background colors (e.g., gray scale).
- Ensure that key details are easily identified (e.g., numeric data in a chart).
- Ensure photos are digitized and saved in a JPG format.
- Ensure consistent look for photos and graphics by establishing standards such as backgrounds, borders, size of borders, etc.
- Save clipart, simple line art, logos, icons, and tables in a .gif format.

3.4.2 Technical Considerations

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

- Use 72 dots per inch of detail for all images.
- Develop graphics for 16-bit SVGA color environment and compress them (or utilize adaptive/custom color pallets) to minimize file size.
- Optimize graphics for viewing in a browser environment and use file formats most appropriate for that purpose (e.g., .gif and .jpg).
- Design graphics so that images appear on the screen before the text or captions when they are not supposed to appear simultaneously with text items.
- Place large or complex graphics on the screen in logical sections. Each section should finish drawing before the next section begins. Large graphics will be saved in a progressive download format (e.g., .gif and .jpg) or sliced to facilitate faster downloading.

3.4.3 Charts and Illustrations

Charts (e.g., pie charts, bar graphs etc) can be used very effectively to present information in an online format for instructional and presentational purposes. The following list of recommended guidelines should be used when producing charts and illustrations:

- Use a standard look and feel for all charts in a course to give them consistency.
- Title charts clearly with appropriate weight fonts and sizes.
- Refrain from overloading the chart with too many small symbols or graphics.
- Use chart animation sparingly; learners should focus on one element only and animations should be no longer than 5 seconds.

3.5 Animation

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

- Avoid using blinking screen elements (e.g., 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 and do not use any special effect that takes attention away from learning.
- Consider your audience and think carefully before using cartoon-like animations.
- Engage learner interaction with the animations by allowing them to click on an item/graphic element, button, or text to play an animation or video clip.
- Animation paths, colors, and object distinctions should remain clear and uncluttered.
- Use complex 2D/3D animation:
  - To show key concepts that are difficult to describe, impossible or cost-prohibitive to photograph or videotape
  - Use complex animation when the animation or parts of the animation will be reused elsewhere in the course

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

- 2D animations should be created in the Flash/Shockwave format (.swf) at the appropriate resolution.
- 3D animations should be created as either digital video files or Flash/Shockwave (.swf) files.
- "Hybrid" animations that can include 3D imagery and/or more complex 2D animations should be created in the Flash/Shockwave format (.swf).
- The Flash 6 plug-in 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).
- From an ADL perspective, it is important to consider the potential platforms for the delivery of the animation. Complex animations, even when effectively compressed, can be a considerable physical size. These animations can present bandwidth constraints that might limit their reach to PDA and other mobile platforms. Even if the animation is streamed, bandwidth constraints may cause latency (a periodic interruption of the stream flow) that may distract from the animation.

3.6 Digital Audio

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

3.6.1 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:

- Incorporate audio into lessons where it is critical to the mastery of the learning objectives.
- While considering the use of narration for content, factor the following:
    1. Will it improve the overall user experience?
    2. Will it improve the learner's ability to retain information?
    3. What will the impact be on the hosting environment? If not implemented efficiently, audio can take a decent amount of bandwidth both in terms of the size of the audio files and the size of the user audience.

The following list of recommended standards should be used to develop audio:

- Create a separate script to correspond to each changing element within the screen (e.g., if the audio is to be synced with the appearance of three bullets, then create three separate audio scripts) and label the scripts and the event to explain the relationship.
- Before recording any audio, ensure all scripts are reviewed and approved by the customer and/or other individuals that have an interest in the content of the audio.
- Remember that legal issues will arise based on the content in the digital audio files. It is illegal to distribute a sound byte or song without appropriate copyright permissions. When obtaining rights to use any audio, be sure to verify the ability to use it in a multimedia environment (Web, CD-ROM).
- 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. Adhere to the following standards:
    - Use short sentences.
    - Avoid acronyms, technical jargon, and unfamiliar terms
    - Define terms if used.
- Express all numbers numerically (e.g., There are 500 species of beetles.).
- Format the acronym to reflect each letter

3.6.2 Post-Production

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

- Ideally, use a professional narrator for all narration and ensure that the narrator uses an appropriate style and tone.
- Implement a text transcript of the audio in accordance with current accessibility standards so they are available for use in closed captioning and as a separate document download.
- Digitize at 44.100 kHz sample rate, 16-bit sample size (a.k.a. sample resolution).
- When down sampling for use in an online or CD-ROM environment, follow these general standards:
  - For music, leave it at that 44.100 kHz rate
  - For speech in a foreign language, down sample to 22.050
  - For native language, down sample to 11.025
- Save source files in their raw form, usually as a .WAV, onto a CD-ROM for delivery to the client for future edits/use. This CD-ROM copy is not to serve as a backup.
- When performing audio compression, consider .MP3 (MPEG-1 Audio layer III) as the ideal option. Even though there are many different bit rates for MP3, a common practice is to use 128 kpbs for music recorded in stereo, and 64 kilobits per second for music in mono. Narration can be compressed as low as 32 kpbs (minimum quality, minimum bandwidth demands) or as high as 128 kpbs (maximum quality, maximum bandwidth demands). 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 learner 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. For many current video CODECs this would mean the MPEG4-based audio compression may already be built into them.

3.7 Digital Video

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

3.7.1 Pre-production

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

- 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 and ensuring that segments of edited video tell a story, writing storyboards in advance of the editing process can be time consuming and expensive, but will save time and cost in the long run. 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 and storyboards are ready and signed off.

- Professional actors should be employed when possible for video productions, unless there is a recognized expert who can communicate the teaching point.
- Continuous video clips (more than 15 – 20 seconds in length) should not be used.
- Appropriate video format for the content should be presented (e.g. talking head, show and tell, interview, panel discussion, simulation, or dramatization).
- Remember that legal issues can arise from the content in digital video files. It is illegal to distribute a captured video image without appropriate copyright permissions. When obtaining rights to use any video footage, be sure to verify the ability to use it in a multimedia environment (Web, CD-ROM).
- If the content requires motion to clearly depict the point then 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 (e.g., wide shots, close-ups, panning shots, zooming in, zooming out, and action shots).
- Separate page should be used for video scripts and reference the corresponding screen number in a two-column format.
    - The left column should describe the scene to be produced.
    - The right column should state the actual words to be recorded.
- Traditional techniques such as zooming, panning, transitional wipes and dissolves and fast motion subjects should be avoided because of the reduced performance it causes when using compressed digital video The images smear.
- Uncompressed AVI or MPEG-2 format should be used for saving video sources and these files should be saved to either CD-ROM or DVD for archival purposes.
- Text transcripts should be created and provided.

3.7.2 Post-production

The following recommended guidelines should be used for video post-production:

- Use video or graphic window overlays to show extreme close-ups of small objects such as knobs and switches for wide-angle views.
- Record original video in a high-quality format such as Beta or digital video. The greater the quality of the original video footage, the greater the quality of the compressed digital video the learner will see.
- Video must be delivered in a file format fitting within the technical specifications of the learner environment.
- The video player must allow learners to play, pause, and repeat video.
- The Flash 6.0 (and higher) plug-in allows for embedded digital video encoded with the Sorenson codec.
- Digital video files should be viewable using the default browser currently in use by the majority of learners. The ability to download needed plug-ins, programs, and APIs should be built into the course/presentation if they are not already available within the targeted browsers.

- Video should be created at a reasonable resolution (320x240 for example) to ease download times. Other resolutions can be used (i.e. 240x188 and 176x144), but any resolution chosen should become a baseline or default throughout the course or presentation.
- Encode video files using a standard that offers widespread support, while providing maximum compression (i.e. 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 (e.g., if a 30-second clip was used from a 20-minute program, then provide the 30-second clip as well as the entire program.) Label the uncompressed source video to correspond to its respective compressed file.
- Consider the audience when creating digital streaming video. If it is possible, create a multi-bit rate encoded video, which allows learners at different connection speeds to view the same file. This type of file actually senses at what speed a learner is connected. If the learner is connected via a dialup connection, the file will deliver a highly compressed video signal for dialup. If the user is connected via a cable or DSL modem, the file will deliver a better quality video signal. The most common bit rates are outlined in Table 11 (below).

Table 11 – Common Encoding Bit Rates

Encoded Bit Rate	Target Audience
28.8 Kbps	Dialup Users at 28.8K
56 Kbps	Dialup Users at 56K
80 Kbps	ISDN and slow corporate networks
150 Kbps	Fast corporate networks
256 Kbps	DSL, cable modem, satellite dish, and very fast corporate networks

3.8 Synchronous and Asynchronous ADL Components

While the Style Guide has discussed many aspects of rich media, the following section addresses advances in ADL that blur the distinction between development and delivery. While these courses may be included as part of a traditional WBT, they are often standalone elements presented in a variety of contexts (See Section 5.0, page 34). The media elements may be broadcast and asynchronous in nature (e.g., a Webcast), interactive and asynchronous (e.g., a Wiki or Blog), or various combinations of these and other technologies. While delivered as part of a synchronous learning environment (e.g., Adobe Breeze or Microsoft Live Meeting) or part of a separate audio or video Podcast, the following concerns apply to streaming ADL content:

3.8.1 Streaming Media

The following recommendations should be considered when deploying streaming media content across a network.

- “Streaming media” refers to both audio and video content being “broadcasted” over the Internet through the delivery of network packets between hosting servers and learners.

- Streaming media can be transported via UDP (User Datagram Protocol), TCP (Transmission Control Protocol), IP Multicast, and HTTP (HyperText Transfer Protocol)
- When considering the content delivery network (CDN) infrastructure upon which streaming media is to be delivered, it is important to note that a local area network (LAN) or wide area network (WAN) firewall may be set up to deny entry of streaming media.
- For streaming of Macromedia Flash content (and its video) consider the user of the Macromedia Flash Media server software.
- Streaming media can be received by the learner in one of three ways: as a progressive download, as a progressively streamed download, and as a real-time stream. A progressive download means that the user will not be able to view the video until it has downloaded in its entirety. A progressively streamed download means that content in the video will be shown as it becomes available during the download (there is no "true" buffering). A real-time stream will "buffer" by downloading a small amount of the video to memory (the "buffer") and then immediately replacing it with the next small amount of video (one piece plays while the next piece downloads).
- In high Internet visibility scenarios, streaming media should ideally be stored on a server that is specifically for such purposes. Streaming servers allow for UDP broadcast, multicast, and video-on-demand capabilities, while ordinary HTTP servers do not. A "streaming media" file hosted on a true streaming media server can be accessed by the learner as a real-time stream. On the other hand, under moderate circumstances, storing a "streaming media" file on an HTTP server will result in progressive downloads of the "streaming media" file.
- With streaming media it is important to consider your CDN (Content Delivery Network) and whether it is prepared for Multicasting.
- Multicasting is a one-to-many form of transmission that sends data to a group of users. Multicasting saves network bandwidth because the files are transmitted as a single data stream until the last hop, where individual streams are sent to the learner or target stations by the router at the end of the path. Multicasting does not require the amount of network bandwidth as unicasting since the file is only sent once over the network. Unfortunately, Multicasting requires that the CDN contain special routers and network hardware.
- Unicast connects point to point which means that the streaming server hosting unicasted files needs to open a new connection for every user that wishes to views its content and requires an open network connection for every user and can be quite expensive in terms of network usage.
- Video at 320x240 is a standard frame size, although smaller sizes such as 240x188 and 176x144 can be used if a significant audience viewing the video via dialup is anticipated.
- Streaming media is often "linked" to what are commonly known as "Meta Files." These are relative "pointer" files that contain the actual absolute path to the video/audio content. Linking to "pointer" files such as these eliminates the need of updating a large portion of absolute links throughout a website by storing the one absolute link in just one file that can easily be updated. Example file extensions include: .RAM, .SMIL, .SAMI, .ASX, and .QTL. Additionally, these files can be used to create "playlists" (i.e., distinct groupings of sequenced files) that can contain instructions to stream several pieces of content back-to-back, eliminating the need for the user to click on multiple links to view multiple pieces of content.

3.8.2 Webcasting

Webcasting uses streaming media technology to take a single content source and distribute it to many simultaneous listeners/viewers. From a learning perspective, the term is usually reserved for referring to non-interactive broadcasts (e.g., live or recorded ILT events). As a streaming technology, the concepts and considerations presented in Section 3.9 apply as well to Webcasting.

From a standards perspective, Microsoft has been championing Channel Definition Format (CDF) as an open, industry-standard way to optimize the broadcast of information to users. CDF provides an index or map of a Web site that describes the type of information contained on the site. Specifically, CDF describes logical groupings of information (i.e., sports news vs. financial information), how often the site gets updated, and how to send that information to the user so that the delivery is much more efficient and personalized. When combined with a cookie file, CDF will allow users to further customize and personalize the type of information they receive.[4]

More recently, the term "Podcasting" has become popularized reflecting the impact of the ubiquitous Apple MP3 player, and the broad reach of "publish and subscribe" approaches using RSS feeds (Really Simple Syndication). RSS is an XML technology that allows content to be coded with metadata, such as content subjects and dates, allowing content to be maintained without manual user intervention.

3.8.3 Wikis and Blogs

Most recently, these asynchronous Web-based tools have become part of online education and training programs:

Wikis: A Wiki is a Web-based collaboration site that enables users to edit both the organization and subject matter of the available content in real time. Wikis have been growing in popularity among younger learners, and have begun to emerge as collaboration areas that evolve and mature into stable content. Wikis are also useful tools for online communities of practice. Wikis are best implemented using standard, non-proprietary HTML technologies (many tools are available), and should have at least one (1) responsible instructor for ongoing review and maintenance.

Blogs: Short for "Web Logs," a blog is a running Web-based commentary contributed by interested participants. It differs from a Wiki in that users are unable to edit the organization of the content, and usually reflect the personality of the blog host. Again, because of the familiarity with blog usage as part of their normal Web experience, younger users are comfortable using blogs to help collaborate informally on various projects. The unstructured nature of blogs makes it less likely that authoritative content will result, but blogs can play an important part in group exercises as part of a larger learning program. More importantly, they are useful tools to help create and sustain online communities of practice. Similar to Wikis, blogs are best implemented using standard, non-proprietary HTML technologies (many tools are available), and should have at least one (1) responsible instructor for ongoing review and maintenance.

Of course, along with these new delivery approaches and tools, instructional professionals must now consider the appropriate ways to introduce these options as part of accepted learning solution. As the Style Guide matures, these sections will undoubtedly expand.

[4] See www.microsoft.com for more information regarding CDF.

4.0 WBT/ADL Development

This section discusses recommended programming standards, scripting and authoring tools, product testing, and configuration management.

4.1 Creating WBT/ADL

4.1.1 Tools & Technologies

Regarding the development of courseware while using the templates, the following will likely be used for a typical course (but not limited to):

- Dreamweaver MX 2004 (or version 8)
- Flash 2004 MX (or version 8)
- Watchfire Bobby or ACC Verify. It is the opinion of the author that ACC Verify is a more robust tool for Section 508 validation and is therefore recommended. Considering that Bobby is no longer freeware, other titles should be given consideration.
- ADL Test Suite 1.2.7 (compatible with both SCORM 1.2 and 2004)

While Dreamweaver is listed as a software option, there is no specific functionality within the templates necessitating its use. The following scripting/authoring technologies are used for the templates:

- HTML
- JavaScript
- CSS
- Flash ActionScript (2.0)
- XML

4.1.2 Template Development Best Practices

The following should be kept in mind, whether developing with the HTML or Flash templates:

- Use a pre-defined naming scheme of the source files to indicate iterations.
- Use logical names when naming source code and graphics files; avoid the use of spaces and case-sensitive naming.
- Comment new code as it is written. Also, avoid integrating new code with existing template code. Instead, use attached JavaScript files (.js) to keep code separate or keep the new code within the page itself.
- Keep page level code separated from template and interface code.
- Adopt the naming methods and scripting best practices used in the templates.

4.1.3 Coding Standards and Best Practices

The following recommended standards should be used during development:

- Comment code when appropriate and possible to provide a description of what a particular line of code, function, or file does.

- Have designers create file names for media during the storyboarding phase. Media files must use the names specified on storyboards. If, during the production of media elements, files must be added, combined, or otherwise renamed, the storyboards must reflect these changes.
- When possible, insert common code fragments which include type files for re-use throughout the course.
- Use frames if and when necessary to break up screen content (i.e. interface areas, menu's, content frames).

4.2 Courseware Testing

Courseware testing is performed using the current procedures in the Course Review and Approval Process. Refer to the NTED Course Review and Approval Process documents, as well as the Development section of the NTED Blended Learning Strategy for further information on testing.

Product testing and Quality Assurance (QA) should be a combination of two major components: individuals testing for specific features, functionality, and content and the use of software tools to validate code. The QA process should be defined in the beginning stages of the project so all involved parties can be identified. Part of defining the QA process includes specifying when the content is going to be tested (or which milestones).

Testing by individuals can be done by more than one team during the key project milestones. These teams can be identified to review the following main areas:

- **Content**: Typically, this is an area that is tested by the SMEs or designers. Examples of testing in this area means reviewing the content text, verifying that there are no spelling errors, making sure screen headers and prompts are consistent, etc.
- **Functionality**: Testing in this area is done by individuals who are focusing on validating courseware code and whether it is performing as expected to the agreed upon specifications. Some examples include verifying that the paging and navigation works properly, the course works on various browsers and environments, and additional course features are fully functional.
- **Other**: Often, it is helpful to include other individuals who may (or may not) have involvement in the project. The intent here is to gather an overall impression from a fresh perspective. These individuals may involve SMEs, specialists Section 508 compliance, or other who may offer a different insight or perspective.

In terms of tools, there are many off-the-shelf solutions available to help validate courseware code, check for SCORM compliance, verify 508 Compliance (if applicable), etc. (See Table 12, below). While these tools can help the QA process, they seldom perform 100% of the steps it takes to validate the courseware.

Table 12 – Section 508 Compliance Tools Listing

Tool	Description
UsableNet Lift	508 verification extension software for **Error! Not a valid link.**
Watchfire Bobby	Third-party Section 508 compliance checking software
ACC Repair/Verify	Third-party Section 508 compliance checking software, also performs repairs

Tool	Description
GW Micro Window Eyes	Screen-reading product that allows Web pages to be read aloud
Freedom Scientific's Jaws for Windows	Screen-reading product that allows Web pages to be read aloud
W3C	The World Wide Web Consortium (W3C) is an international consortium where Member organizations, a full-time staff, and the public work together to develop Web standards.

As mentioned earlier, it is best to define in the beginning of a project when the milestones are for testing. Testing can be done at the lesson level, module, or even course. Overall, there is a trade-off between the size of the instructional unit being tested, the frequency of testing, and the financial impact of the two. Basically put, when you test more often and test a smaller unit of training then QA costs will increase proportionately. The benefit however is that you will have a better chance of identifying issues that can cost time and money to change later. Conversely, if testing is done at a larger unit of instructional scale then QA costs may decrease. However the chance is higher for more re-work since a larger chunk of content is being reviewed at the same time.

Finally, when considering the issues, milestones, teams, etc., for product testing it is important to think about implementing a project management workflow tool. A tool can be configured to allow project managers, developers and testers to make comments in real time regarding issues, their status and resolution. A key component of this feature is that comments are stored in a database. The value in a tool like this is that it allows an organization the ability to track many comments from various individuals from various stages of a project. This can be a large task when one is talking about several hours or more of courseware.

4.3 Configuration Management

Standard configuration management practices should be established at the beginning of the production cycle:

- **Directory Structure:** Directories should be created and named in such a manner that the Course is organized in an easy to understand and maintain manner. Course structure should also reflect the requirements of SCORM (discussed earlier).
- **File Naming Conventions:** Files (html, graphics, and script files) should be named in a way that designates the course structure. For maximum compatibility with Apache/Linux based servers, avoid the use of spaces and upper/lower case characters.
- **Backup Practices:** Files should be backed up on a regular basis. Local backups should be done several times a day. Hard copy backups (tape, CD-ROM) should be done on a weekly basis. Once a project is finished, an archive of the project (including source files) should be created, using any suitable media (DVD, hard-drive, tape).
- **Migration:** Courseware should be migrated to appropriate servers for development testing, reviews, and final hosting. Refer to the NTED Standard Operating Procedures (SOP) for loading courses on the firstrespondertraining.gov Learning Management System (LMS).

5.0 WBT/ADL Delivery Standards and Best Practices

In addition to the instructional, design, and development guidelines outlined throughout this document, it is also important to consider how this content will be delivered, managed, and hopefully reused or repurposed. Some level of coordination is required to provide the Emergency Responder Community with the flexibility it needs to share content and realize its investment in Blended Learning. This includes adopting industry-recognized standards for content packaging, using Learning Management and Learning Content Management Systems (LMS and LCMS) that incorporate industry-recognized standards for interoperability and accessibility, and applying a delivery approach suitable to Emergency Responder learners.

5.1 Content Delivery Systems

Modern content delivery systems are normally Web-based, Commercial-Off-The-Shelf (COTS) systems that may be characterized into two broad classes: Learning Management System ("LMS") software that automates the administration of learning events, and Learning Content Management System ("LCMS") software that enables authors to register, store, assemble, manage, and publish learning content for delivery via Web, print, or CD.[5] Both classes of products have come to prominence over the past five years, with many enterprise-class products blurring the line between the two.[6] Most simply, learners normally interact with an LMS (e.g., select a WBT course and register) while content authors interact with an LCMS (e.g., to develop new content or reuse existing content).

While LMS and LCMS products have different strengths, weaknesses, architectures, supported computing platforms, ability to manage and maintain metadata, licensing approaches, and levels of standards conformance, they normally address the following areas of functionality:

General Areas of LMS Functionality

- Learner Registration & Administration
- Training Event Management (i.e., scheduling, tracking, and delivery)
- Curriculum & Certification Management
- Skills & Competencies Management
- Reporting
- Training Record Management

General Areas of LCMS Functionality

- Template-driven, collaborative content development
- Facilitated content management (i.e., indexing and reuse)
- Publishing
- Workflow integration
- Automated interface with LMS

In addition to LMS, many organizations employ a firstrespondertraining.gov or single Web entry into their learning content and resources. While this gateway may redirect users to a number of different physical locations, it presents a single, consolidated interface and starting point for users interested in Blended Learning. The portal then becomes the "presentation layer" that links the various resources and systems (e.g., the LMS) to the user.

[5] "Making Sense of Learning Specifications & Standards: A Decision Maker's Guide to their Adoption," MASIE Center Learning Consortium Industry Report (March 8, 2002). See http://www.masie.com for more information.
[6] See http://www.brandon-hall.com for extensive research regarding current LMS and LCMS products.

While NTED is planning to offer LMS and LCMS services to the Emergency Responder Community via an integrated Portal, it is intended to complement and interoperate with other systems used by the Emergency Responder community. For this reason, NTED offers the following guidance to those organizations considering content delivery systems:

- Develop and maintain formal requirements throughout the acquisition and implementation process.
- Check for supported interoperability and accessibility standards as described above (e.g., SCORM, AICC, and Section 508). Also check any additional accessibility or Web standards local to your organization.
- Ensure compatibility with industry standard relational database management systems such as Oracle, Microsoft SQL Server, and IBM DB2.
- Check to see that the product's technical platform (e.g., Microsoft .NET or Sun Microsystems Java 2 Enterprise Edition – J2EE) and its throughput capacity (i.e., number of simultaneous users) are supported by the organization's technical infrastructure.
- Check the security and privacy regulations regarding content delivery systems within your organization. These systems may be considered a "system of records" as defined by the Privacy Act, and may require a formal System Security Plan (SSP) as indicated by the Government Information Security Reform Act (GISRA), OMB-A-130, and the Computer Security Act.

5.2 Online Collaboration

As mentioned earlier, online collaboration is quickly becoming a key aspect to Web-based instruction. The following list illustrates a few the leading Web collaboration environments and their goals:

- Adobe Breeze: Intended for Web-based conferencing and interaction; can be used in both synchronous and asynchronous modes. Also offers tight integration with other Adobe (previously Macromedia) products.
- Microsoft Live Meeting: Can be used in much the same way as Breeze, with the additional benefits of added integration into other Microsoft products.
- WebEx: Provides excellent real-time, synchronous screen sharing of actual applications.

These and many other products can be used in conjunction with other instructional components as effective tools. These tools can also be used as stand alone components, or as integrated components in broader Web environments (e.g., LMS and LCMS). In any event, these Web-based components will play a larger role in training in the future, and are encouraged for use in the First Responder community (given the recommendations provided in Section 3.8, page 28).

5.3 Learner Platform Considerations

Though technology continually improves, large user populations are often slow to incorporate these advances. Unfortunately, this applies to connection speed (e.g., dial-up versus broadband), screen resolution, color depth, and even versions of popular Web browsers (e.g., Microsoft Internet Explorer and Netscape).

For this reason, and based on current industry practice, the following "de facto" learner platform standards have evolved for delivering courseware via the Internet. While not the absolute "lowest common denominators," these criteria should be considered recommended minimum targets for content developers:

Hardware

- Connectivity: At DSL (Digital Subscriber Line) speeds. Dialup is quickly becoming insufficient for these needs.
- Processor: Pentium II-based/AMD Athlon 800 MHz PC
- Memory: 256 MB RAM
- Monitor: 17-inch VGA Color
- Color Depth: 16-Bit
- Screen resolution: 800X600
- CD-ROM or DVD (preferred)

Software

- Operating System: Microsoft XP (SP2), Mac OS 10.x
- Browser: Microsoft Internet Explorer 6 and Netscape 6.2
- Plug-ins: Microsoft Windows Media Player, Adobe Acrobat, and Macromedia Flash Player (bundled with IE and above)

Note: Software downloads needed to execute the courseware should be made available at the start of the course.

These recommended minimums are intended to benefit the preponderance of the Emergency Responder community. Platforms at either end of the normal distribution (i.e., broadband power users and users of older platforms) may need to lower their expectations or upgrade some components. In other words, it is not recommended that developers specifically target users at the extreme ends of the technology distribution, while adversely affecting the majority.

6.0 References

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